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Environmental impacts of nutrient recycling and adaptation strategies for integrated nutrient management

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Food grain production in India has made a quantum jump from a mere 50.8 million tonnes in1950-51 to above 255.4 million tonnes by 2012-13(4th estimate). This was made possible by the introduction of dwarf wheat in 1968, which set in the "Green Revolution". A parallel increase in the consumption of fertilizers from 69.8 thousand tonnes in 1950 to 27.7 million tonnes (N + P_2O_5 + K_2O) was witnessed by 2011-12. Nutrients in an ecosystem recycle through soil organisms, plants, and grazing livestock. Appropriate management can enhance the nutrient cycle, increase productivity, and reduce costs. Rising levels of gases in the Earth's atmosphere have the potential to cause changes in our climate. Some of these emission increases can be traced directly to organic wastes. Forms of N (NO^{3-} and NH^{4+}) which are taken up by plants can be made available for crop production through chemical fertilizers, natural and anthropogenic biological N fixation and through recycling of plant and animal wastes. The National Agricultural Policy envisages annual growth of 4 per cent in agricultural production. Government of India has already initiated concerted action to double the agricultural production by 2025, which means increasing production from agricultural crops, horticultural crops, animal husbandry and fishery sectors. The country will need 301 million tonnes of food grains by 2025 to feed its 1.4 billion population. Crops remove nutrients from soil. However, the soil is not an eternal supplier of nutrients required for crops growing on it. There is always a need to supplement the nutrient supply to crops through external sources like fertilizers and manures. Continuous use of inorganic fertilizers might harm the soil though the nutrients are supplied in adequate amounts. Integrated plant nutrient management is the combined application of chemical fertilizers along with organic manures, green manures, bio fertilizers and other organic recyclable materials for crop production. The INM encourages the use of in house organic wastes, which also helps in keeping environment clean and safe. Integrated nutrient management includes the utilization of bio fertilizers such as *Rhizobium, Azotobacter* and *Azosprillum* to meet part of nitrogen needs of crops. Use of phosphate solubilizing micro organisms (PSM) helps in more efficient utilization of native P and also absorption of P from difficultly available source like rock phosphate. Use of increasing amounts of reactive N in the form of fertilizers in Indian agriculture and proper management of fertilizer N will remain at the forefront of issues to improve the global reactive N balance over both the short and long term. To achieve the tripartite goal of food security, agricultural profitability and environmental quality in a country like India, improving N use efficiency in agriculture will have to be the top priority.

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