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Sustainable Agriculture for Food Security

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ABSTRACT

Climate change is a major threat to food security in the world. Sustainable agriculture is one of the key strategies to improve food security. In this paper, we will focus on sustainable Agriculture, food security, and food systems. We will discuss the impact of climate change on food security by using sustainable agriculture techniques. The importance of sustainable Agriculture for food security will be discussed in detail. This paper will highlight the importance of crop rotation, cover crops, and agroforestry in sustainable agriculture.

Keywords: Food Security, Sustainable Development Goals, Environment, Resources

1. Introduction

Sustainable agriculture refers to agricultural practices that meet current edible and textile demands without compromising the ability of present or future generations to meet their own needs. It might be based on familiarity with ecosystem services. Growing environmentally friendly crops requires an awareness of and support for the relationship between living things and the environment. This is known as sustainable agriculture. Agriculture and animal husbandry are merged in this process to create serendipitous processes and procedures. Sustainability improves our quality of life, protects our environment, increases soil fertility, and preserves natural resources for use in the future. Food security is major problems faced all over the word by use of sustainable agriculture we solve food security positive way [1]. There are several causes of food waste including Lack of suitable storage facilities, Customers are making impulsive purchases, Food harm results from inaccurate predictions of shelf life, The early harvest of a poor farmer is due to a lack of food and resources, When food is presented, it is occasionally not consumed, resulting in plate waste, Food spoilage is another factor contributing to food waste, inadequate food storage, transportation, and packaging systems, Food waste is a result of a lack of competent labor and advanced technologies and People choose to discard of food leftovers rather than reusing it because they believe it to be a more economical option.

Food security and Sustainable Agriculture are Related:

a scenario in which everyone always has physical, social, and financial access to enough, safe, and nutritious food to suit their dietary needs and food preferences for an active and healthy life (According to FAO, 1996). The management and protection of natural resources with a focus on technological transformation to assure the ongoing fulfilment of human needs for the current generation and future generations (By FAO)

Sustainable development objectives:

- to eradicate hunger globally
- In order to secure food
- enhancing nutrition

Some of the interconnections include advancing gender equality, eradicating rural poverty, providing a healthy lifestyle, empowering small farmers, and reducing the consequences of climate change.

Both the production and consuming sectors must implement integrated sustainable agriculture techniques and food systems [2]. Land, good soil, water, and plant genetic resources are the main inputs in food production, but their scarcity is increasing in many regions of the world, making it impractical to utilize and manage them sustainably.

conferences worldwide on energy, food, and SA

- In Padang, Indonesia (12–14 May 2014), the first international conference on sustainable agriculture, food, and energy was conducted.
- Bali, Indonesia (17–19 September 2014) hosted the second international conference on sustainability, agriculture, and energy.
- The third international conference on sustainability, energy, and food took place in Ho Chi Minh City, Vietnam, during November 17–19, 2015.
- Colombo, Sri Lanka hosted the 4th international conference on sustainable agriculture, food, and energy from October 20–22, 2016.
- Malaysia hosted the fifth international conference on sustainable agriculture, food, and energy (august 22–24, 2017). Manila, Philippines hosted the 6th international conference on sustainability, food, and energy from October 19–21, 2018.
- Phuket, Thailand hosted the 7th international conference on sustainable agriculture, food, and energy (October 19–21, 2019).
- Jeju, South Korea hosted the 8th international conference on sustainable agriculture, food, and energy (October 21, 2020).

The following are the eight conference's goals:

- to offer a platform for the community of worldwide scholars to interact, share knowledge, and conduct research on sustainable food, agriculture, and energy
- to encourage cooperation amongst researchers working on sustainable food, energy, and agriculture.
- Through research, teaching, regional collaborations, and community participation, raise awareness of the significance of living and working in a way that improves our community's economic, environmental, and social well-being.
- to create a regional network for persons interested in sustainable food, agriculture, and energy.
- It is impossible to overestimate the significance of food security for national security:

Lack of eating may result in:

- Malnutrition
- Public unrest
- Political turbulence
- Economic downturn
- Intensification of criminal activity
- Issues in achieving food security
- worldwide water crisis

Factor Responsible for Low Yield

The water tables are dropping in major nations including Northern China, the United States, and India as a result of massive over pumping utilizing strong diesel and electric pumps. Iran, Pakistan, and Afghanistan are among the nations that are struggling with a lack of water.

Degrading of the land

It is a long-term loss or reduction of at least one of the following: biological productivity, ecological indicators, or value to humans. It is a negative trend in the condition of the land that is caused by direct or indirect human-induced processes, including anthropogenic climate change.

The major causes of land degradation are excessive grazing, deforestation, and over-exploitation of plants for usage.

Changing weather

Environmental stressors and climate change have a substantial impact on the security of the world's food supply. Due to climate change, the agriculture and food systems around the world are being impacted by extreme climatic occurrences including floods and droughts.

farm-related illnesses

The infections that afflict both livestock and agricultural farms can have disastrous implications on the supply of food if there is no effective strategy and management in place. Some diseases, like stem rust, have the potential to cause a crop loss of 100%.

Food wastage and loss

Before the food reaches its customer, problems with manufacturing, storage, processing, and distribution lead to food loss.

Food that is appropriate for eating but is purposefully wasted during the retail or consumption phases is referred to as food waste.

increase in the population

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In 2017, UN predictions indicated that population growth would continue. In 2050, it's anticipated that there will be over 9 billion people on the planet. Pressure from population increase is being placed on the environment, the world's food supply, and the energy resources.

How can food security be improved?

Working on the actions listed below will help us increase food security:

- Create ways to deal with food loss and waste:
- According to estimates, one third of the food produced worldwide is lost. The adoption of improved ways of food preparation can minimize food wastage.
- The amount of food lost can be reduced by implementing better packing and storage techniques.
- Improvements to the infrastructure
- The whole food chain's overall infrastructure has to be optimized. For planting, harvesting, and other agricultural procedures, we require an adequate number of competent workers, cutting-edge technology, and equipment. For the security of the food supply, weed, pest, and disease prevention is crucial.

Fair-trade principles:

Small farmers must receive a fair price for their goods, just as big businesses are fairly compensated in the food markets.

Changing climate. The primary stressors caused by climate change Floods and droughts are common, and battling these two can lower crop failures.

Adopting manufacturing techniques with a high-water usage efficiency would be wise. By absorbing carbon dioxide, crops help to reduce the quantity of greenhouse gases that are the primary driver of global warming and climate change. Knowledge of the following indirect causes of food insecurity:

One of the primary reasons of food insecurity is the imbalance between imports and exports, thus there has to be enough money available to import food. All demographic groups must have affordable access to wholesome meals.

Sustainable agriculture has favorable benefits on soil

In order to avoid soil erosion by safeguarding the environment, sustainable agricultural methods including cover crops, conservation tillage, and agroforestry are used. Building healthy soils, controlling soil erosion, saving water, and reducing water, air, and soil pollution are all aspects of sustainable farming. Additionally, it involves fostering and strengthening biodiversity as well as improving agricultural resistance to adverse weather conditions.

In traditional agriculture, residues are burned, which increases air pollution and greenhouse gas emissions. In sustainable agriculture, however, residues are preserved in the soil and suitable tillage is used to improve air quality, therefore reducing air pollution. One of the major issues with conventional farming is soil erosion, however in the case of sustainable agriculture, we choose zero tillage or minimal tillage, which disturbs the soil very little and reduces soil erosion. Adding additional plants, mulching, or controlling the irrigation system so that runoff doesn't occur

Because we utilize environmentally friendly techniques like crop rotation, which helps enrich the soil and also prevents the outbreak of diseases and pests, sustainable agriculture promotes biodiversity in the soil [3].

Weed management in organic farming

Correct crop stand, in-situ green manuring, intercropping, crop rotation, organic manuring, and cover cropping fall under this group of cultural techniques. Mechanical methods: they include off-season plowing, soil solarization, stale seed beds, the use of weed eaters, and mulching. Allelopathic plants, bio-fertilizers, biological weed control, bio-herbicides, and herbicide-resistant crops can all be used as biological techniques in this area.

Benefits of weed control that is sustainable. It enhances soil and water resources, slows down global warming, increases biodiversity, lessens pollution, increases food nutritional density [4].

Pakistan's contribution to food security

The nation's food security policy is the first comprehensive plan that focuses on accomplishing nutrition and food security objectives via the growth of the agricultural industry sustainably. To achieve the stated goal of a food secure world, it focuses on expanding food supply, improving food access, facilitating food use, and maintaining food stability at all levels. Pakistan

This policy's objectives are:

Reduce poverty, eliminate hunger, and combat malnutrition. By reaching an average growth rate of 4% per year, promote sustainable food production systems (crop, livestock, and fisheries). Make agriculture more lucrative, climatically resilient, productive, and competitive. Pakistan is currently self-sufficient in the main basics, according to the National Nutritional Survey 2018 by the Ministry of Health and UNICEF. Pakistan ranks eighth in the world for growing wheat. Pakistan has developed into a nation with a food surplus throughout time and is a large producer of wheat, which it distributes to the population in need through a number of channels, including the World Food Program.

Working on Agriculture Research to Ensure Food Security

The importance of agrarian exploration in ensuring food security cannot be overstated. Agrarian production is increased by novel crop varieties, animal species, and husbandry techniques that are developed as a result of agricultural exploration. To fulfill the rising worldwide demand for food as the world's population continues to grow, production must be raised. Crop resilience research aids in the development of cultivars that are more resilient to environmental stresses as failure, pests, and weather. In the face of changing rainfall patterns and climate change, this flexibility is crucial. Efficiency of Resources The study of agriculture focuses on the efficient and sustainable use of resources, such as water, land, and diseases. This efficiency is essential for increasing food production and reducing its negative effects on the environment. It is impossible to emphasize the value of agricultural exploration in maintaining food security. New crop types, animal species, and husbandry methods created as a consequence of agricultural exploration boost agrarian productivity. Production must be increased to keep up with the growing global demand for food as population growth continues. The creation of cultivars that are more resistant to environmental challenges including failure, pests, and weather is aided by crop resilience research. This adaptability is essential in the face of shifting rainfall patterns and climate change. The usefulness of Resources The effective and sustainable use of resources, including water, land, and diseases, is the main topic of agricultural studies. This effectiveness is crucial for growing food.

How to Use Waste land for Production & Food Security

In line with the Sustainable Development Goals (SDGs), the utilization of desert land for agriculture and its contribution to food security is a critical component of sustainable development. A global initiative called Sustainable Development Pretensions seeks to address economic, social, and environmental problems. A few of these aspirations are directly connected to enhancing food security and using wastelands for produce. Zero hunger: By using desert land for agriculture, we can considerably improve food security, lessen hunger, and guarantee that everyone has access to wholesome food. Restoring squatter areas can help prevent desertification, restore ecosystems, and protect biodiversity. It encourages the wise use of agroecosystems, which are vital to the production of food. Sustainable agriculture can lessen the effects of climate change. We can boost climate change in food product systems, minimize emigration, and collect carbon by recovering wasteland. Creating communal auditoriums or productive green areas on vacant land close to major cities might increase local food security and create more adaptable, sustainable metropolises. There are numerous approaches to improve food security by using wasteland as a source of product. On wasteland, planting trees and bushes can increase soil fertility, lessen corrosion, and yield fruit, nuts, and wood products. Fresh, locally produced food may be provided while fostering social cohesiveness by involving original communities in husbandry wastelands to cultivate fruit, vegetables, and sauces. Crop rotation and cover crops are examples of techniques that can improve the health of the soil and make it ideal for farming. Monoculture can be a solution in locations with degraded land close to bodies of water [5].

Country	Waste per capita (kg)	Annual waste (tons)
Nigeria	189	37.9M
Rwanda	164	2.1M
Greece	142	1.5M
Behrain	132	216.2K
Malta	129	56.8K
Iraq	120	4.7M
Tanzania	119	6.9M
Saudi Arabia	105	3.6M
Lebonan	105	717.5K
Yemen	104	3M

Food waste by country

Country	Gross amount of food waste (million tons)
China	91
India	68
United states	19
Japan	8
Germany	6
France	5
United Kingdom	5
Russia	4
Spain	3
Australia	2

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