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Integrated Nutrient Management for Sustainable Agriculture

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Abstract

Soil fertility must be maintained by carefully utilizing inorganic and organic nutrient supplies. Growing population food demands, as well as the necessity for an environmentally responsible approach to long-term agricultural improvement, necessitate careful attention when addressing crop yield increase. Integrated nutrition management (INM) is seen as a reassuring technique for dealing with such difficulties and plays a critical role in addressing these concerns. INM is capable of improving plant efficiency and effectiveness of resources are improved, while security for the environment and quality of resources are preserved.

Keywords: Food demand, INM, Organic nutrient, Soil fertility

Introduction

Integrated nutrient management system comprises with the efficient and judicious quantity, application, or management of entirely important plant-based resources, such as chemical-based fertilisers when combined with animal manures, compost and green manures. To improve soil fertility, health and production, pulses in cropping systems, biofertilizers, crop leftovers or decomposable remaining and other locally available nutrient resources are used. It has been established that combining the supply and utilisation of nutrients that come from chemical fertilisers and manure that is organic resulted in significantly greater crop yields than either treatment alone. This increase in crop productivity is due to their mutual and harmonious effect, which aids in the advancement of soil's chemical, physical and biological protagonists and as a result, standing soil nutrients and organic matter; well regulated supply of nutrients to plants of cropping systems; and, if any, no or minimally detrimental environmental impact. The basic goal of integrated nutrient delivery and management is to provide as much neutral nutrient input to crops as feasible while retaining and improving soil fertility health for long-term high productivity. The optimal and equilibrium combination(s) of plant nutrition resources to a producing technique varies depending to land use, social, economic and environmental factors. This is because plant nutrients sources are distinct greatly depending on the type of nutrient substances, distribution effectiveness or fascination, positional availability, crop specificity, farmer appropriateness and so on. The most efficient combination(s) of a production approach for an ideal and balanced nutrient supply will be decided based on land utilisation environmental, social and economic variables. In terms of nutrient components, delivery effectiveness or fascination, location accessibility, crop specificity, farmer suitability and other considerations, plant nutrient sources vary widely.

Concept of INM

INM is primarily defined as the integration of traditional and modern nutritional management practises into an agricultural system that uses every source of natural, inorganic and biological parts and elements and is

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resource-efficient and environmentally sound. The basic concept of ISSM is integrated nutrient management (INM), which, in accordance with the local environment, rebuilds the complete production system by employing the right crop kinds, sowing dates, density levels and INM (Chen *et al.*, 2014; Zhang *et al.*, 2012).

In order to coordinate nutrition uptake by the plant and release into the surroundings, it optimises all elements of the cycle of nutrients, encompassing the macro- and micronutrients inputs and outputs as well as N, P and K. It also aims to increase the physical, biochemical and hydraulic qualities of the soil in order to increase farm output and decrease land deprivation. INM can subtly increase agricultural production while safeguarding soil resources. Growers use farmyard manures, farm wastes, soil adaptations, crop residues, natural and artificial fertilisers, green manures, cover crop cultivation, intercropping and rotational cultivation, fallows, sustainable farming, irrigation and drainage to increase the amount of water and plant nutrients available (Janssen, 1993).

The basic concepts of INM includes following:

- Maintaining optimal plant nutrition delivery to promote targeted crop output.
- Variable quantities of chemical fertilisers as well as organic manures, residues from crops and N-fixing plants must be utilised in accordance with the land used system and the environmentally friendly, social and economic conditions.

In order to create INM practises for many categories, this methodology focuses on the farming system rather than a single crop or location. The physical factors with respect to of the soil's structure, aggregate strength, moisture from the soil retention and hydrological conduction are improved by a combined nutrient management system. INM approaches can reduce plants' needs for inorganic nitrogen fertiliser and for small-scale farmers in developing nations; using less of the nutrients that's purchased in fertiliser can save them a lot of money.

Components of INM

Organic Manures

Urban compost, FYM, agricultural residues, human excreta, city rubbish, rural compost, sewage-sludge, press mud and other types of agro industrial by-products are examples of high-nutrient-potential organic manures. Compost and FYM have traditionally been important manures for protecting the fertility of the soil and crop stability. Non-edible oilcakes and food processing industry waste are two other potential organic nutrition sources. There are also a number of industrial by-products and municipal garbage with high nutritional value. However, these nutrient-carriers have not been thoroughly studied in order to identify fertiliser equivalents.

Synthetic Chemicals

Fertilisers remained the most significant component of INM. Because of the necessity to feed enormous quantities of nutrients in cropping practises with high productivity, the reliance on chemical fertilisers has been steadily growing. Despite this, fertiliser intake is not only insufficient but also unbalanced.

Green Leaf Manures

Green leaf manuring is the use of green leaves as well as twigs of trees, shrubs and plants acquired elsewhere. Green leaf manure is primarily derived from the leaves of forest trees. Plants growing on wastelands, field bunds and other disturbed areas are a further source for green leaf manure.

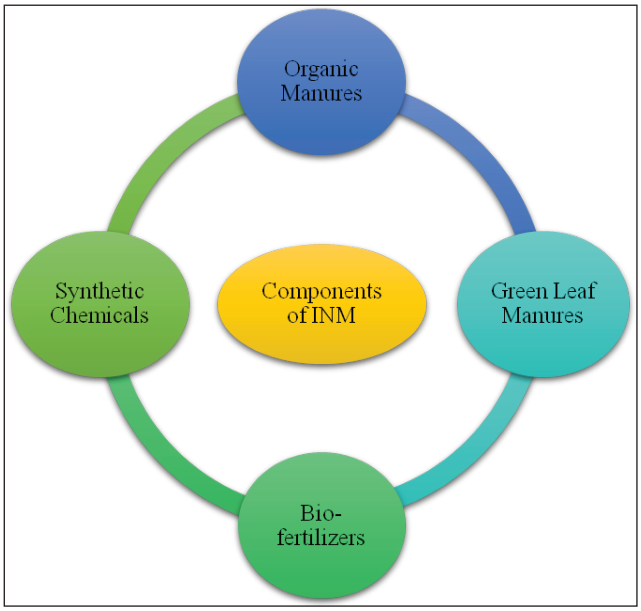

Figure 1: Components of integrated nutrient management

Biofertilizers

Biofertilisers are materials that contain living or dormant cells of economically beneficial microbes that play a crucial part of enhancing fertility of the soil and crop productivity by fixing atmospheric N, solubilizing/mobilizing P and decomposing farm waste, leading to the discharge of plant nutrients. The amount to which these microorganisms benefit depends on their abundance and effectiveness, which is influenced by a variety of soil and atmospheric variables. Bacterial cultures such as Rhizobium, Azospirillium and Azotobacter have capacity to fix atmospheric N, increasing crop N supply.

Integrated Nutrient Management Serve as Agricultural Sustainability

Sustainable agricultural production comprises the concept of using organic reserves to boost productivity and profitability, particularly for low income populations, without degrading the natural reserve base. Integrated nutrient management system protects soil in this manner because they act as essential nutrient reservoirs for vegetative plant growth. The goal of INM is to effectively use both organic and inorganic plant nutrients to boost agricultural output while preserving the environment and future generations' access to productive soil. INM expresses reliance on a wide range of things, including the submission and safeguarding of relevant nutrients, as well

as the transmission of knowledge concerning INM practises to farmers and scientists.

Conclusion

Unless adequate and dependable nitrogen supplies are provided to plants, it is difficult to achieve the necessary yield increases of the major crops as long as agriculture is still a soil-based sector. In order for high yields to be advantageous in the short and long term, the necessary conditions for nutrients to be accessible for a specific crop in the appropriate method, in the right exact and proportional amounts and at the right time must be available. Governments must persuade "nutrient cycles" studies to have a more solid foundation in order to discover plant nutrient movement into and out of soils. Governments should establish appropriate assessment and tracking programmes to collect data pertaining to the process of nutrient cycling and nutrient balances in specific areas across their rural economies.

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