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Organic Manure: Types, Application Method and Benefit of Organic Manure in Sustainable Crop Production and Productivity in Agriculture

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INTRODUCTION

The crop removes large quantity of plant nutrients from soil, particularly the removal of NPK nutrients at the present level of crop production has been estimated at 125 kg/ha/annum whereas the annual addition is not more than 75 kg resulting in depletion of the nutrient reserve of soil. The excessive reliance on chemical fertilizers and the negligence shown to the conservation and use of organic sources of nutrients have not only caused the exhaustion of soil of its nutrient reserves but also resulted in soil health problems not conducive to achieving consistent increase in agricultural production. Moreover, Indian soils are poor in organic matter and in major plant nutrients. Soil organic matter is the key to soil fertility and productivity. In the absence of organic matter, the soil is a mixture of sand, silt and clay. Organic matter induces life into this inert mixture and promotes biological activities. Although the beneficial influence of organic matter on the physical, chemical and biological properties of the soil is widely known, the full appreciation of the same remains largely ignored in modern agriculture. The regular recycling of organic wastes in the soil is the most efficient method of maintaining optimum levels of soil organic matter. Recycling of organic matter in the soil should become a regular feature of modern agriculture. In the traditional agriculture, followed over generations in India, the use of plant and animal wastes as a source of plant nutrient was the accepted practice. The importance and aim of organic manures and green manure crops have failed to be recognized in modern agriculture. Agriculture is the backbone of our global food system, providing sustenance for billions of people and supporting countless livelihoods. However, the conventional agricultural practices that have dominated the industry for decades often come at a significant environmental cost. These practices, which rely heavily on synthetic fertilizers and pesticides, can degrade soil health, harm ecosystems, and contribute to greenhouse gas emissions.

In the face of mounting environmental challenges and a growing global population, it is imperative that we transition towards more sustainable agricultural practices. Organic manuring, also known as organic fertilization, offers a promising solution to enhance agricultural sustainability. This age-old practice involves the application of organic materials such as compost, animal manure, and crop residues to improve soil fertility and overall farm productivity. Organic manuring aligns with the principles of organic farming, which prioritize soil health, biodiversity, and ecological balance. In this discussion, we will explore the multifaceted benefits of organic manuring and its pivotal role in advancing agricultural sustainability. We will delve into how organic manuring can enhance soil health, reduce environmental impact, promote biodiversity, and contribute to food security. Furthermore, we will examine the challenges and considerations associated with adopting organic manuring practices on a broader scale. As the world grapples with the urgent need to address climate change, soil degradation, and the depletion of natural resources, organic manuring emerges as a key strategy to foster a more sustainable and resilient agricultural system. By embracing organic manuring, we can pave the way for a future where agriculture coexists harmoniously with the environment, ensuring food security for generations to come while preserving the planet's delicate balance.

Types of Organic Manures: -

I. **Farmyard Manure (FYM):** Farmyard manure (FYM), also known as barnyard manure or simply animal manure, is a valuable organic fertilizer and soil conditioner made from the mixture of animal excreta (dung and urine) and plant materials like straw, hay, and bedding materials. FYM is a traditional and widely used source of organic matter and nutrients for agricultural and gardening purposes. Here are some key characteristics and benefits of farmyard manure (FYM):

II. **Green Manure:** Green manure crops like legumes (e.g., clover, alfalfa) are grown and then incorporated into the soil to add organic matter and nitrogen. Green manure, often referred to as cover crops, is a sustainable farming and gardening practice that involves planting specific crops primarily to improve soil health and fertility rather than for harvest. Green manure crops are typically grown, then incorporated into the soil before they reach maturity. This practice offers various benefits to the soil, environment, and overall crop production. Green manure plants add organic matter to the soil when they are incorporated or mulched into it. This organic matter improves soil structure, enhances moisture retention, and increases microbial activity.

III. **Vermicompost:** Vermicompost is a nutrient-rich, organic fertilizer and soil conditioner produced through the process of vermicomposting, which involves the use of earthworms to decompose organic materials. This natural and sustainable method of recycling organic waste not only reduces waste going to landfills but also results in a highly beneficial product for gardening, agriculture, and horticulture. Vermicomposting is the process of using specific species of earthworms, typically red wigglers (Eisenia fetida) or Indian blue worms (Perionyx excavates), to break down organic matter like kitchen scraps, garden waste, and other biodegradable materials. Earthworms consume organic materials, digest them, and then excrete a nutrient-rich, granular material known as vermicompost or worm castings. This process is carried out in a controlled environment, such as a worm bin or vermicompost pit, where conditions like temperature, moisture, and aeration are optimized for the worms' activity

IV. **Poultry Manure:** Poultry manure refers to the waste products generated by domesticated birds, primarily chickens, turkeys, ducks, and other fowl kept for meat or egg production. Poultry manure is considered a valuable source of organic fertilizer for agricultural and horticultural purposes due to its nutrient content. Poultry manure is rich in essential nutrients required for plant growth, including nitrogen (N), phosphorus (P), potassium (K), and various micronutrients. The nutrient content of poultry manure can vary depending on factors like the type of poultry, diet, and management practices. Poultry manure is known for its relatively high nitrogen content, making it an excellent source of this essential nutrient for plants. However, its nitrogen content can also lead to nutrient imbalances if not used judiciously. Poultry manure contains organic matter that improves soil structure, moisture retention, and microbial activity in the soil. It contributes to the overall health of the soil.

V. **Biochar**: Biochar is a carbon-rich, fine-grained material produced through the process of pyrolysis, which involves heating biomass (such as wood, agricultural residues, or organic waste) in the absence of oxygen. This process transforms the biomass into a stable form of carbon that can be used as a soil amendment and has various environmental benefits

VI. **Fish Emulsion:** A liquid organic fertilizer made from fish waste, it's a good source of nitrogen. Fish emulsion is a liquid organic fertilizer made from fish waste, such as fish scraps, fish parts, and fish processing byproducts. It is a nutrient-rich product commonly used in gardening and agriculture to provide essential nutrients to plants.

Application method: - Organic manures can be applied in various ways, such as top-dressing, incorporation into the soil, or through compost tea applications. The choice of application method depends on the type of manure and the specific needs of the crops. Choosing a method of manure application depends on the physical characteristics of manure (liquid or solid), type of operation, manure handling and storage, type of spreader and cost. Typically, beef cattle and poultry manure are handled as solid manure, whereas dairy and swine manure are stored and handled as liquid manure. The application system used will have implications for nutrient management and environmental risk, in particular nutrient placement and nutrient retention

1. **Solid Manure Application: -** Broadcasting manure onto the surface of a field is the oldest method of spreading. It is easy, cheap, and can be done during almost any season. But there are also some significant disadvantages. From a nutrient standpoint, a substantial amount of nitrogen can be lost within a few days of application. This happens when ammonium (inorganic, plant available N) converts to ammonia gas, a process called volatilization. The organic N is not lost, however, and some of it may become available later in the growing season. Other concerns are odors and the possibility of nutrient or pathogen runoff in large rain or snowmelt events.
2. **Liquid or Slurry Manure Application: -** Liquid or slurry manure (less than 12% solids) can be surface applied or directly injected using a number of different systems. Because of relatively low nutrient concentration, liquid livestock manure may be applied at relatively high volumes, but it is generally recommended that it not be applied at rates that exceed the soil infiltration rate, nor exceed the amount needed to bring the soil to field water holding capacity.

Benefits of Organic Manuring: - Organic manuring offers several valuable uses in agricultural fields to improve soil fertility,

enhance crop growth, and promote sustainable farming practices.

1. Soil Fertility Improvement, Organic manures are rich in essential nutrients like nitrogen (N), phosphorus (P), and potassium (K) along with micronutrients. Applying organic manures to the soil helps replenish these nutrients, making them available to plants over time.
2. Enhanced Soil Structure, Organic matter in manures improves soil structure by increasing its porosity and water-holding capacity. This improves aeration, root penetration, and overall soil quality.
3. Nutrient Recycling, Organic manuring recycles nutrients from organic waste materials, such as crop residues, animal dung, and kitchen scraps. This reduces the need for synthetic fertilizers and minimizes nutrient runoff, which can be harmful to the environment.
4. Microbial Activity Organic matter in manures promotes the growth of beneficial soil microorganisms. These microorganisms play a vital role in breaking down organic materials, making nutrients more accessible to plants, and suppressing harmful pathogens.
5. Weed Suppression, Well-composted organic manures can help suppress weed growth by creating a thicker mulch layer on the soil surface. This reduces competition for water and nutrients between crops and weeds.
6. Reduced Soil Erosion, the increased soil structure and improved water-holding capacity resulting from organic manuring help reduce soil erosion, especially in sloped or vulnerable areas.
7. pH Regulation, some organic manures can help regulate soil pH levels. For example, liming materials derived from organic sources can be used to raise soil pH in acidic soils.
8. Disease Suppression, Organic materials like compost and well-rotted manure can contain beneficial microorganisms and compounds that suppress certain soil-borne diseases, contributing to healthier crops.

Caution: - While organic manures are beneficial, it's essential to apply them judiciously to avoid overloading the soil with nutrients, which can lead to imbalances. Proper composting and aging of manures can also help reduce the risk of pathogens and weed seeds in the soil. Organic manuring is a sustainable and environmentally friendly way to improve soil fertility and productivity in agriculture and gardening. It promotes the use of natural resources and reduces reliance on synthetic fertilizers, contributing to more sustainable and ecologically sound agricultural practices.

CONCLUSION

Organic manuring represents a sustainable and environmentally friendly approach to enhancing agricultural productivity while preserving soil health. By harnessing the potential of organic materials, farmers can reduce their dependence on synthetic inputs, mitigate environmental risks, and contribute to the long-term sustainability of their farming operations. However, effective implementation requires a sound understanding of local conditions, nutrient management, and best practices in organic manure application. Addition of organic matter through all sources significantly improved the soil properties. Improvement in crop growth was principally due to increase in P and K availability in soil. Hence integrated use of organic manure with chemical fertilizers would be a better and practical approach to sustain soil fertility and productivity.