

A Comparative Study between Eco Sustainable Agriculture and Organic Farming

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Abstract- Sustainable agriculture is farming in sustainable ways (meeting society's food and textile needs in the present without compromising the ability of future generations to meet their own needs) based on an understanding of ecosystem services, the study of relationships between organisms and their environment.

Organic farming is a modern and a sustainable form of agriculture that provides consumers fresh natural farm products. Organic farming works in synchronization with nature rather than against it. This objective is achieved by using techniques to improve crop yields without harming the natural environment as well as the people who live and work in it. Organic agriculture offers an exclusive amalgamation of environment-friendly practices, which require low external inputs, thereby contributing to increased food availability. Organic farming has a very positive influence especially on birds, insects, weeds, wildlife, and soil. Conventional farming is capital intensive, which requires more manufactured inputs and energy as compared to knowledge- and labor-intensive organic farming. Organic agriculture uses energy more competently than conventional agriculture.

According to the Codex Alimentarius Commission, “organic agriculture is a holistic production management system that avoids use of synthetic fertilizers, pesticides and genetically modified organisms, minimizes pollution of air, soil and water, and optimizes health and productivity of interdependent communities of plants, animals and people.” Organic farming is a production scheme, which mainly prohibits or avoids the utilization of artificial pesticides, fertilizers, livestock feed additives, and growth regulators. The objectives of environmental, financial, and social sustainability are the fundamentals of organic farming. The major features include protecting long-lasting fertility of soil by preserving organic matter level, nitrogen self-sufficiency through the use of biological nitrogen fixation and legumes, careful mechanical intervention, fostering soil biological activity, successful recycling of organic materials including livestock wastes and crop residues, and pest control relying mainly on crop rotation, diversity, natural predators, resistant varieties, and organic manuring. A huge emphasis is made on preserving the soil fertility by returning all the wastes to it primarily through compost to reduce the gap between nitrogen, phosphorous, and potassium (NPK) addition and its removal from the soil.

I. INTRODUCTION

It has been defined as "an integrated system of plant and animal production practices having a site-specific application that will last over the long term", for example to satisfy human food and fiber needs, to enhance environmental quality and the natural resource base upon which the agricultural economy depends, to make the most efficient use of non-renewable and on-farm resources and integrate natural biological cycles and controls, to sustain the economic viability of farm operations, and to enhance the quality of life for farmers and society as a whole.

II. BENEFIT ORGANIC FARMING

Organic farming helps to provide long-term benefits to people as well as the environment. Other environmental advantages of organic farming include supporting local food markets, increased biodiversity, improved soil quality and reduced pesticide pollution and packaging waste, and water usage. Besides its potential to alleviate poverty and economic gains, organic farming proves to be valuable in a number of ways. Some of its benefits are listed below.

2.1 Environmental Benefits

Organic farming protects the environment from harmful effects, which arise from the use of synthetic inputs, specially pesticides, fertilizers, and hormones. Fertilizers and pesticides release dangerous toxic chemicals into soil and water. Some pesticides can cause harm to the environment or on direct exposure, they can prove to be toxic and dangerous to human health. Children are at a higher risk than adults to direct exposure, since the toxic effects of pesticides are often more severe in children than adults (Committee on Pesticides in the diets of Infants and Children). Agriculture, without pesticides and chemical fertilizers, might deliver in a number of situations, but outputs would be less than traditional farming. Therefore, generating the massive amount of the worldwide diet will need agricultural methods together with the use of fertilizers. Organic agriculture more or less constantly supports more biodiversity and usually has a positive environmental impact per unit of land.

It does not essentially have a positive impact per unit of production. Organic cereals and milk, all produce elevated greenhouse gas (GHG) emissions per unit of product than their traditionally farmed counterparts. On the other hand, organic olives and beef have lower emissions in majority of the cases. On the whole, organic foodstuff requires less energy input, but extra land than the traditional products. Studies show that organic farming system provides greater biodiversity as compared to the traditional farming system due to decreased soil changes and chemical application. Organic farming has a positive and favorable influence especially on birds, insects, weeds, wildlife, and soil flora and fauna. All non-crop species exhibit partiality for organic farming system in terms of both diversity and abundance. An average of 30 % more species reside in organic farms. Butterflies, birds, beetles, spiders, earthworms, mammals, soil microbes, and vegetation are particularly affected. The birds' number and species show higher density in organic farms.

Agro-biodiversity or agricultural biodiversity is a division of biodiversity, which consists of all shapes of life directly significant to agriculture, and can subsist equally in a farm and crossway farms. Ecologists have disagreed that at the farm level, a boost in on-farm variety and a range of overlying

collection of species improve the level of agricultural biodiversity. This amplifies crop resilience and ecological firmness.

The farming of a huge number of crops at the farm level, i.e., crop biodiversity, is a component of agricultural biodiversity, and generates differentiation in soil fauna, pests, predators, and weeds at the farm level. More significantly, crop biodiversity has been accounted to raise agricultural output through the control of pest infestation and replacement of agricultural soil, directing to better farm income constancy and security. Population density and biodiversity fitness are improved by the lack of pesticides and herbicides. Beneficial insects are attracted by weed species which, in turn, improve forage on weed pests and soil quality. Soil-bound organisms often get a wide range of benefits because of the large number of bacterial organisms produced by natural fertilizers and experience a reduced intake of pesticides and herbicides. The risk of getting poor yield is reduced to a great extent in organic farming because it promotes biodiversity.

Organic farms are more capable of withstanding harsh weather conditions as compared to the conventional farms. Occasionally in drought conditions, their yield is 70–90 % more than conventional farms. Organic farms have been found to be more cost effective in the drier states of the USA because of their better drought performance. In addition, organic farms can endure hurricane damage much better and keep hold of 20–40 % more topsoil, thus incurring smaller economic losses as compared to their neighbors. Hence, organic farming contributes positively to the reduction in soil, air, and groundwater pollution. Moreover, it is also an excellent solution to nitrate pollution. In addition, it improves soil fertility, structure, and soil fauna.

The organic matter is globally recognized to enhance soil fertility. In addition, improving the soil's chemical, physical, and organic matter has the prospective to add to climate change alleviation by impounding C from the atmosphere. The basic methods to guard organic elements inflowing the soil against decay are:

- a. Selective preservation and production of resistant molecular preparation, structure, and association (biochemical methods).

- b. Physical detachment from O₂, enzymes, decomposers, etc., by occlusion in aggregates (physical systems).
- c. Chemical diffidence by intimate sorption (association) with mineral exteriors (chemical mechanisms).

2.2 Economic Benefits and Profitability

Various studies have revealed that organic crops use 97 % less pesticides and yield 95–100 % higher along with 50 % lesser expenditure on energy and fertilizer. Hence, organic agriculture consumes zero pesticides and less energy. High prices that consumers disburse for organic products along with decreased cost of pesticide inputs and synthetic fertilizers add to increased profits. Organic farms have always been found to be more profitable as compared to the conventional farms. According to the FAO, “Organic farming is a pioneer to establish energy reducing practices by using organic principles. Organic principles, which emphasize farm-level self-sufficiency, incorporation of externalities and environmental stewardship, can be improved to form plans for limiting the use of fossil fuel-based energy in organic farming. Especially in the post-production handling sections, advancements done in order to decrease the consumption of energy can affect the traditional parallel sectors.” In the majority of cases, 30–50 % less energy is consumed by organic farming as compared to the traditional farming:

- Organic agriculture typically uses energy more competently than conventional agriculture.
- Organic agriculture often needs about one-third additional manual labor hours as a substitution for energy-intensive inputs used in traditional agriculture. Modern chemical-dependent farming methods:
 - Lessen soil of nutrients
 - Demolish important soil microorganisms
 - Contribute to global climate change and desertification
 - Oversupply farmlands with toxic fertilizers, herbicides and pesticides, which then move into groundwater, rivers, lakes, and oceans.

For example, numerous regions of Minnesota, which is the most important farmland, are now facing the problem of increased nitrogen in drinking water. Health risks of nitrogen include a potential correlation

with cancer, in addition to reproductive and thyroid problems in both livestock and humans. Organic agriculture is about 30 % more efficient to produce the same amount of food as compared to the traditional farming. Conventional farming is capital intensive, which requires more manufactured inputs and energy as compared to the traditional organic farming which is knowledge and labor intensive. The system engages large skilled and semi-skilled/unskilled labor for various tasks to be performed (sowing, planting, cultivating, rearing, maintenance, aftercare, harvesting, cleaning, washing, grading, bar coding, labeling, packing, transporting, and marketing) in order to follow a strict code of “organic farming”. Serious issues are being raised about the energy-intensive nature of these methods and their unpleasant outcomes on soil yield and environmental excellence. Organic agriculture is capable of supporting about three to 4 billion people. In a study of 1,144 organic farms conducted in UK and Republic of Ireland, organic farms engaged more workers as compared to the conventional ones.

2.3 Health Benefits

Food for starving population, fiber for clothing, and feed for animals and even, in a number of cases, fuel for vehicles come from worldwide agriculture. Consequently, in the world’s temperate climates, human agriculture has displaced 45 % of temperate forests, 50 % of savannas, and 70 % of grasslands. Agriculture is one of the main sources of GHG emissions; the most important cause of deforestation in the tropics and a recurrent basis of water pollution and nonrenewable groundwater mining. A number of farmers have turned to the organic methods. Such a kind of farming is destined to reduce human health and environmental impacts by evading the use of chemical pesticides, synthetic fertilizers, and antibiotic or hormone treatment for livestock. The use of industrial methods, predominantly synthetic nitrogen fertilizer, has fed the human population during the previous century. Currently, there is no noticeable evidence of any health benefit of consuming organic over conventionally produced food products.

Individual studies have taken into account a variety of potential impacts, including residues of pesticides. Pesticide residues provide a second channel for health effects. The organically produced vegetables and fruits

are likely to contain less agrochemical residues than their conventionally grown alternatives. Nitrate concentration might be less, but the potential health impact of nitrates is arguable. The users trust that organic products are healthier than traditionally grown products. Research has shown that organic products contain less nitrate content, because larger amount can cause cancer of the alimentary tract and methemoglobinemia in infants. There is a decreased risk of eczema associated with consumption of organic milk, though no similar evidence was found in case of organic vegetables, fruits, or meat. The higher cost of organic products (ranging from 45–200 %) may limit the intake of the recommended fiveservings per day of fruits and vegetables, which reduce the risk of cancer and improve health irrespective of their source. The utilization of vegetables and fruits has been linked with lesser risk of chronic human health harms like hypertension, cancer, cardiovascular diseases, and diabetes type II because of their elevated phytochemicals. The health advantages of vegetables and fruits have so far been endorsed to the antioxidant characteristics of phytochemicals. The cell membrane lipid peroxidation (LPO) degree is found to be 60 % higher in organic tomatoes. The superoxide dismutase (SOD) activity is also radically higher in organic fruits. The organic tomato fruits under oxidative stress build up higher content of soluble solids as sugar, vitamin C, and phenolic compounds. These have smaller mass and size than the conventionally grown systems. In addition, they are also rich in soluble solids, phenolic compounds, and phytochemicals including vitamin C. In the past few decades, yield has been of greater importance as compared to micronutritional and gustative quality of plant products.

2.4 Social Benefits

Organic farming may have an important social effect on local communities. To start with, organic agriculture may provide employment opportunities to the local people. More manual labor is often required in organic agriculture to compensate for pesticide and synthetic fertilizer loss, thus providing more jobs in local communities.

Commonly, the labor required to run an organic farm is 10–20 % higher as compared to the traditional farms. Organic farmers also expand their crops and

widen their planting schedules throughout the year in order to enhance soil health and maintain biodiversity. This establishes year-round employment opportunities and may lessen the problems related to migrant labor. More job opportunities will increase the population of local communities and also halt migration to urban areas. Thus, organic agriculture can increase the local communities and support rural development. In order to stay competitive, farmers must adjust to the local conditions by managing land, labor, and resources so that the production can be increased. Farmers also depend on their neighbors to sustain certain principles in order to guarantee the reliability of their own water, soil, and air. Ties within the community are strengthened by association on these issues, leading to greater association among organic farmers and also partnerships. Cooperatives or organized groups can thus gain power in trade negotiations, gather their resources, and enjoy greater access to markets. There is some proof that increased collaboration results in new businesses among local communities and more active participation in local government. Consumer protection is another keystone of organic farming. The well-built regulatory frameworks, whereby the government verifies organic certifications, are essential for consumers to trust the food that they buy.

III. BENEFITS OF SUSTAINABLE FARMING

The benefits of sustainable farming can be found from producing healthy food for humans and animals, to conserving the environment and empowering farmers economically. Sustainable farming, which simply means producing crops and livestock using practices that have minimal effects on the environment, has a wealth of benefits. Unlike industrialized farming that focuses on mass production for maximum profits, impact on ecosystem notwithstanding, sustainable farming is a balanced type of agriculture that seeks to protect public health, animal welfare, environment and human communities.



- Benefits of Sustainable Farming

1. Health

The first benefit that comes out of sustainable farming discourages the use of inorganic resources in production. As a result, animal and human health is enhanced as more chemical-free food is made available.

2. Environment

Environmental benefits of sustainable farming are numerous. From lowering greenhouse gas emission (we are seeing the result now) to keeping the soil rich with organic matter, this method of farming enhance a pollution-free environment.

In sustainable agriculture there is a decreased use of synthetic chemicals and non-renewable resources. Reduction in soil contaminants contributes not only to soil health (enhancing future productivity) but also, decreasing the chances of having consumer's bio-accumulating heavy metals like lead (Pb) and arsenic (Ar).

Notable also, is the drastic reduction in soil erosion, which is achieved through practices like mulching, reduction of runoff through managed irrigation and elimination of tillage.

3. Economical

Sustainable farming leads to a reduction in the use of expensive synthetic fertilizers and other inorganic resources in livestock and crop production thus, farmers are able to save on inputs. In addition, urban farming which is a type of sustainable farming, cuts on transportation costs leading to lower food prices.

- Sustainable Agriculture Practices

1. Crop Rotation

Crop rotation is basically where a different crop, like a legume, is planted on a field in a subsequent season to replenish the nutrients used by the previous crop, say a grain. This helps counter crop diseases as well as keep the soil healthy by suppressing pathogens, weeds and insect pests.

2. Soil Management

This technique involves nurturing and protecting soil for long-term stability and productivity, using manure, cover crops, soil cover like mulches.

3. Soil Amendment

This practice relates of adding manure, water retention materials like clay, lime for soil acidity reduction. This is done to improve plant health and growth.

4. Poly culture

Poly culture, which essentially means growing multiple crops together, helps in pest control and reduction of crops' susceptibility to diseases among other benefits.

5. Managed Grazing

Managed grazing involves practices like lowering stock density, subdividing the grazing field into small enclosures (known as paddocks), where the livestock are moved between the them regularly.

The importance of using paddocks is that, on top of providing animals with a range of nutrients, the method ensures animals are not exposed to build up of microorganisms that are likely to cause infections.

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