Organic v/s Inorganic Fertilizers: Either or Both?

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Introduction:

Prior to the Industrial Revolution, and the Superphosphate manufacturing development in the mid- 19th Century, the only sources of fertilizer was from animal manures and composted plant material.

With the rapidly increasing world population, and industrialized chemical manufacturing, including the Haber-Bosch process producing ammonia, the availability of synthetic fertilizers grew fairly rapidly.

The use of these inorganic fertilizers soon, far exceeded that of organic inputs. This went hand-in-hand with the need to produce more food, especially with the general move to the cities.

The Organic Approach

Of late, there has been an increased awareness of the importance of organic matter in the soil, with its chemical, physical and biological advantages.

It has always been important to maintain as much organic matter in the soil as possible, but in dry and hot climates, such as in most of South Africa, and the practice of ploughing and removing soil cover with plant material, this is easier said than done.

Farming practices that reverse this approach such as reduced, minimum or no-till have become widespread and where they are understood and correctly implemented, have made important contributions.

There is also a large move to promote the production and use of “Organic” food, by using only “Organic” inputs.

Synthetic chemicals, such as crop protection products, like insecticides, herbicides and pesticides and even some fertilizers such as superphosphate, are not permitted for organic certification.

This almost extreme approach, though justified in many respects, has tended to polarize public opinion.

Regulation of Agricultural Inputs, including Fertilizers

In most countries of the world, the manufacture, quality and use of fertilizers is regulated to a greater or lesser extent. This is also the case in South Africa.

According to Act 36 of 1947, all fertilizer products, both organic and inorganic, must be registered. In South Africa fertilizers are currently controlled under the Fertilizers,

Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947).

A draft Fertilizer Bill, to replace the above Act, is out for general comment.

The main purpose of this legislation is to:

- Protect the consumers and users of fertilizer;
- Disseminate an efficient and effective traceability system;
- Ensure compliance with food safety, human and environmental requirements

In South Africa, fertilizers are grouped under three different categories, depending on their properties and concentrations.

- Group 1 fertilizers contain a total equal to, or greater than, 100g/kg of N, P or K or any combination thereof.
- Group 2 fertilizers contain a total of less than 100g/kg of N, P or K or any combination thereof or any other recognized plant nutrient(s) in acceptable amounts as indicated in Tables 1 – 9 and 13 – 15 of the fertilizer regulations relating to the Act.
- Group 3 fertilizers are natural or synthetic substances or organisms that improve the growth or yield of plants or the physical, chemical or biological condition of the soil and do not qualify for registration as Group1 or Group 2 products.

Essential Plant Nutrients

The recognized essential nutrient elements are:

Macro-elements:

Nitrogen, phosphorus and potassium (N, P, K).

Sulphur, calcium and magnesium (S, Ca, Mg).

(The N, P and K are sometimes referred to as Primary elements and the S, Ca and Mg as Secondary elements).

Micro-elements:

Iron, manganese, copper, zinc, molybdenum, boron and chlorine.

There are also some elements that are regarded as advantageous to some crops under some circumstances:

Nickel, cobalt, selenium, silica.

It should be noted that, in general terms, these plant nutrients are taken up in the same ionic form whether they originate from mineralized organic sources or from synthetic inorganic sources.

This could be interpreted as a simplistic statement, and there are many forms of complex molecules providing nutrition to plants.

Inorganic Fertilizer as Sources of Plant Nutrients

Nitrogen: Ammonia, urea, ammonium nitrate, ammonium sulphate, limestone ammonium nitrate, ammonium sulphate nitrate.

Phosphorus: “Rock phosphates (igneous and sedimentary). The latter sometimes used as such, but mostly chemically processed. Kalmaphos, silphos, phosphoric acid, superphosphates, ammonium phosphate (MAP and DAP), polyphosphates, nitrophosphates.

Potassium: Potassium chloride, potassium sulphate, potassium nitrate.

N, P, K Mixtures

Calcium and Magnesium: These are mostly supplied through agricultural limes that contain different amounts of Ca and Mg. They are primarily used to ensure that the background pH conditions are suitable for plant growth and nutrient availability. They consist of carbonates, oxides, hydroxides, silicates.

Sulphur: Gypsum which comprises both calcium and sulphate. It is also used for improving brack soils and, in some cases, for subsoil acidity.

Micro-nutrients

The micro-nutrients are available for application in a number of different forms, including natural and synthetic compounds, such as chelates, lignosulphonates and polyflavonoids

Foliar applications are often used, as well as mixing with solid fertilizers. To ensure more effective mixing and distribution, various coatings containing the nutrient are sprayed onto the dry base fertilizer.

Organic Fertilizers

The following are sources of economic importance of organic origin:

- Guano
- Chicken Manure
- Raw Cattle Manure
- Composted Cattle Manure
- Peat
- Dry Sewage Sludge

Depending on the availability and envisaged use, the above products are often mixed in different ratios.

There are strict conditions imposed on the registration of such materials, especially relating to potentially harmful elements and human pathogens.

The advantages of organic fertilizers include improved aeration, moisture retention, gas exchange and structure, if applied in sufficient amounts. They promote microbial activity by providing an energy source and contributes to plant nutrition through release of nutrients.

Enriched Organic Fertilizers

As the nutrients are not always ideally balanced or plant nutrition, it is often common practice to enrich organic manures with one or more inorganic product (mostly nitrogen).

Group 3 Fertilizers / Novel Products

In this group of fertilizers a number of “novel” natural or synthetic substances or organisms are included: seaweed, organic acids, biofertilizers, fertilizer coatings, retardants such as controlled release products, nitrification and urease inhibitors and moisture absorption products are included.

Many of these enhance the availability of nutrients and promote a more balanced soil ecosystem, making external inputs less necessary, and in some cases superfluous.

It is a development of which much more will be heard in the future.

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