

## Popular Article

### Sustainable Development in The Indian Agriculture Sector

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#### Introduction

Sustainable agriculture refers to farming practices that meet society's current food and textile needs without jeopardizing current or future generations' ability to meet those needs. It is a type of farming that produces enough food to suit the demands of the current generation without depleting the ecological assets and productivity of future generations' life-supporting systems. Ecological farming, eco-farming, organic farming, natural farming, and permaculture are all terms used to describe this type of farming.

#### According to National Agricultural Research, Extension and Teaching Policy Act of 1977.

"Sustainable agriculture" is defined as an integrated system of plant and animal production practices having a site-specific application that will, over the long term:

- ✓ Satisfy human food and fiber needs
- ✓ Enhance environmental quality and the natural resource base upon which the agriculture economy depends
- ✓ Make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls
- ✓ Sustain the economic viability of farm operations
- ✓ Enhance the quality of life for farmers and society as a whole

The notion of sustainable agriculture came as a result of a plateau in modern farming yields and an environmental crisis caused by excessive use of chemicals and fertilizers, as well as pesticide residue in the food chain. Many farming practices are employed to help agriculture become more sustainable. Growing plants that produce their own nutrients to reduce fertilizer use and rotating crops in fields to reduce pesticide use since the crops change regularly are two of the most prominent strategies. Mixing crops is another frequent practice that decreases the danger of a disease killing an entire crop while also reducing the demand for pesticides and herbicides.

It also makes use of water management techniques such as drip irrigation, which wastes less water. There are a variety of approaches that can be used to improve agriculture's long-term viability. It is critical to build flexible business processes and farming methods while developing agriculture within sustainable food systems. Agriculture contributes significantly to climate change (one-third of anthropogenic GHG emissions are attributed to food systems), water scarcity, water pollution, land degradation, deforestation, and other processes. It is causing and being impacted by environmental changes at the same time. It consists of agricultural methods that are favorable to the environment and allow for the production of crops or livestock without causing harm to human or natural systems. It entails avoiding negative consequences for soil, water, biodiversity, nearby or downstream resources, as well as those who work or live on the farm or in the surrounding area. Permaculture, agroforestry, mixed farming, multiple cropping, and crop rotation are all examples of sustainable agriculture.

### **Method of sustainable agriculture**

**Crop rotation-** It is one of the most significant methods for achieving long-term agricultural sustainability. Sustainable agriculture aims to avoid the negative impacts of planting the same crops in the same soil year after year. It aids in the prevention of pest problems because many pests favour specific crops. If the pest has a consistent food supply, it can rapidly expand its population.

**Permaculture-** It is a food production system with intention, design and smart farming to reduce waste of resources and create increased production efficiency. Permaculture design techniques include growing grain without tillage, herb and plant spirals, sheet mulching, each plant serving multiple purposes.

**Cover Crops-** Many farmers prefer to have crops planted in a field at all times and never leave it barren; this can cause unintended consequences. The farmer can fulfil his aims of minimizing soil erosion, controlling weed development, and improving soil quality by planting cover crops like clover or oats. Cover crops also cut down on the use of chemicals like fertilizer.

**Soil Enrichment-** Soil is a central component of agricultural ecosystems. Healthy soil is full of life, which can regularly be killed by the overuse of pesticides. Good soils can increase yields as well as help create more healthy crops.

**Natural Pest Predators-** It is critical to consider the farm as an ecosystem rather than a factory in order to maintain effective pest control. Many birds and other animals, for example, are natural predators of agricultural pests.

**Bio intensive Integrated Pest Management-** Integrated Pest Management (IPM) is an approach, which basically relies on biological as opposed to chemical methods. IMP also emphasizes the importance of crop rotation to combat pest management.

**Polyculture Farming-** This technique is similar to crop rotation that tries to mimic natural principles to achieve the best yields. It involves growing multiple crop species in one area. These species often complement each other and help produce a greater diversity of products at one plot while fully utilizing available resources.

**Agroforestry-** It has become one of the most effective techniques available to farmers in dry regions with desertification-prone soils. When addressed effectively, it entails the establishment of trees and shrubs among crops or grazing land, combining both agriculture and forestry practices for long-term, productive, and diverse land use.

**Better Water Management-** The first step in water management is the selection of the right crops. Local crops that are more adaptable to the weather conditions of the region are selected.

## **Benefits of Sustainable Agriculture**

- 1. Contributes to Environmental Conservation:** The environment plays a critical role in meeting our basic necessities for survival. In turn, it is our responsibility to protect the environment so that future generations do not go without. Sustainable agriculture contributes to the replenishment of the soil and other natural resources like as water and air. Farmers will reduce their dependency on nonrenewable energy, cut chemical use, and conserve rare resources by adopting sustainable methods. Given the expanding population and demand for food, this replenishment assures that these natural resources will be able to sustain life for future generations.
- 2. Saves Energy for Future:** Modern agriculture is heavily dependent on nonrenewable energy sources, especially petroleum. Sustainable agricultural systems have reduced the need for fossil fuels or nonrenewable energy sources and a substitution of renewable sources or labor to the extent that is economically feasible.
- 3. Public Health Safety:** Sustainable agriculture avoids harmful pesticides and fertilizers. As a result, farmers are able to produce fruits, vegetables and other crops that are safer for consumers, workers, and nearby communities. Through careful and proper management of livestock waste, sustainable farmers can protect humans from exposure to pathogens, toxins, and other hazardous pollutants.

4. **Prevents Pollution:** Sustainable agriculture means that any waste a farm produces remains inside the farm's ecosystem. In this way, the misuse cannot cause pollution.
5. **Prevents Air Pollution:** Agricultural activities affect air quality by smoke from agricultural burning; dust from tillage, traffic and harvest; pesticide drift from spraying; and nitrous oxide emissions from the use of nitrogen fertilizer.

By absorbing agricultural residue into the soil, employing appropriate amounts of tillage, and planting windbreaks, cover crops, or strips of native perennial grasses to prevent dust, sustainable agriculture can enhance air quality.

6. **Prevents Soil Erosion:** Our continued ability to produce adequate food has been a serious threat to soil erosion. Selection of suitable species and varieties that are well suited to the site and conditions on the farm can improve crop yield and diversification of crops (including livestock), and cultural practices enhance the biological and economic stability of the farm.
7. **Reduction in Cost:** Sustainable agriculture reduces the costs of farming in general. Everyone involved in the agriculture industry has benefited from smarter farming and more efficient food transportation from farm to fork. Sensor data from seed drills, sprayers, and spreaders, as well as drones, satellite photos, and soil, makes it so that surprises are rare.
8. **Biodiversity:** Sustainable farms produce a wide variety of plants and animals, resulting in biodiversity. During crop rotation, plants are seasonally rotated, and this results in soil enrichment, prevention of diseases, and pest outbreaks.
9. **Sustainable Livestock Management:** Sustainable agriculture includes sustainable livestock production by selecting appropriate animal species, animal nutrition, reproduction, herd health, grazing management, which leads to the overall development of livestock for the long term.
10. **Social Equality:** Practicing sustainable agriculture techniques also profit workers as they are offered a more competitive salary as well as benefits. They also work in humane and fair working conditions, which include a safe work environment, food, and adequate living conditions.
11. **Beneficial for Environment:** Sustainable agriculture decreases the need for nonrenewable energy resources, benefiting the environment as a result. Due to population growth, it is anticipated that by 2050, we would require around 70% more food than is currently produced in order to meet the required daily calorie intake of the estimated 9.6 billion people on the planet. This isn't a small task, but unlike many other sustainability concerns, it's one that everyone can help with. We all

need to eat, but we can make a difference by simply decreasing food loss and waste, eating lower-impact diets, and investing in sustainable produce.

**Factors affecting sustainability:** Climate, soil, fertilizer, and water resources for an agricultural site are the most essential aspects that determine sustainable farming. Water and soil conservation are the most responsive to human control among these factors. Farmers remove some nutrients from the soil when they cultivate and harvest crops. The land suffers from nutrient depletion and becomes unusable or has lower yields if it is not replenished. Sustainable agriculture relies on soil replenishment while reducing the use of non-renewable resources like natural gas and mineral ores.