**Sustainable Agriculture and Food Security in India**

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**ABSTRACT:**

Food security has become a matter of key significance to a country like India where the population rises in geometric progression whereas agricultural production can only grow in arithmetic progression, much more effort will be needed in order to sustainably increase agricultural production, improving the food demands, control on food losses and waste, and make sure that all who are suffering from hunger and malnutrition have right to use nutritive food. Sustainable agricultural practices including both production and consumption must be adopted from a holistic and integrated approach. India population is projected to reach 1.668 billion by 2050. To meet the food demands of the exponentially increasing population, a massive food production is necessary. Agriculture plays a strategic role in improving food availability, preservation of the food supply and in achieving food security. Eradicating hunger and ensuring higher quality foods is not going to be easy even as agriculture is affected by climate change. Agriculture practices must be sustained by the capability of farm land to produce food to satisfy human requirements as well as having sustainable impacts on the environment. Therefore, sustainable agriculture must be comprehensive and have adaptability and flexibility over time to respond to demands for food production. In view of all these points, this chapter has been prepared to generate awareness of food security and focuses on perspectives of sustainable food production and security towards human society.

**Keywords:** Food Demand, Population, Climate, Crop Production, Sustainable Agriculture

**INTRODUCTION**

Agriculture contributes about 18.8% to India’s gross value added (GVA) and is the largest employer of the workforce 2021-22 (Economic Survey). Agricultural sustainability is the fruitful management of assets for agriculture to fulfil changing human needs, while keeping up or enhancing the quality of the environment and conserving natural resources (Gregory, 1989). Sustainable agriculture includes those agricultural methods which safeguard the environs, preserve natural resources, reduce the use of chemicals, and promote financial independence. Sustainable agriculture is in fact an economical and environmental necessity in nations like India where poor population is higher and production technologies require a huge extent of production expenses, which are not easy to afford. Therefore, advancement should be evaluated by qualitative and quantitative criteria and the effects of agricultural development on social, environmental, and health aspects. Food security is the key to attain to the Sustainable Development Goals. Ensuring food security should be an extraordinary significance for a nation like India having more than 20 per cent people living below poverty line. According to the Global Food Security Index 2022 India has a predominance of under nutrition of 16.3%, 30.9% of children in India are stunted, 33.4% are underweight, and 3.8% are obese. As per International Food Security assessment 2022-23, India because of its population size, tends to influence food insecurity trends distinctly, 65% account of the food insecure population in 2022-23. By the next decade, the number of food-insecure people in India is projected to decrease to 24.7 million or 1.7%. National Food Security plays a vital role in economic development, poverty and the food security by supplying nutritional sustenance and improving the livelihoods.

Food security is a wide concept, the meaning and scope of food security has taken long time to evolve, the traditional concepts of food security includes simple measures such as national food production, food grain storage, national food self-sufficiency, and food aid. As human population is growing, food consumption has increased and present great challenges for agriculture, which are intensified by the effects of climate variations and climate change, land and soil degradation, and diminishing resources such as freshwater, phosphates, fossil fuels, and fertile topsoil. Over the next decades, annual crop yield is projected to grow with less than 1%, and there is very limited space for expansion of arable land (Alexandratos and Bruinsma 2012). Overall demand for food is affected by population growth, while economic

development and rising incomes tend to shift diets toward meat and animal products that are more expensive and resource intensive to produce (FAO 2010). To overcome the food scarcity and food demand challenges, technology is being used which includes the development and use of nutrients, pest control products, crop cultivation, and farm equipment, and it also includes the vision of genetically modified crops providing greater nutritional efficiency (more calories per yield or more yield), manipulation of natural pest control agents, and use of farm management techniques that emphasis on whole farm productivity over time, not just annual production per hectare (Stone and Pedigo 1972). Sustainable proliferation of agriculture involves the use of agricultural practices that are economically and environmentally sustainable it offers a beneficial method to tackle food security which is a result of increase in population and environmental degradation (Simon et al. 2013)

**SUSTAINABLE AGRICULTURE**

The word ‘sustain’ from the Latin sustinere (sus-from below and tenere -to hold, to keep in

existence or maintain) expresses long term sustenance or permanence. As it pertains to agriculture, sustainable decreases farming systems that are capable of maintaining their productivity and usefulness to society indefinitely. Such systems must be resource preserving, socially helpful, commercially competitive and environmentally sound. Sustainable Agriculture systems are designed to take maximum benefit of existing soil nutrients and water cycles, energy flows, helpful soil organisms and natural pest controls. By getting benefit from on existing cycles and flows, environmental damage can be minimized (Chel & Kaushik, 2010). Sustainable agricultural technologies are largely recognized due to the environmental impacts of modern agriculture, dependence of agriculture on non-renewable resources, and long-term productivity of agricultural systems relying on huge external inputs (Leal Filho, 2000).

Sustainable Agriculture is an alternative for solving fundamental and applied issues (Lal, 2008). Although Green Revolution agriculture addressed mainly productivity issues. Sustainable Agriculture must not only address productivity issues more intensively but do so keeping multidimensional (economic, environmental, and social) concerns of Sustainability insight (Rao & Rogers, 2006). Agriculture is sustainable when it is environmentally sound, economically feasible, socially fair, culturally suitable and based on a holistic scientific approach (Kandula, 2004). According to India’s Agriculture Policy, (2000), agriculture is based on technically comprehensive, economically feasible, environmentally non-degrading and socially suitable. Farming systems and practices that maintain or enhance the economic viability of agriculture production, the natural resources, and other factors which are influenced by agricultural activities, may be called sustainable agriculture.

Indian government started the National Mission for Sustainable Agriculture (NMSA) in 2014-15.

Sustainable Agriculture pursues to integrate three main objectives into their work:

● A healthy environment

● Economic profitability

● Social and economic equity

People involved in the food system i.e. producers; food processors, suppliers, retailors, consumers and waste managers can play a role in ensuring a sustainable agriculture system.

Sustainability rests on the principle that we must meet the needs of the present without disturbing the ability of future generations to meet their own needs.

Agriculture has changed dramatically since the end of world war ll. Food and fibre productivity has flew due to new techniques and machinery, increased chemical use, and various new government policies that have favoured in increasing the food production and reducing the prices. Due to this many farmers produce more food and fibre at lower prices.

Sustainable Agriculture is not a single, well defined and goal. Scientific understanding about

what constitutes sustainability in environmental, social and economic terms in continuously

evolving and is influenced by many issues. For example agricultures ability to adapt to climate change was not considered a critical issue 20 years ago, but is now receiving increasing attention. In addition, the details of what constitutes a sustainable system many change from one set of conditions. (e.g. soil types, climate, labour cost) to another and from one cultural and ideological perspective to another, resulting in the term sustainable being a contested term. Therefore, it is more useful and potential to think of agricultural systems as ranging along a continuum from unsustainable to very sustainable, rather than placed in a sustainable/unsustainable dichotomy.

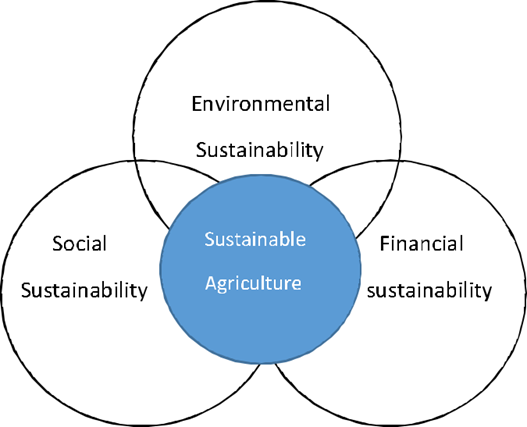


Fig: 1 Components of sustainable agriculture.

Goal oriented methods can be implemented and assessed for sustainability in agriculture (Von Wiren-Lehr (2001). The objective of sustainable development is to eliminate hunger, achieve food security, and improved nutrition. Empowering small farmers, promoting gender equality, ending rural poverty, ensuring healthy lifestyles, and tackling climate change are some of the inter linkages that supports sustainable agriculture.

Sustainable agricultural practices and food systems, include both production and consumption of food products, it should be followed in a complete and combined perspective. Land, soil, water, and plant resources are important inputs for the food production, as due to high demand there is growing scarcity in many parts of the world makes it strong to use and manage them sustainably. To increase the yield on existing agricultural land includes restoration of degraded land, through sustainable agricultural practices. Proper management of limited water through better irrigation and storage technologies, combined with development of new drought-resistant crop varieties, can contribute to sustaining dry land’s productivity. Halting and reversing land degradation will also be critical to meeting future food needs.

**FOOD SECURITY**

Food security means availability, accessibility and affordability of food to all people at all times. Food security is a fundamental human right. The right to food is one of the basic human rights which are closely linked to Right to life under Article 21 of the Constitution of India, 1950. “Food security” includes both physical as well as economic access to food. The term accessibility here includes both availability and affordability. Food security is defined as “when all people at all times have access to sufficient, safe, nutritious, food to maintain a healthy and active life”( The World Food Summit of 1996). The WHO depicts food security consists of three dimension viz. “food availability”, “food access” and “food use”. Remarkably, the food and Agriculture Organisation of the United Nations (FAO 2009) added a fourth dimension i.e. “the constancy of the first three dimensions of food security over time”. Thus food security is multidimensional concept.

It has following dimensions:

● Availability: It means food production within the country, food imports and the stock

stored in government granaries.

● Accessibility: It means food is within range of every person without any discrimination.

● Affordability: It implies that having enough money to buy sufficient, safe and nutritious

food to meet dietary needs.

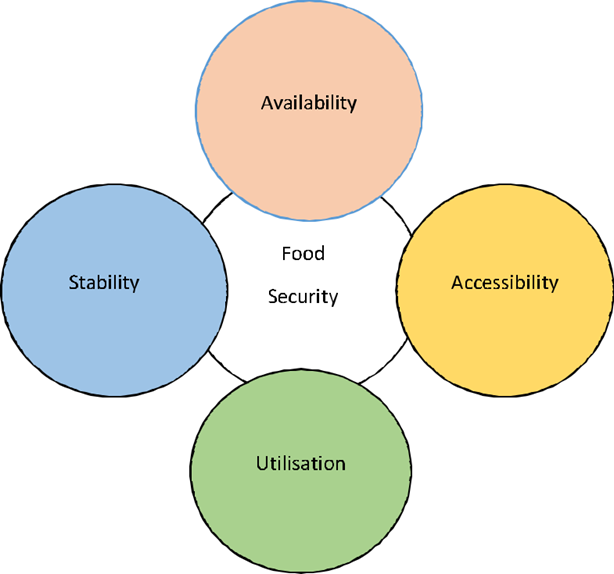


Fig: 2 Dimensions of Food Security

Therefore, food security is certain in a country only when adequate food is available for every individual, if everyone has the earnings to purchase food of acceptable quality, and if there are no barriers to access.

India wants to be self-sufficient in food. Therefore, it is imperative for the national food security that we need to grow sufficient food within the country. At the same time, for domestic food security, we need to sustain economic growth to raise the income levels and purchasing power of the poor people. These apart, agricultural regulations through fixation of

Food grains procurement prices and public distribution have an important role in ensuring food security at the domestic level, even if self-sufficiency is achieved in food grain at the national level. To safeguard the farmers against low and unpredictable prices for their product governments mediate and control a large amount of the marketed food supply but, due to inefficient pricing it leads to undesirable consequences regarding access to food supplies. India has experienced remarkable economic growth in recent years and remains one of the fastest growing economies in the world. However, poverty and food security in India are still areas of concern in spite of many strides. For the sustenance, development and growth of an individual food is basic and essential amenity. Although the Government of India has been actively addressing food security at households for a long time through the Public Distribution System (PDS) and National Food Security Act (NFSA) 2013, there are still concerns related to food security in India amidst increasing population, climate change and global supply disruption (Russia-Ukraine War) that need to be addressed.

**Issues and challenges related to Sustainable Agriculture and Food Security in India** -

**Challenges related to Sustainable Agriculture:**

1. Rising Population and degraded Ecosystem: Growing population and damaged ecosystem have made intensive, conventional farming (using HYV seeds and chemical fertilizers) and deforestation more resilient.
2. Lack of capital: Large portions of the agricultural community (Small and medium farmers) lack 2the funds necessary to make the switch to Sustainable Agriculture production.
3. Lack of Access to information & Technology: There is a lack of access to information and technology to enhance agriculture practices, processing and marketing of agricultural products.
4. Lack of Economic Incentives: Farmers are uncertain of the benefits of switching to

Sustainable farming.

1. Lack of Public Policy & Infrastructure: Public policies and fundamental infrastructure are insufficient to encourage the use of Sustainable Agriculture.

**Current Framework for Sustainable Agriculture in India:**

National Mission on Sustainable Agriculture: Its goal is to increase Agricultural productivity, particularly in rainfed regions, by emphasizing integrated farming, managing soil health, and coordinating resource conservation.

Pradhan Mantri Krishi Vikas Yojna (PMKVY): The PMKVY program intends to encourage

commercial organic production by involving a group of farmers certified in organic farming.

Network Project on Organic Farming of ICAR: Its goal is to compare the performance of important agricultural systems that are peculiar to a given place under organic and conventional farming and estimates the agronomic efficiency of various production systems.

**Challenges related to Food Security:**

Deteriorating Soil Health: A key element of food production is healthy soil because nearly 95 % of global food production depends on soil.

Soil degradation: Due to excessive inappropriate use of agrochemicals, deforestation and

natural disaster is an important challenge for the sustainable food production. About one-third of the Earth soil is already degraded.

Invasive weed threats: In the past 15 years, India has faced more than 10 major invasive pests

and weeds attack.

● Fall Armyworm (pest) destroyed almost the entire maize crop in the country in 2018.

India had to import maize in 2019 due to the damage caused by pests in 2018.

● In 2020, locust attacks were reported in districts of Rajasthan and Gujarat.

Lack of Efficient Management Framework: India lacks a strict management framework for food security. The Public Distribution System (PDS) faces challenges like leakages and diversion of food-grains, inclusive exclusion errors, fake and bogus ration cards, and weak grievance redress and social audit mechanism.

Faults in Procurement: Farmers have diverted land from producing coarse grains to the production of rice and wheat due to a minimum support price (MSP).

Climate Change: The monsoon accounts for around 70% of India’s annual rainfall and irrigates 60% of its net sown area. Changing precipitation patterns and growing frequency and intensity of extreme weather events such as heat waves, floods are already reducing agricultural productivity in India, posing a serious threat to food security.

Supply Chain Distribution due to Unstable Global Order: At a time when the Covid-19 pandemic had already impacted food supply around the world in 2020, Russia-Ukraine War in 2022 has disrupted the global supply chain and resulted in food scarcity and food inflation.

**Current Framework for Food Security in India:**

Buffer Stock: Food Corporation of India (FCI) has the prime responsibility of procuring the food grains at MSP and stored in its warehouses at different locations and from there it is supplied to the state governments in terms of requirements.

Public Distribution System: Over the years, PDS has become an important part of Government policy for management of the food economy in the country. PDS is supplemental in nature and is not proposed to make available the entire requirement of any of the commodity.

National Food Security Act (NFSA), 2013: It marks a paradigm shift in the approach to food

security from welfare to rights based approach. NFSA covers 75% of the rural population and

50% of the urban population under:

● Antyodaya Anna Yojna: It constitutes the poorest of the poor, who are entitled to receive

35 kg of food grains per household per month.

● Priority Household (PHH): Households covered under PHH category are allowed to get 5 kg of food grains per person per month.

In addition, the act lays down special provision for children between the ages of 6 months and 14 years old, which allows them to receive a nutritious meal for free through a widespread network of Integrated Child Development Services (ICDS) centers, known as Anganwadi centers.

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