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Crisis on Farmland: Chemical Fertilizers

Dr. Surekha T. Rongate

Head, Department of Economics, Fergusson College (Autonomous) Pune-4

Abstract

India has reached the first position among the most populous countries in the world. Known as the "country of youth," India remains rooted in agrarian culture. Providing healthy food twice a day to a growing population is naturally linked to agriculture. In this era of global climate change, agriculture business especially arable farming, faces various challenges. Hybrid crop varieties, chemical fertilizers, pesticides are being used for production. Chemical fertilizers and pesticides are increasingly used for production to boost yields and productivity. Unfortunately, these practices degrade the soil, adversely affecting soil fertility. This degradation presents a significant challenge for the country to meet its growing demand for food grains.

Introduction

India has reached the first position among the most populous countries in the world. Known as the "country of youth," India remains rooted in agrarian culture. Providing healthy food twice a day to a growing population is naturally linked to agriculture. In this era of global climate change, agriculture business especially arable farming, faces various challenges. Hybrid crop varieties, chemical fertilizers, pesticides are being used for production. Chemical fertilizers and pesticides are increasingly used for production to boost yields and productivity. Unfortunately, these practices degrade the soil, adversely affecting soil fertility. This degradation presents a significant challenge for the country to meet its growing demand for food grains.

Assuming that the world's population will grow to nine billion by 2050, food production will have to increase by at least 50 percent to feed additional three billion people. According to the United Nations' report, Land in Numbers, increasing food grain production per acre of fertile land is essential. However, the world is heading in the opposite direction, with per acre production decreasing by 10 to 50 percent globally. Consequently, the expected food grains production in thirty years seems unlikely to meet demand. As a result, hunger will become more prevalent, food grains prices will rise and poor countries will feel the impact acutely. Reduced purchasing power will further decrease efficiency. Given that this is a land-related issue, it will have to be considered separately at the global level.

The growing demand for food grains depends on the available soil fertility, which is the ability of the soil to supply all the required nutrients to the crops. Soil fertility can be determined through soil testing. To meet the food demand of India's growing population and urbanization, the area under cultivation is partially inadequate due to the expansion of human settlements, industrial areas, irrigation facilities, roads. Consequently, more pesticides are used in agriculture to increase production in these areas. While this practice boosts food grain production, it decreases soil fertility and causes adverse health effects.

Pollution has changed seasonal cycles in nature, leading to drought conditions in some areas and an increase in barren land. As a result, the number of starving people is increasing due to lack of food, affecting the economy. Two billion hectares of land in the world is on the verge of becoming infertile,

making it unsuitable for agriculture. This infertility directly impacts the standard of living of half of the world's population. Over the past century, more people have died from drought than from disease. Urbanization, decreases the availability of agricultural land, with between 1.6 and 3.3 million hectares of land expected to be used for urbanization from 2000 to 2030. Since sugarcane is a cash crop, the land under this crop has started to become saline. Experts estimate that the economic loss due to decreased land productivity amounts to at least $18 billion annually. The situation in India is also dire; of the country's 328.72 million hectares of geographical area, 96.4 million hectares are barren. Maharashtra, Goa, Rajasthan, Delhi, Jharkhand are particularly affected.

In the states of Nagaland, Tirpura, Himachal Pradesh, 40 to 70% of the land is infertile, which poses a serious threat. Over the past ten years, the amount of barren land has increased in 26 states. This degradation of fertile land, forests, water sources, along with factors related to agricultural production, has resulted in the decrease in agricultural production. Despite spending ten thousand crore rupees annually on water conservation since 1980 and nearly one thousand crore rupees on tree plantation in the last twenty years the availability of forest and arable land continues to decline. From 2005 to 2014, 26,000 trees were cut down illegally in Maharashtra, reflecting similar situations in Jharkhand, Goa, Himachal Pradesh, Nagaland, Andhra Pradesh and other states.

Currently, as agricultural lands are fetching high prices, many leaders and industrialists attempt to acquire farmers' lands by various means. Additionally, some government schemes force the farmers out of agriculture by offering minimal compensation. For instance, around 15000 hectares of land have been acquired in Maharashtra for the SEZ project.

Traditional Indian agriculture: Organic farming

For thousands of years, our ancestors practiced farming using abundant organic fertilizers, naturally maintaining soil fertility. However, since the green revolution, farmers have been increasingly using chemical fertilizers, pesticides and excessive water damaging the soil and reducing production capacity. In order to meet the needs of the growing population, it is essential to maintain the land's productive capacity and adopt large-scale ‘organic farming’. Organic matter, mainly composed of carbon, hydrogen, oxygen and nitrogen out of which carbon is especially important. Although organic fertilizers contain fewer nutrients than chemical fertilizers, they provide essential secondary and micronutrients not available in chemical fertilizers. Crop fields depend on soil type and topography, good results are achieved when these factors are accompanied by sufficient rainfall. Deep, fertile land and well-distributed rainfall lead to better crop production. In hilly regions with ample rainfall, pasture farming, forest farming, livestock farming are generally beneficial, while arable farming remains the best option in regions with moderate or low rainfall.

Farmers need good soil texture to get good quality produce. In recent years, excessive use of chemical fertilizers has decreased soil fertility. During the Green Revolution in the 1960s, excessive use of chemical elements like nitrogen increased, significantly, leading to a decline in farmers' productivity and income and causing gradual land degradation. A variety of organic carb and other nutrient have been depleted as a result.

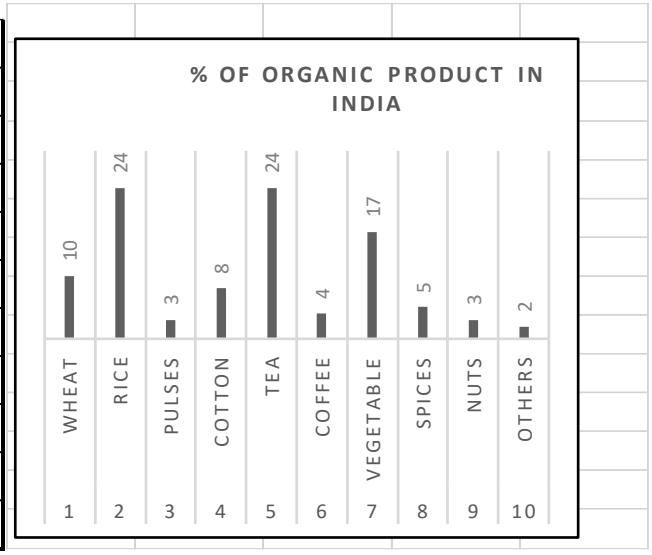
The survey found that increasing the use of chemical fertilizers in current farming methods requires more water for crops, which increases the salt content in the soil, making it saline. Nutrient management is essential for soil nutrition, and this involves the use of chemical fertilizers, organic fertilizers, biological fertilizers, and green manures. The use of organic fertilizers helps in maintaining and improves soil

fertility. Green manures increase the organic matter in the soil, while Blue-green algae have a large capacity to fix nitrogen. Additionally, organic matter supplies micronutrients and other nutrients that chemical fertilizers lack, making it necessary to have organic matter in the soil.

Organic fertilizers also shade the soil and increase its temperature while organic materials help bind the soil. Although the growth of numerous bacteria in the soil can lead to the growth of disease-causing bacteria the introduction of Trichoderma organisms can destroy these harmful bacteria.

Percentage of organic produce in India

No	Crop	%
1	Wheat	10
2	Rice	24
3	Pulses	3
4	Cotton	8
5	Tea	24
6	Coffee	4
7	Vegetable	17
8	Spices	5
9	Nuts	3
10	Others	2



Ref. Wikipedia, Organic Farming

To effectively implement the concept of organic farming, the use of organic matter, bacterial fertilizers and green manures is essential. Crop rotation and intercropping also significantly impact organic farming. Cation exchange capacity (CEC) is the soil's ability to exchange salt particles. Organic fertilizers increase the CEC by 20 to 30 percent, allowing plants to absorb various alkaline and receive balanced nutrients.

Organic farming was widely practiced in India until the Green Revolution. Green revolution which introduced chemical fertilizers in the 1960s. Before this period, most land was ploughed with wooden Plows, later transitioning to iron Plows and tractors. However, the extensive use of chemical sprays has led to soil hardening and degradation.

Maintaining soil fertility is crucial today. Physical, chemical and biological properties must be cultivated. Over the past two years, around 197 countries have been working to preserve fertile land, holding Conference of Parties (COP) meetings twice a year to share ideas. One committee, focuses on measures to restore fertile land, a process referred to as Land Degradation Neutrality. Efforts are also being made to increase forest areas for future sustainability.

High phosphorus levels can make iron, a vital micronutrient, unavailable to crops. To address this, all farmers should use balanced mix of chemical, organic and biological fertilizers based to the soil test report.

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