



Fertilizers as Economic Asset for Agriculture Sector

(* Anamika Tiwari)

Department of Biotechnology, Faculty of Engineering and Technology, Rama University, G.T., Road, Kanpur 209217, Uttar Pradesh, India

*Corresponding Author's email: anamika.fet@ramauniversity.ac.in

The chemical composition of various essential minerals and elements intended for the normal as well as the growth and nutrition of all plants is called as fertilizers have been regularly used to encourage and increase the productivity of commercial crops, hence they are called agricultural fertilizers. Enhance the soil fertility and nourish it with required nutrients through the fertilizers also increase the yield of the crops. Fertilizers are the nutrient full sources which nurture the plants with compulsory nutrients and soil turn as a medium between the crops and the fertilizers. A material added to the soil (as manure or a special chemical) to support plant growth.

Fertilizers are inorganic products of high analytical value and certain composition that can supply nutrients and trace components, typically used to the soil to stimulate crop growth. In the latter half of the 20th century, increased use of nitrogen fertilizers was an integral component of traditional nutrition system's increased productivity. Usage efficiencies of fertilizers N (30-35 %), P (15-20 %) and K (35-40 %) have remained stable in recent decades, leaving a large portion of additional fertilizers to accumulate in the soil or join the aquatic environment causing eutrophication.

Most mainstream micronutrients that are useful as fertilizers around the world are water-soluble salts, which mainly contain sulphates or their chelated forms can be lost by escape and run-off in acidic sandy soils and accompanying heavy rainfall, resulting in high demands, industrial costs and severe environmental problems. The usage of slow-(SRFs) or controlled-release (CRFs) fertilizers that in a slower mode provide critical plant nutrients compared to conventional fertilizers is another approach that has been used as a solution to these problems. Most research on CRF technologies are currently under way is focused on releasing adaptable nitrogen (N) from fertilizers. There are a few forms of managed release micronutrient fertilizers available in commerce that are typically focused on insoluble oxides and their mixture of polyphosphates. This perception was discovered for the SRFs based on micronutrients Cu and Zn using a short-chain polyphosphate. These CRFs' nutrient discharge mechanisms are based on either diffusion through their shielding, or slow hydrolysis.

However, soil parameters such as water content, pH, ionic content, and temperature are other factors that influence the release of nutrients via the hydrolysis or diffusion cycle. As a result, there is a possible discrepancy between the amount of micronutrients released into the soil and the compulsory nutrients intake rate per crops.

Forms of fertilizers

There are many methods of classifying fertilizers. They are graded according to whether they contain one element (e.g., N, P, or K), they are considered "pure fertilizers." "Multinutrient fertilizers" bear other nutrients, such as P and N. Fertilizers are also graded as inorganic or organic. Inorganic fertilizers exclude materials that contain carbon. Plant fertilizers are

generally vegetable or animal-derived matter (recycled). Inorganic fertilizers are often referred to as synthetic fertilizers because they need specific chemical treatments for their production.

Single ("straight") nutrient fertilizers

A single fertilizer based on nitrogen is ammonia, or its solutions. Also commonly used is ammonium nitrate (NH_4NO_3). N fertilizers are Ammonium Sulphate and Urea which are another source of crop production. Nitrate nitrogen e.g., NaNO_3 -16% N; $\text{Ca}(\text{NO}_3)_2$ -15.5% N. Ammonium containing N fertilizer e.g., Ammonium sulphate, $(\text{NH}_4)_2\text{SO}_4$ -20% N; Ammonium chloride-24% N.

Superphosphates are the main direct fertilizers of phosphate. "Single Superphosphate" (SSP) contains 14–18 per cent P_2O_5 , typically Triple Superphosphate (TSP) contains 44–48 per cent P_2O_5 . The combination of single superphosphate and triple superphosphate is dual superphosphate. The standard superphosphate fertilizer is water-soluble at about 90 per cent. The largest straight potassium-based fertilizer is Potash Muriate (MOP), which comprises 50–52 per cent K. Potash Muriate is 95-99 per cent KCl and is typically available as a 0-0-60 or 0-0-62 fertilizer.

Multi-nutrient (complex) fertilizers

These fertilizers are mutual and contain dual components or even more nutrients.

Binary fertilizers (NP, NK, PK): Major two-component fertilizers supply plants with both nitrogen and phosphorus. They are known as NP fertilizers. NP fertilizers are monoammonium phosphate (MAP), and diammonium phosphate (DAP). It is active ingredient in MAP $\text{NH}_4\text{H}_2\text{PO}_4$. In DAP the active agent is 2HPO_4 in (NH_4) . Around 85 per cent of MAP and DAP fertilizers are water-soluble.

NPK fertilizers: NPK fertilizers are nitrogen, phosphorus, and potassium-borne fertilizers composed of three components. The NPK score is a method describing how much nitrogen, phosphorus, and potassium is present in a fertilizer. The NPK ratings contain three numbers separated by dashes (e.g., 10-10-10 or 16-4-8) which define the fertilizer's chemical content. The first digit shows the percentage of nitrogen in a product; the second, P_2O_5 ; and the third, K_2O . Fertilizers do not necessarily produce either P_2O_5 or K_2O but the term used in a fertilizer is a traditional shorthand of the amount of phosphorus or potassium described by D Ibrahim et al., 2018.

Macronutrients fertilizers

There are six main elements which play a crucial role in plant development. The principal macro-nutrients are nitrogen, phosphorus, and potassium. These macro-nutrients are very important for any plant's proper and anti-retardant growth and further these nutrients improve yields by wide differences. Secondary macro-nutrients are Calcium, magnesium, and Sulphur. Though the plants require all these nutrients in nearly similar amounts, their availability marks the difference.

Micronutrients fertilizers: Molybdenum, zinc, boron, and copper, magnesium, and manganese are the principal micronutrients. These elements are supplied as salts which are water soluble. Its absence can affect crop yields, cause low nutrient absorption and structural problems. Plants also need certain nutrients in slight but necessary amounts. Plant growth can be delayed and can also have a protracting effect on the yields. The micro-nutrient fertilizers, however, are intended to help the plants' decreased but essential needs and are therefore intended to provide small portions of nutrients such as manganese, iron, copper, nickel boron, molybdenum, chlorine and zinc. The concentrations at which these elements are needed intensively vary from 5-100 ppm.

Organic fertilizers

As the name implies, organic fertilizers are composed of naturally occurring biodegradable materials and nutrient enhancers of the soil. Most organic fertilizers are made with: animal compost, manure, seaweed, peat moss, mineral deposits and additional ingredients from nature.

Inorganic Fertilizer

Inorganic agricultural fertilizers created by inorganic chemical substances, i.e., triple superphosphate granular, potassium chloride, urea, ammonia anhydrous, etc. Usually these fertilizers are non-biodegradable, and further divided into several classes based on their preparation elements and procedures. Such fertilizers are also called synthetic or synthesized fertilizers, because they are manufactured using the new equipment in the factories. Artificial developing processes reduce a rough touch of these fertilizers and force them to be strong and highly performative.

Positive effect of fertilizer

There is a strong belief that fertilizers are increasing crop productivity around the world. The usage of existing fertilizers increased during the Second World War. Fertilizers based on ammonia also contributed to the introduction of specializations in pesticides which were owned by the state in agriculture. Vastly improved food production and helped save the earth from starvation, modern agriculture, with the use of fertilizers and herbicides, could "double or triple food production" in India. Raised production of nutrients would also reduce the need for wildlife for agriculture, contributing to better conservation of biodiversity. They're easy to transport, store, and apply. We may choose a specific fertilizer for the supply of a particular nutrient due to its unique nutrient quality.

- They are water soluble, and can be dissolved easily in the soil. Thus, they are absorbed easily by plants.
- Swift impact on crops.
- Enhance crop yield and deliver sufficient food to feed the large population.
- They're consistent, efficient.