

Importance and Approaches of Sustainable Agriculture

Monika Meena

Institute of Agricultural Sciences, BHU, Varanasi

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Introduction

Our environment, and subsequently, our ecology have become an area of concern for us over the last few decades. This has increasingly led us to contemplate, innovate and employ alternate methods or smaller initiatives to save our ecology. One such initiative is sustainable farming. It simply means the production of food, plants and animal products using farming techniques that prove to be beneficial for public health and promote economic profitability. It draws and learns from organic farming. Sustainable farming or Sustainable agriculture helps the farmers innovate and employ recycling methods, apart from the conventional perks of farming. A very good example of recycling in sustainable farming would be crop waste or animal manure. The same can be transformed into fertilizers that can help enrich the soil.

The path towards sustainable agriculture involves the consideration of two key societal priorities: preserving the environment, and providing safe and healthy food for all. These priorities are both intertwined and essential in order to find a common path towards a sustainable future. Sustainability refers to the perpetual ability and is a systems issue. Sustainability as a goal seeks permanence for an activity or a system where a system is a conglomeration of different elements, components, subsystems, or constituents knit together into an integrated whole that help in the system's organization and maintenance of its integrity (Von Bertalanffy, 1968). A sustainable system is one that survives or persists through emerging stresses and shocks owing to the interactive nature of its components (Costanza and Palten, 1995). Sustainability does not mean that a system has an infinite life span, but a sustainable system is one that attains its expected life span consistent with temporal and spatial scale.

Importance of Sustainable Agriculture



Sustainable agriculture frequently encompasses a wide range of production practices, including conventional and organic. A regionally integrated system of plant and animal production practices are designed to produce long-term results such as:

- Production of sufficient human food, feed, fiber, and fuel to meet the needs of a sharply rising population
- Protection of the environment and expansion of the natural resources supply
- Sustainment of the economic viability of agriculture systems
- Make the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls
- Enhance the quality of life for farmers and society as a whole.

Why sustainable agriculture is important?

- The world population is growing at a great pace. There are countries with a population expressed in billions of Asian countries, and in Europe and the Americas it is estimated that the population will soon find billions. This will certainly create a serious need for food in the future. One of the main objectives of industrial agriculture is to ensure that everyone has access to basic needs in the present and future years.
- Industrial agriculture, on the one hand, uses more chemical input to meet the increasing demand, on the other hand, agricultural and soil resources are polluted by chemical residues and production potential is reduced. In fact, this is a contradiction. At this point, the sustainable farming method protects both the soil and the environment and ensures the production and the long-term agricultural production. In summary, the benefits of sustainable agriculture are as follows:
- With sustainable agriculture method, it is possible to produce more than one product in small areas and high efficiency.
- An enterprise with sustainability will have a positive impact on the ecosystem. Efficient soils will have a habitat for animals, but will also contribute to agricultural production.
- The fertilization of the soil will ensure long-term use and increase of productivity.
- In addition to the benefits to agriculture, contributes to the creation of new areas of employment.

General principles of sustainable agriculture

Some general principles of sustainable agriculture can be listed as follows:

- ✚ **Soil must be protected and developed:** Soil is absolutely necessary for good and healthy products. Soil should be enriched with natural fertilizers such as organic and green manure and compost. Natural fertilizers are healthier for soil, plants, water, air and people than chemical fertilizers.
- ✚ **Water and water resources should be protected:** As in life, it needs absolute water in agriculture. In arid regions, the best way to protect water is to grow plants that are suitable for the ecology of the region or that only need water during the rainy season. Green manure and mulch are useful in keeping water in soil. The contour barriers protect the water by preventing the water flow. Another method for preserving water is to apply drip irrigation instead of traditional irrigation methods and to make irrigation time planning.
- ✚ **To control pests and diseases naturally:** Instead of chemical control, natural or integrated protection management should be applied to balance nature, products, pests, diseases, weeds and soil. In this regard, techniques such as choosing durable varieties, keeping proper distance between plants in planting, determining the timing of agricultural practices correctly, using natural predators and crop rotation are important for the success of the method.
- ✚ **Cultivate different agricultural products:** This is called product rotation. According to the characteristics of the products, for 3–6 years rotation or cultivating multiple crops are the methods of preventing diseases and pests. Thus, nutrients are kept in the soil and diversity in agriculture is ensured and healthy food is provided.
- ✚ **Start with small changes first:** Most agricultural techniques have been developed over a long period of time. However, new methods may not always be successful. New ideas should first be tried in small areas, and should be applied when it becomes clear and successful.

What is Agricultural Sustainability?

Many different terms have come to be used to imply greater sustainability in some agricultural systems over prevailing ones (both pre-industrial and industrialised). These include sustainable, eco-agriculture, permaculture, organic, ecological, low-input, biodynamic, environmentally-sensitive, community-based, wise-use, farm-fresh and

extensive. There is continuing and intense debate about whether agricultural systems using some of these terms qualify as sustainable.

Systems high in sustainability are making the best use of nature's goods and services whilst not damaging these assets. The principles are to:

- Integrate natural processes such as nutrient cycling, nitrogen fixation, soil regeneration and natural enemies of pests into food production processes;
- Minimise the use of non-renewable inputs that damage the environment or harm the health of farmers and consumers;
- Make productive use of the knowledge and skills of farmers, so improving their self-reliance and substituting human capital for costly inputs;
- Make productive use of people's capacities to work together to solve common agricultural and natural resource problems, such as for pest, watershed, irrigation, forest and credit management.
- The idea of agricultural sustainability does not mean ruling out any technologies or practices on ideological grounds. If a technology works to improve productivity for farmers, and does not harm the environment, then it is likely to be beneficial on sustainability grounds. Agricultural systems emphasising on multiple principles jointly produce food and other goods for farm families and markets, but also contribute to a range of valued public goods, such as clean water, wildlife, carbon sequestration in soils, flood protection, groundwater recharge and landscape amenity value. Sustainable agriculture seeks to make the best use of nature's goods and services, so technologies and practices must be locally adapted and fitted into place.

Approaches of sustainable agriculture

- ✚ **Permaculture-** Permaculture is a food production system with intention, design, and smart farming to reduce waste of resources and create increased production efficiency. The focus is on the use of perennial crops such as fruit trees, nut trees, and shrubs that all function together in a designed system that mimics how plants in a natural ecosystem would function.
- ✚ Permaculture design techniques include growing grain without tillage, herb and plant spirals, hugelkultur garden beds, keyhole and mandala gardens, sheet mulching, each



plant serving multiple purposes, and creating swales on contour to hold water high on the landscape.

- ✚ **Biodynamic Farming-** Biodynamics incorporates ecological and holistic growing practices based on the philosophy of “anthroposophy.” Biodynamic practices can be applied to farms that grow a variety of produce, gardens, vineyards, and other forms of agriculture. In biodynamic farming, the high biodiversity of plants, animals and beneficial insects help replenish soil fertility and enhance plant growth to create a resilient ecosystem and support each other’s health. Biodynamics focus on generating the necessary health and soil fertility for food production onsite through the implementation of practices such as composting, application of animal manure from farmed animals, cover cropping or rotating complementary crops. Working with the natural phenomenon of the cosmos also given much importance that influences upon the health of the soil, plants, and animals during different moon and sun cycles.
- ✚ **Organic farming** It refers to agricultural production systems that prohibit the use of genetically modified (GM) seed, fertilizers, or synthetic pesticides. Organic farmers hope to preserve the environment by using biological methods and management practices. Employing diversified crop rotations is one of them, as well as soil and water quality preservation. By increasing soil organic matter, organic agriculture also enhances the soil’s capacity of absorbing and storing carbon, and cycle nutrients. Soil organic matter is more resilient under natural stresses, including drought and flooding.
- ✚ **Conservation agriculture-** Conservation agriculture is based on the interrelated principles of minimal mechanical soil disturbance, permanent soil cover with living or dead plant material, and crop diversification through rotation or intercropping. It helps farmers to maintain and boost yields and increase profits, while reversing land degradation, protecting the environment and responding to growing challenges of climate change. Conservation agriculture conserves natural resources, biodiversity and labour. It increases available soil water, reduces heat and drought stress, and builds up soil health in the longer term.



- ✚ To reduce soil disturbance, farmers practice zero-tillage farming, which allows direct planting without ploughing or preparing the soil. The farmer seeds directly through surface residues of the previous crop.
- ✚ Zero tillage is combined with intercropping and crop rotation, which means either growing two or more crops at the same time on the same piece of land, or growing two different crops on the same land in a sequential manner. These are also core principles of sustainable intensification.
- ✚ Sustainable intensification is a process to increase agriculture yields without adverse impacts on the environment, taking the whole ecosystem into consideration. It aims for the same goals as conservation agriculture.
- ✚ **Regenerative agriculture** - This is a form of agriculture that is restoring soil health. Creating a living soil full of insects, micro-organisms, and fungi. A third of the biodiversity is found in the soil. So restoring healthy soil is very useful for our future food production. Regeneration is the process of renewal, restoration, and growth that makes genomes, cells, organisms, and ecosystems resilient to natural fluctuations or events that cause disturbance or damage.
- ✚ **Carbon farming**- Implementing carbon farming can also help address other environmental impacts related to agriculture, including groundwater and surface water degradation, although this is not the focus of the approach. Resource efficiency is another component, albeit with the objective of reducing emissions – converting manure and other waste into compost is resource-efficient, but it avoids the release of GHGs, particularly methane.
- ✚ **Climate smart agriculture**- Climate-smart agriculture (CSA) is an approach for transforming and reorienting agricultural production systems and food value chains so that they support sustainable development and can ensure food security under climate change. Climate-smart agriculture helps in sustainably increase agricultural productivity and incomes, adapt and build resilience to climate change and reduce and/or remove greenhouse gas emissions. Climate-smart agriculture is not a new agricultural system, nor a set of practices. It is an innovative approach for charting development pathways that can make the agriculture sectors more



productive and sustainable and better able to contribute to climate change adaptation and mitigation.

Conclusion

As we know long time farmer practices organic agriculture till green revolution, after that organic agriculture replaced by conventional agriculture. Due to application of chemical fertilizers and pesticide, our soil fertility reduces day by day. Again we are moving toward stability to maintain fertility of soil and make healthy soil by using organic manure. Sustainable agriculture make wasted resources will be recycled and it will be reused again to improve the fertility of soil and environment friend

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