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Ground Water Depletion in Southern Haryana

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ABSTRACT

The impact of soil fertility is very huge as it is an essential component for the good quality of the crops. It is said that if the soil is less fertile then there are more chances that the yielded crop would be of lower quality. Hence, farmers tend to enhance the fertility level of soil before irrigation. According to a research report, the pH level of the soil should be between 6.0 and 7.0 so that the production level of the crops can be raised in an effective way.

Soil should have the capability of providing all the nutrients like Nitrogen, Phosphorus , Potassium, Calcium and Magnesium etc required by the crop. Also, the soil productivity depends on the level of soil fertility. Soil fertility relates to the capacity of soil to provide essential nutrients to the crops. The current paper highlights the impact of soil fertility on the production of crops.

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KEYWORDS:

Soil, Crop, Production, Fertility

INTRODUCTION

In India, most of the rural population depends on the agricultural activities. They get their livelihood through agriculture. Therefore, it becomes very important for them to generate quality production of crops so that they can get enough profit. Hence, it is very essential for them to keep the fertility level of the soil higher so that good quality of the crop can be yielded.

But, in recent years, it is observed that in a number of places, the fertility of the soil is decreasing due to natural disaster like drought, lack of essential nutrients and other natural disasters. Hence, it has become very challenging for the farmers to maintain the higher level of soil fertility.

To overcome the problem of lower soil fertility, farmers are using a number of methods where in many cases, it is observed that the farmers are using manure, fertilizers and other organic materials in order to enhance the soil fertility to get higher crop production.

For the sustainable agriculture development, soil health and soil fertility are two major factors which certainly prove to be essential tools for better crop productivity. According to a survey, it is found that almost 73 percent of the farmers use chemical fertilizers during cultivation and rest

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of 27% of the farmers use both types of fertilizers i.e. organic as well as inorganic.

Most of the crop production depends on the soil and its nutrient status. If the soil to be used for the cultivation, has less capability of providing good range of nutrients to the crop then that type of soil can't yield good range of crop.

On the other hand, the soil with higher capability of providing all the nutrients to the crop then that kind of soil is like a boon for the crop as the level of the production of crops on this kind of soil tends to move upward.

The nature of soil depends on the surrounding conditions as it is observed that the status of the soils near the river area is found to be goes as compared to the soil near the industrial areas. For example, the level of soil fertility of the soil near the Ganga river is found higher than that of Delhi and NCR.

Most of the soil is formed from the rock materials and under the changing weather conditions, the formation of the soil takes place. A number of minerals and essential nutrients are found in the soil which is beneficial for the crop production.

Figure 1 shows the vertical section of a typical soil. Typically, there are four soil horizons in the vertical section of the soil. The top most part is

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known as topsoil which is approximately 25 cm under the crust and next horizon is sub-soil at 50 cm.

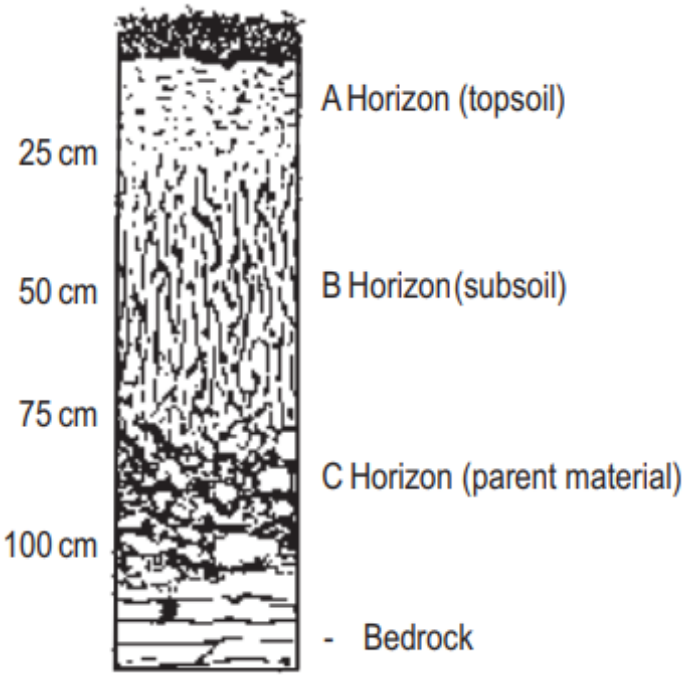

Figure 1: A vertical cross-section of a typical soil profile showing soil horizons

Parent material is found at the depth of 75 cm and finally, the bedrock is found at the depth of approximate 100 cm.

GROUND WATER DEPLETION IN SOUTHERN HARYANA

Soil fertility is a complex quality of soils that is closest to plant nutrient management. It is the component of overall soil productivity that deals with its available nutrient status, and its ability to provide nutrients out

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of its own reserves and through external applications for crop production. It combines several soil properties (biological, chemical and physical), all of which affect directly or indirectly nutrient dynamics and availability. Soil fertility is a manageable soil property and its management is of utmost importance for optimizing crop nutrition on both a short-term and a long-term basis to achieve sustainable crop production.

Soil productivity is the ability of a soil to support crop production determined by the entire spectrum of its physical, chemical and biological attributes. Soil fertility is only one aspect of soil productivity but it is a very important one. For example, a soil may be very fertile, but produce only little vegetation because of a lack of water or unfavorable temperature. Even under suitable climate conditions, soils vary in their capacity to create a suitable environment for plant roots. For the farmer, the decisive property of soils is their chemical fertility and physical condition, which determines their potential to produce crops. Good natural or improved soil fertility is essential for successful cropping. It is the foundation on which all input-based high-production systems can be built.

An integrated soil fertility management aims at maximizing the efficiency of the agronomic use of nutrients and improving crop productivity. This can be achieved through the use of grain legumes, which enhance soil

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fertility through biological nitrogen fixation, and the application of chemical fertilizers.

Whether grown as pulses for grain, as green manure, as pastures or as the tree components of agro-forestry systems, a key value of leguminous crops lies in their ability to fix atmospheric nitrogen, which helps reduce the use of commercial nitrogen fertilizer and enhances soil fertility. Nitrogen-fixing legumes are the basis for sustainable farming systems that incorporate integrated nutrient management. Use of nitrogen-15 lends understanding of the dynamics and interactions between various pools in agricultural systems, including nitrogen fixation by legumes and utilization of soil and fertilizer nitrogen by crops, both in sole and mixed cropping systems.

Micronutrients, as the name suggests, are required in very small quantities and expressed as parts per million (ppm) in plant tissue. They include boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), nickel (Ni), and zinc (Zn). Other trace elements required by some, but not all plants, include cobalt (Co), silicon (Si), sodium (Na), and vanadium (V). Although needed in very small amounts, micronutrients have an important role to play in plant growth and development. Most of them are involved in enzymatic reactions that are essential for plant survival such as photosynthesis and respiration. When testing your soil for the first time, it is recommended to test for

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micronutrients. Once initial concentrations are known and measures have been taken to optimize them, test for micronutrients every 4 to 5 years.

Soil organic matter and clay particles hold large stores of plant nutrients. These reservoirs, however, are not all available to the crop. In an organic crop rotation, the grower manages soil organic matter and nutrient availability by incorporating different crop residues, cycling among crops with different nutrient needs, using cover crops, and adding organic soil amendments. Most crops deplete soil nutrients during their growth cycle. Some of these nutrients leave the farm as harvested products, and the rest return to the soil as crop residues. The nutrients in residues may or may not be available to the next crop. Crop roots and residues improve soil fertility by stimulating soil microbial communities and improving soil aggregation. This improved soil physical environment facilitates water infiltration, water holding, aeration, and, ultimately, root growth and plant nutrient foraging. This section will review different ways that crop rotations affect soil fertility.

DISCUSSION

Understanding the basics of how nutrients are added to and released from soil organic matter will help the farmer in choosing crop sequences and amendments to optimize organic crop fertility. Certain fractions of

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soil organic matter contribute to plant nutrition more than other fractions. To effectively plan organic crop rotations to meet crop nutrient needs, several factors should be considered. Legume crops, which capture atmospheric nitrogen and “fix” it into forms available to plants, can be used strategically in rotations to meet the needs of nitrogen-demanding crops.

Inorganic fertilizers are generally less expensive and have higher concentrations of nutrients than organic fertilizers. Also, since nitrogen, phosphorus and potassium generally must be in the inorganic forms to be taken up by plants, inorganic fertilizers are generally immediately bio-available to plants without modification. However, some have criticized the use of inorganic fertilizers, claiming that the water-soluble nitrogen doesn't provide for the long-term needs of the plant and creates water pollution. Slow-release fertilizers may reduce leaching loss of nutrients and may make the nutrients that they provide available over a longer period of time.

Soil fertility is a complex process that involves the constant cycling of nutrients between organic and inorganic forms. As plant material and animal wastes are decomposed by micro-organisms, they release inorganic nutrients to the soil solution, a process referred to as mineralization. Those nutrients may then undergo further transformations which may be aided or enabled by soil micro-organisms.

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Like plants, many micro-organisms require or preferentially use inorganic forms of nitrogen, phosphorus or potassium and will compete with plants for these nutrients, tying up the nutrients in microbial biomass, a process often called immobilization. The balance between immobilization and mineralization processes depends on the balance and availability of major nutrients and organic carbon to soil microorganisms. Natural processes such as lightning strikes may fix atmospheric nitrogen by converting it to (NO_2). Denitrification may occur under anaerobic conditions (flooding) in the presence of denitrifying bacteria. Nutrient cations, including potassium and many micronutrients, are held in relatively strong bonds with the negatively charged portions of the soil in a process known as cation exchange.

Organic matter amendments to soil decompose at different rates, and this affects how quickly nutrients become available to crops. Several factors affect the rate of decomposition of organic amendments, including the carbon-to-nitrogen ratio of the amendment, soil type, temperature and moisture conditions, and the crop being grown. Green manures, which are part of the more active organic matter fraction, decompose readily, liberating nutrients relatively quickly. Composts have more stable, humic organic matter, and decompose more slowly. As a result, most composts release nutrients to crops more slowly than green manures.

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CONCLUSION

Organic matter decomposition is enhanced in the area immediately around roots (the rhizosphere). Roots release organic compounds, such as carbohydrates, amino acids, and vitamins, into the soil, stimulating growth of microorganisms in this zone. Many of these organisms decompose organic matter, resulting in nutrient release to the crop. Very little research has been done to determine which plant varieties or species best support these nutrient-releasing microorganisms. In the future, such information may help identify crop varieties well adapted to organic systems.

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