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Keeping the Soil Healthy is a Challenge

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INTRODUCTION

India's farmers have been able to attain record food grain production year after year due to increasing agricultural input penetration. Everything in India's agriculture sector is going swimmingly. India is contributing around 2.5% of the world's total land area, while it is habitat to more than 16% of the world's human population and 20% of the world's livestock. Clearly, the pressures of ever-increasing production have resulted in a steady loss in soil fertility, which is today a major concern for Indian agriculture.

India faces a major threat of losing its food surplus status in the near future due to rising population, inadequate agricultural land availability, small land holdings, and deteriorating soil fertility. Food grain demand is predicted to rise from 192 million tonnes in 2000 to 355 million tonnes in 2030, according to estimates.

Excessive use of chemical fertilizers on soil, lack of suitable crop rotation and excessive tillage have all occurred from rising pressure on limited agricultural land in India over the years. Soil erosion and fertility loss have resulted, presenting significant issues for Indian farmers. Soil degradation is expected to be having a significant influence on India's 147 million hectares of cultivable land, resulting in a decline in its productive capacity.

There has been a gap between nutrient demand and supply in numerous agricultural districts across the country, with declines in organic matter status, micronutrient deficiencies in soil, soil acidity, salinization, and sodification among the results.

What causes soil fertility loss?

Farmers' food and livelihood security are directly affected by widespread land degradation caused by inappropriate agricultural practices. Excessive tillage, frequent cropping, inadequate irrigation and water management, and improper crop rotation are all examples of inadequate agricultural practices that contribute to this. Soil organic matter loss results in reduced soil life and poor soil structure.

Due to rising food demands, the factor productivity and rate of response of crops to applied fertilisers in intensive cropping systems are decreasing year after year, according to a document issued by the Indian Institute of Soil Science on the subject. For most nutrients, current nutrient-use efficiency is still relatively low. For example, soil nutrient-use efficiency for phosphorus was found to be only 15-20%; for sulphur, it was found to be 8-12%; and for nitrogen, it was found to be 30-50%. This situation is caused by a decline in the chemical, physical, and biological health of the soils.

Farmers' cultural methods such as leaving the land fallow for a period of time to allow it to regain its lost nutrition and proper crop rotation have been dropped in favour of continuous cropping, resulting in a decrease in Soil Organic Carbon (SOC) content in the country to 0.3-0.4 percent, when it should ideally be 1 to 1.5 percent. (Organic matter is important for soil fertility because it stores nitrogen and sulphur in organic forms, as well as other critical elements like potassium and calcium.) Frequent tillage accelerates the loss of organic matter.

Organic carbon is a catalyst.

Soil organic carbon is important for maintaining soil fertility by storing nitrogen, phosphorus, and a variety of other nutrients for plant growth, holding soil particles together as stable aggregates, improving soil properties such as water-holding capacity and providing gaseous exchange and root growth, acting as a food source for soil fauna and flora and even suppressing crop diseases, and acting as a buffer against toxic and harmful substances such as pesticides and herbicides.

Soil organic carbon makes up the majority of the terrestrial carbon reservoirs, accounting for almost twice as much as carbon in the atmosphere and vegetation. More carbon deposited in the soil as organic carbon reduces the quantity of carbon in the atmosphere, hence assisting in the mitigation of global warming and climate change.

Making the switch to organic

All of this raises the critical question of how we can meet India's expanding foodgrain demands while also maintaining and improving soil health and fertility. And the solution lies in focusing on biological products to restore soil health, encouraging the careful use of agrochemicals, minimising excessive reliance on fertilisers and pesticides, and reviving methods like sensible crop rotation.

It is not only the responsibility of the government and cultivators to improve soil health in order to increase sustainable food production. The agrochemical sector also has a responsibility to invest with renewed vigour in biological products that can organically restore soil health.

Simultaneously, farmers must be educated on how to improve the health of their nutrient-depleted soils through techniques such as crop rotation and the use of organic manure boosters such as cow dung and dried leaves.

It's also important to teach students about the proper use of agrochemicals and how to strike a balance between chemical and organic products, which are both crucial to India's food sustainability goals.