nature science
Touching Minds, Inspiring Life | e-Magazine
Volume 2, Issue 5, ISSN: 3048-8117

Top Agronomy Practices to Boost Crop Yield and Soil Health

Sushma[1] and Neha Gawde[2]

1. *Ph.D., Department of Soil Science and Agricultural Chemistry, College of Horticulture and Research Station Saja, Bemetara, Chhattisgarh*
2. *Ph.D., Department of Soil Science and Agricultural Chemistry, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh*

naturesciencemagazine.in | **Article ID**: nsm.2.9.17 | Advances in Agritech | Issue: May 2025

Introduction

As the world population is expected to reach 10 billion by 2050, the demand for food is increasing rapidly. But the sustainability challenge is not just about making more – but making better ones. Modern agriculture stands at a critical crossroads. We need to produce more food. If we don't produce more food, we might not be able to feed everyone. Also, soil is one of the basic needs for farming. However, soil health is declining. Therefore, we have to come up with some ways to tackle this problem. All around the world it's long-term viability of agriculture that's threatened due to erosion, nutrient loss, loss of biodiversity, and climate volatility.

Agronomy is not only science here but lifeline as well. The science of agronomy is basically an integrated principle that includes study of crops, soil, water and climate. It seeks to obtain the best productivity without causing any damage to the environment. It is where biological science delivers engineering breakthroughs with old traditions and new technologies. With the help of agronomic practices, the farmers are armed with the power to understand the complexity of nature and make suitable decisions for improving crop yield and soil health. The soil beneath our feet isn't just dirt; it's alive with microbes, fungi, rotting organic matter and more.

This holds water, recycles nutrients, and promotes the growth of every crop that feeds the planet. But this life-sustaining resource is finite and fragile. Once degraded, it can take centuries to rebuild. Enhancing soil health is critical; it's not optional. This is where reliable production systems, steady food production, and climate-smart farming all begin.

Top agronomy practices which boost productivity while regenerating and sustaining the healthy soils are described in this article. Through precision farming, cover cropping, conservation tillage and integrated pest management, we will be able to scale up more sustainably, i.e. do more with less and in a way which will be pro-planet. Farmers, growers, and policy-makers alike must use these tactics to lay the groundwork for a mutually beneficial future of productivity and sustainability. Most of us might believe that the future of agriculture is rooted in production increases, but we think otherwise.

Soil Testing: The Initial Step Towards Intelligent Farming

You can't manage what you don't measure. We should regularly test soil because it gives you a lot of information like its pH, any nutrient deficiencies, and the texture of the soil. Farmers can use this information to apply their fertilizers and soil amendments correctly, rather than guesstimating. Soils that have balance ensures good root development and resilient crops. It is advisable to test your soil once every 2-3 years and before planting a new crop.

Crop rotation - pest and disease management

Repeatedly planting the same crop can cause a depletion of certain nutrients over time. Some pests tend to favor crops that are planted repeatedly and, as a result, they can easily build up as a result of this monoculture. Crop rotation breaks this cycle. Changing your crops helps improve the structure of the soil, loosen the disease pest pressure, and fix nitrogen in the soil. For example - Replenishing nitrogen levels: Rotate corn with soybeans or alfalfa.

Use a cover crop to feed the soil and not the crop

Clover, rye, vetch, and others are not just filler crops; they are soil superheroes. They prevent soil erosion, they suppress the growth of weeds and they add organic matter when they die. There are legumes that can help cut the use of chemical fertilizers as well. Cover crops also help to increase biodiversity and attract beneficial insects.

Integrated Pest Management–Intelligent and Sustainable Solution

IPM uses biological, cultural, mechanical and chemical methods to control pests in the most effective and responsible manner. Farmers examine pest populations and only spray if intervention is absolutely necessary. This helps to prevent the resistance of pests, cut costs, and protect the pollinators. Introduce ladybugs into your garden to control the aphid population.

Farming with technology is precision agriculture

Farmers today can apply water, fertilizer, and pesticides with the exact quantity and at the most suitable time, thanks to GPS, drones and data analytics. With precision agriculture, wastage is lesser, the environmental impact is low, productivity is high and money is saved. Invest in soil moisture sensors to optimize use of inputs like GPS-guided tractors.

Conservation Tillage: A Style Less Plows More Life

Soil structure degradation and erosion through ploughing can happen. No-till or strip-till methods fall under the category of conservation tillage. It retains organic matter, preserves moisture, and promotes the proliferation of diverse soil life. Soil that is better in quality ensures more earthworms, fungi and microbes and this results in better crops.

Use compost, manure, and mulch

Organic matter is the engine of soil fertility. The incorporation of compost, well-rotted manure or plant residue into the soil improves the soil quality and water-holding capacity. It also helps microbial activity which is necessary for nutrient cycling. Don't use raw manure on edible produce—compost it first for better results.

Conclusion

The future of agriculture is not just innovation but also the regeneration of soil, ecosystems and the age-old relationship between man and soil. Agronomy, at its core, is more than a set of techniques. It is a systems science that considers the complexity of the soil-crop-climate-farmer system. Farmers are not simply looking for higher yields by implementing best practices such as soil testing, crop rotation, cover cropping, integrated pest management and precision technologies. They are developing strengths, efficiencies, and environmental compliance. Healthy soil is alive. It breathes and cycles nutrients, holds moisture and supports billions of microscopic organisms which are the building blocks of life on Earth.

The beauty of agronomy is how adaptable it is to the land's story. It also recognizes climate change, resource scarcity and the need for food security that are challenges of our times. Through reduced use of synthetic inputs, enhanced carbon sequestration through contributions to soil management and promoting biodiversity, good agronomy becomes part of the solution to climate challenges.

References

- FAO (Food and Agriculture Organization of the United Nations). (2021). Status of the World's Soil Resources. Retrieved from https://www.fao.org
- Lal, R. (2020). Regenerative agriculture for food and climate. Journal of Soil and Water Conservation, 75(5), 123A-124A. https://doi.org/10.2489/jswc.2020.0620A
- NRCS (Natural Resources Conservation Service, USDA). (2023). Soil Health Management. Retrieved from https://www.nrcs.usda.gov
- Tilman, D., Cassman, K. G., Matson, P. A., Naylor, R., & Polasky, S. (2002). Agricultural sustainability and intensive production practices. Nature, 418(6898), 671–677. https://doi.org/10.1038/nature01014
- Ciampitti, I. A., & Vyn, T. J. (2012). Physiological perspectives of changes over time in maize yield response to nitrogen rate: A review. Field Crops Research, 133, 48–67. https://doi.org/10.1016/j.fcr.2012.03.008
- Pretty, J., Bharucha, Z. P. (2014). Sustainable intensification in agricultural systems. Annals of Botany, 114(8), 1571–1596. https://doi.org/10.1093/aob/mcu205
- International Food Policy Research Institute (IFPRI). (2019). Fostering Sustainable Agricultural Intensification. Retrieved from https://www.ifpri.org
- Godfray, H. C. J., et al. (2010). Food Security: The Challenge of Feeding 9 Billion People. Science, 327(5967), 812–818. https://doi.org/10.1126/science.1185383