Organic fertilisers: their importance, and the methods of producing and using them

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Introduction:

In this series, we present an important topic that benefits workers, producers, those interested in agriculture and rural communities worldwide. However, this is particularly important in Syria, which due to several crises, is experiencing a food security crisis.

The world has become more concerned with the production of healthy food in a sustainable way recently. We have realised that a return to nature positively impacts human health and life, food provision, and the protection of natural resources and the environment for future generations.

Our topic today is about natural organic fertilisers: their importance, types and uses. **We will provide the necessary guidance to farmers on how to make them on their farms.**

Welcome to you, Dr Manaf. Welcome to all those who listen and care about the Syrian agricultural sector. We'd like to talk about organic fertilisers: what are they? Why are they important? Why have they become so popular recently?

God has created a stable system from antiquity in which soils can regenerate their vitality and fertility without human intervention. Plants, animals, the environment, and the climate contribute to the perpetuation of life by conserving renewable natural resources. For example, in regions of forests, pastures and plains, fallen leaves accumulate, and dead plants accumulate on the soil surface, which mix with animal waste. These materials decompose and return the soil to fertility and vitality in a continuous cycle.

Also, the annual river floods restore the soil to full health by leaving organic and mineral residue, which improves the soil structure, increases its nutrients, and eliminates the accumulation of harmful salts on the surface.

These systems are no longer fully functioning because of human intervention and technological progress. We rely on chemical fertilisers and pesticides to increase agricultural production, no longer allowing the natural renewal of soil vitality. These chemicals reduce soil health and vitality in the long term and threaten the continuation of man on this planet.

Are they not the ones that have contributed to the increase in crop production and fed our communities? Also, the financial imports of the farms have increased, which must have a positive impact on the farmer's living conditions?

The benefits that I have mentioned to chemical fertilisers are temporary, not permanent. Production often declines after prolonged use, and pollutants and harmful substances accumulate in soil with excessive use.

Miscalculations of the amounts of chemical fertilisers suitable for agriculture have negative repercussions on human health and the rest of life. For example, chemical fertilisers containing nitrogen materials can cause cancer by converting nitrates in the human intestine to nitrite, a carcinogenic substance in the blood, stomach and intestine. In addition, nitrates are transmitted from the contaminated soil by irrigation of agricultural sewage into river and groundwater and, subsequently, into humans and animals by drinking water or eating nitrified vegetables.

Urea-compost also contains toxic, high-temperature biorites, and urea can release ammonia, causing respiratory infections and sterility in men.

The accumulation of harmful heavy elements in soil due to the use of phosphatic fertilisers leads to the accumulation of cadmium, which is detrimental to human health.

Overuse of fertilisers increases pollution in both soil and water by accumulating harmful elements left behind in soil and sewage.

Fertilisers significantly increase plant vegetable growth, so excess fertiliser use increases vegetable growth at the expense of crop and fruit output, weakening plants and rendering them susceptible to disease and insects, thus reducing production.

Agricultural sewage usually contains residues from chemical fertilisers, such as nitrates, which lead to the multiplication and growth of algae and parasites in banks and lakes. This reduces the oxygen content of water and prevents it from flowing.

Chemical fertilisers may contribute to more rapid plant growth, but they do not conserve soil fertility, and so in the long run, they degrade agricultural soil and ruin its structure.

Chemical fertiliser leads to the production of crops and vegetables with less taste, flavour, and low nutritional value.

We return to our first question about the importance of organic fertilisers, their types, and how to manufacture them.

- In brief, organic fertilisers can produce the same effects as chemical fertilisers without damaging the environment, soil, and man. Organic fertilisers:

  - Improve the soil structure and provide the soil with the necessary elements.

  - helps increase soil fertility and enhance its water- and nutrient retention capacity.

  - Works to build and form a healthy, strong soil free of pollutants.

  - Organic fertilisers are renewable, biodegradable, sustainable and environmentally friendly.

  - Crops produced by organic fertilisers tend to be more food-intensive and better-grained because of the nutrients they draw from impermeable healthy soils of minerals and nutrients.

  - Organic fertilisers reduce the exposure of soil and plants to toxic chemicals or minerals, as organic matter is fully decomposed.

  - There is no possibility of damage to plants or soil when organic fertilisers are used. They are always safe because they decompose slowly.

  - Results of organic fertilisers are slow to show but valuable for both soil and plants.

  - assists microbial activity and microorganisms present in the soil.

These are significant benefits and crucial for conserving the environment, soil and human beings, but in short, what are organic fertilisers?

An organic fertiliser is any substance of plant or animal origin, which has been broken down via fermentation, to improve the physical, chemical and biological properties of the soil and provide more of the plant's required nutrients, such as nitrogen, phosphorus, potash and calcium.

It can be obtained from several different sources:

1- Organic fertilisers can come from animal sources, such as dung from cows, horses, sheep, goats, domestic birds, etc.

2- Vegetable organic fertilisers come from leaves and branches of fallen trees or crop waste from nurseries, gardens, natural and artificial forest trees. It is called green manure.

3- Organic fertilisers produced by sewage, used to fertilise crops and irrigate trees after recycling and disposing of contaminants.

4- Compost, which combines organic fertiliser from animal waste and fertiliser from plant waste. It is produced via the decomposition of animal organic materials, such as animal dung, and plant materials, both dry and green, by soil microbes within a wet environment. This increases the content of phosphorus, nitrogen and other nutrients in the fertiliser.

Before we get into how organic fertilisers are made, especially compost, we always hear about organic compounds such as peat, compost, berlite, humus, municipal fertiliser, manure, ruth. What's the difference between these compounds?

In general, humus, municipal fertiliser, manure, and blackness generally refer to organic fertiliser from animal and plant residues.

Manure refers to the solid and liquid wastes of farm animals mixed with the "brush" used on the floors of pastoral or poultry animals. The composition and benefits of the dung vary according to the type of animal, age, diet and type of brush used.

Compost is dung that has been fermented and

has had its bonds disintegrated by bacteria.

Humus is the primary organic substance found on the soil surface, i.e. it is exclusively soil-specific. Humus contains the nutrients and elements necessary for plant growth and crop production.

Humus is formed in the soil over time as a result of the microbial decomposition of plants and animals. It contains 60% carbon in its composition, 6% nitrogen, and smaller amounts of phosphorus and sulfur. Usually, when humus decomposes, its constituents are changed to usable forms by plants.

But we have to differentiate between these things, even though many do not distinguish between them.

Peat results from the decomposition of wet forests. The algae, leaves and other plant residues have accumulated and been fermented in water (hydrofermentation or anaerobic-aerobic fermentation). That is, they have been decomposed in an anaerobic manner for a very long time, which may extend for thousands of years, to become a light, carbon-rich, black sponge compound. Peat is an excellent growing environment and is used most often in nurseries, greenhouses and inland plants. It is a crucial element in most types of agricultural soils. Peat is very nutrient-poor. It can be regarded as a mere plant growth environment and used in combination with other soils. It is very good at reducing the acidity in high acidity soils.

The Most Important Feature of Peat:

It helps soil retain moisture, reduces soil loss of water, helps soil retain nutrients, improves soil texture, supports plant growth, is disintegrative and lightweight, and protects soil against pests and insects. It can be used in vegetable beds.

Perlite is an inorganic farm environment. It is made of volcanic stone and grades from grey to white. It is a stable and lightweight substance.

Perlite drains well yet can also retain water at the same time, making it ideal for mixing with peat to create clean, healthy soil free of pathogens.

Perlite is widely used in agriculture. It can be used individually and yield good results. We can mix it with other soil to get an ideal soil texture that provides water for plants whilst discharging excess moisture, thereby creating a highly porous and permeable agricultural environment that allows roots to grow and breathe.

We have to discuss in detail compost. What is its importance, and can the farmer create it from the organic material he has on his farm?

Of course, a farmer can make it easily with materials that are available to him in abundance and at no cost, like a few residues of dry and green crops, a little bit of manure and soil.

Compost is an organic fertiliser that supplies nutrients to plants, resulting from bacterial decomposition from a mixture of plant and animal residue or any organic waste. The compounds are mixed with clay, sand and lime and can be used as organic fertiliser after decomposing to aid in plant growth and supply with the necessary nutrients. Mature compost is dark brown or black.

Compost has several advantages, including:

1. The compost produced is characterised by high degradation quality and no smell.
2. It is characterised by a high content of obese elements and organic matter.
3. It is free of grass seeds and pathogens of plants and nematodes, which protect the soil against pests and diseases and prevent plant roots from rotting.
4. Assists with improving soil properties, supplying it with the necessary nutrients and increasing the capacity of soil to retain water.
5. It contains biostimulants and the natural hormones necessary for plant growth.

Dr Manaf, what should farmers do to get compost rich in nutrients and free of diseases, pests and weed seeds?

The steps are:

1. The area allocated to the heap shall be selected because the ton will occupy approximately 2 x 3 m of land near the source of irrigation water. The land will be well-tuned to prevent leaching, and a canal around it will be dug 20 cm wide and 10 cm deep and will end up in the pool of the filter so that it can be reused for spraying the heap

2 - A layer of brown plant waste, i.e. land 2 x 3 m wide and 50 - 60 cm thick, shall be enclosed with a 10 - 15 cm thick layer of animal waste. In the absence of animal waste, we can scatter a layer of soil above the dry plant waste layer to obtain decomposition bacteria. Then we put a green vegetable waste layer, repeating the layers and then treading on it with feet to compress and reduce the volume

3 - This process is repeated, alternating waste layers with water and pressure until the stack reaches between 1.5 - 2m. We then spray it with water from the outside.

4. The heap is watered once each week in winter and twice to three times in summer or whenever necessary. The compost should never be dry or saturated so that if a handful of the compost is taken at a depth of 50 cm from various positions and squeezed, the hand is only wet. This degree of moisture is considered essential for the success of aerobic decomposition and must be maintained until full maturity.

5 - In the typical case, the temperature within the heap shall rise after 48 - 72 hours to more than 50 degrees, increase to 65 - 70 degrees and continue for several weeks, depending on the type of plant residue. These temperatures are needed to eliminate all pathogens, nematodes and grass seeds.

6. To help mix components and increase degradation, it is best to flip the pile at the latest every two to three weeks.

It's best to break up any plant waste to a length of 5 - 7 cm.

How do we know that the process of bacterial antenna analysis is complete and we've got mature compost?

There are signs of the Compost maturity:

1. The temperature of a stack must not exceed the temperature of the atmosphere surrounding it.
2. Relative humidity in the stack is about 50%
3. The smell of ammonia disappears from the pile
4. P must be between 7.5 - 8.5
5. The product is spongy in colour and light brown
6. No unacceptable odours on the product

We've heard a lot about vermicompost and its importance in increasing crop and vegetable production and plant conservation. So what's the difference between it and compost?

Compost, we mentioned, is the product of anaerobic bacterial decomposition of animal and plant organic materials. Although rich in organic fertilisers, it is not enough to feed plants on its own because of the decrease in the amount of small and large elements needed by plants during their growing periods. Compost is also usually not free of microscopic pathogens.

The vermicompost is fully decomposed organic matter that earthworms have then digested. They digest or neutralise any harmful residual material left in the decomposed organic matter.

They compartmentalise and simplify soil components, making them easier for plants to absorb and utilise. For example, adding 1 kg of fermi compost to the soil does the same for the material value of the soil as adding 20 kg of standard compost.

The vermi elements of the compost are easily dissolved in water. In contrast, elements in compost are insoluble in water and cannot be readily utilised by the plant.

The influence of the fermi compost occurs quickly following its initial use, perhaps even less than one week. The compost is effective much longer.

The vermicompost provides the plant with the large and small elements it needs and supplies the soil with a large group of bacteria that are essential for the plant. It provides the soil with the necessary facilities to manufacture nutrients, growth organisations and materials to resist soil pests, which will restore the soil to its vitality.

Vermicompost contains antibodies and fungi such as actinomyces, which increase plants' resistance to insects and diseases, thus decreasing the need for pesticides.

Earthworms can remove heavy metals from the soil, which contaminate it, and pack the mineral molecules with a protein called metallothenes instead. This limits the damage caused by heavy metal pollution.

Vermicompost can be produced on a small scale for use in a home garden. Agricultural enterprises can produce it on a farm and obtain self-sufficiency in fertilising farm plants. Many investors have also established mega-projects that produce and sell Fermi Compost and export it to impoverished countries.

However, I think it would be better to create a suitable environment for earthworms in your soil and then transfer them to soils that need help. The worm will produce fermous compost in the soil and provide it directly to the plant at no additional cost. This will also improve soil aeration, water seepage control, soil acidity, the distribution of minerals in the soil, increase the amount of nutrients and microbes in the soil.

To end, what do you advise people to fertilise their fields with to obtain abundant and healthy crops and vegetables?

We have to do away with chemical fertilisers because of their (as mentioned above) effects on the environment, renewable natural resources, and man. They should be replaced with organic fertilisers that help improve the soil and increase its fertility, providing abundant and healthy crops and vegetables. In addition, organic fertilisers can be made in a house garden or field, which is available to those of us with many plants or farm animals. This will save a lot of money. In my opinion, it is possible to fertilise all at various stages of crop growth with organic fertiliser. We can encourage use earthworms to convert decaying organic matter into vermicompost, creating a high-value organic fertiliser. Vermicompost can be easily absorbed by the plant, offers immediate protection against pests and diseases, increases productivity and improves the taste of vegetables and fruits.

- **We thank Dr Manaf Al-Dakhil for this session. We hope this episode has provided our listeners with all the information needed to increase and improve their agricultural production while preserving the environment and man.**