The Food Chain Aspects - Sustainability in Agriculture

Sustainability in the food chain through agriculture

Agriculture is one of the most critical sectors to have an impact on climate change. Infant, farm animals in the agriculture sector are considered to be the second-largest contributor majorly because of the use of their bodies for food and due the waste generates by them. Chemicals used in farming practices also have a significant impact on the disturbing the sustainability aspect in the sector as they contribute to environmental pollution and degradation.

Many diverse populations of crops and animals maintained by farmers have disappeared due to genetic erosions. Now, these erosions have been caused by a focus on high yielding plant varieties and animal breeds. Additionally, these animals have started to compete with humans in terms of feed. Hence, large areas of rainforest are disappearing due to the increasing land demand for more land for the production of animal feed and biofuels.

Some of the other aspects that need to be carefully watched upon are climate change, soil degradation, food waste, competition on land use, and significant social inequalities in access to food, which leads to instability and results in unsustainable agri-development.
Global challenges affecting agriculture and food production

“The demand for food and other agricultural products is anticipated to increase by 50 percent between 2012 and 2050” (FAO). The overall demand will undergo structural changes, owing to significant contributors such as urbanization, population growth, and per capita increases in income. Based on these factors, the natural resource on which agriculture depends will become increasingly stressed.

There are six critical challenges around food production and consumption globally that need to be addressed to reach the sustainability goals. The challenges include; widespread malnutrition, growing food demands, poverty among the people working in the agriculture sector, unequal food availability across regions, food waste and losses, and unwanted environmental impacts on agriculture production.

**Malnutrition**— Malnutrition refers to the condition where people either eat a diet that contains either very few or too many nutrients. Malnutrition includes under-nutrition, micronutrient-related malnutrition, and overweight.

The WHO factsheet on malnutrition shows that 1.9 billion adults are overweight or suffering from obesity, while 462 million are underweight. Data collected on children indicates about 47 million children under five years of age are wasted, 14.3 million are severely wasted, and 144 million are stunted. Also, 38.3 million are overweight or obese.

Malnutrition, undernourishment, and micronutrient deficiency is anticipated
to increase further with the increase in the world population that is estimated to be concentrated disproportionally in under-developed countries. The shift in dietary patterns in developing countries will encourage increased consumption of animal products along with foods rich in fat and sugars, combined with sedentary lifestyles. All these changes will cumulatively increase the risks of overweight and obesity.

In most of the countries of Africa, children are both fat and stunted. This reason behind this is malnutrition. Economic woes, drought, and extreme weather are also some of the vital factors affecting the scenario. The demand for food among these countries will witness a hike, which, if not catered to, will lead to many more cases of undernourishment or malnutrition and micronutrient deficiency.

**Growing demand for food** - The global demand for food has been increasing due to the growth in population and shifting diet preferences. Increasing the population in low-income countries will fuel the demand for staple crops. Additionally, growth in income and urbanization will support the shift in dietary patterns. Agriculture and food systems would witness stress to meet the food and nutritional demands of consumers of both rising incomes and shifting diets along with the demands from the growing population of poor and hungry.

**Substantial improvements in resource-use efficiency** and gains in resource conservation to address the challenges of increasing food demands are required to achieve food security globally.

**Poverty** among the people working in the agriculture sector - About 2.1 billion people globally are still living in poverty and about 700 million in extreme poverty. It is observed that the mass population of poor and hungry across the globe rural people who earn their livings from agriculture, fisheries, and forestry. This somehow indicates that agriculture is the key to alleviate poverty and hunger based on the fact that poor people rely on agriculture for their livelihoods.

Reducing rural poverty would require measures to increase productivity and profitability; steps should be taken towards linking farmers to markets and the provision of efficient extension and agricultural advisory services.

Unequal food availability across regions - Based on the data represented by the Food and Agriculture Organization (FAO), the vast majority of the world’s hungry people live in developing countries of Asia and Africa. Additionally, the population of women and children are most affected by poverty and
hunger. This reason behind is the cultural tradition and social structures.

It is seen that the women who are already underweight /malnourished give birth do their children who usually are malnourished and struggle to reach a healthy weight. Without any external support, they are generally not able to grow up healthy, learn, and go to school.

Inequalities are universal between rural and urban areas, ethnic groups, regions, and men and women. Growth is less efficient in low-income countries with high initial levels of inequality, which is one of the significant challenges that need the government’s input.

**Food losses and waste**—Food wastage at various levels is also one of the key reasons behind the issue of unequal food availability across the region. Across the globe, around one-third of all food produced is lost or wasted along the food chain, starting from production until consumption. Food wastage happens not only on the consumer level but also on retail and manufacturing levels.

1. In higher-income countries – 55-65% of the food is wasted at the consumer end, 15-20% at the retail, and 20-25% during manufacturing.
2. The developing countries suffer the majority of the losses during agriculture production.

Food losses and waste often result in economic losses for farmers and other stakeholders within the food value chain and higher prices for consumers. Both food loss and prices add-on to the global food insecurities by making food less accessible for vulnerable groups.

**Unwanted environmental impacts on agriculture production**—Intergovernmental Panel on Climate Change (IPCC) has stated that in low-latitude countries crop production will be ‘consistently and negatively affected by climate change.’ Also, the impacts on production would be more uncertain in northern latitudes, and there may be positive or negative consequences. Climate change may significantly reduce yields in the long run.

There are significant knowledge gaps about the impact of climate change on agriculture, and future research needs to be done to check the effect of yield variability (due to climate variation) on the quantity and quality of food production. However, the fact that climate change could significantly affect food production cannot be denied as well.
How to establish sustainable agriculture and food system?

A. Why do we need to establish a sustainable system?

It is now evident that we need to reform our food system. There are many challenges in the sector, including droughts, energy demands, to the lack of transparency in our food choices. Many such reasons support why we need to change from a conventional industrial food system to a sustainable system. Over time, the traditional style of agriculture of heavy tillage and increasing use of toxic chemicals will dominate our food system and will prove to be destructive to soil ecology. Sustainable farming practices eliminate many such factors that destroy the farms and decrease food productivity and hence needs to be promoted.

B. What are the key domains to establish sustainable agriculture and food system?

According to FAO, the three major domains to be considered for the establishment of sustainable agriculture and food systems are:

1. Food and nutrition security for the growing world population

Major issues that are to maintain sustainable agriculture development include food safety issues, nutrition deficiencies, regulation inconsistencies, post-harvest losses, and consumer attitudes. These challenges must be addressed in maintaining food security and sustainability.

Food and nutrition security is achieved when sufficient food (quantity, quality, safety, socio-cultural acceptability) is available and accessible. Food is to be satisfactorily used and utilized by all individuals at all times to live a healthy and active life (UNICEF, 2008 in Committee on World Food Security (2012)). It is evident that besides the production of enough food globally, hundreds of millions of people are still undernourished, and more than a billion is overweight or obese.

The food security situation has deteriorated in regions- western Asia, southeastern Asia, and sub-Saharan Africa. The reason behind this is due to conflicts combined with natural disasters that are exacerbated by climate change. The stated purposes support the fact that the integration of food security and nutrition and sustainable food system approaches needs to be adopted to ensure sustainable agriculture and food system.
2. Sustainable agriculture that contributes to economic and social development

The concept of “sustainable development” is multidimensional. Three types of goals are interrelated and are interpreted as the dimensions of sustainability: environmental, economic, and social. Sustainable development requires actions that are ecologically comprehensive, economically feasible, and socially acceptable.

Sustainable agriculture includes multifunctional development. The economic functions include producing raw materials and food, intensification of production, technical and technological progress, structural adaptation, efficiency and effectiveness of production and sales, price competitiveness, high quality of products and services, high income, R&D inputs, and developmental investments. The economic dimension most often also covers work productivity, efficiency, off-farm income, agricultural income, revenue, and production potential measured as the asset value.

The social aspect is measured by the level of education, ways of supporting decision making, farming experience, and skill, social status of the family, living conditions, involvement in community issues, safety, among others.

3. Agriculture and food systems that ensure environmental sustainability

Developments in food systems have resulted in the expansion of off-farm employment opportunities and the widening of food choices beyond local staples to satisfy consumers’ preferences in terms of taste, form, and quality.

Environmental sustainability is determined by ensuring that the impacts of food system activities on the surrounding natural environment are neutral or positive. Biodiversity, soil, water, the carbon footprint, animal and plant health, the water footprint, food loss and waste, and toxicity are also considered. Similarly, the environmental functions of sustainable agriculture include; guarding the sanitary conditions of food articles, protecting the earth’s natural resources, protecting, and developing the natural environment.
Is “Sustainable agriculture intensification (SAI)” the solution?

Sustainable Agricultural Intensification (SAI) aims to increase agricultural output without increasing the input. That means, from the same available land area, while reducing the negative environmental impacts of agricultural technology. The ambition for sustainable agricultural intensification (SAI) is highlighted in the sustainable development goals (SDG). The key to meet all the rising food production and sustainability challenges requires the adoption of SAI approaches based on understanding and the ability to harness the knowledge of ecological processes both within agricultural systems and to the natural environment.

When we see the input side of SAI – finance, infrastructure, finance, weather data, and risk insurance are considered as the critical components along with functioning markets and distribution systems for seed, tools, fertilizer, and appropriate mechanization. Science-based advances and technology that includes soil testing, improved seed and varieties, micro-irrigation, precision farming, seed treatment, new and improved fertilizer technology, and agricultural extension are also central to the process.

Markets and consumers are driving change towards sustainable agriculture,
and agriculture and farming remain essential even as economies evolve. People have started noticing the benefits and for sustainable agriculture based on which innovative technologies are being incorporated into farming practices for a better chance. For instance, smartphones are turning out to be a boon and have become a useful tool in agriculture. The smartphones are equipped with various sensors, which make them a promising tool to assist diverse farming tasks. They have become an “up and coming” tool for scaling up the extension and are further bridging the gap between farmers and input and output markets.

### Exhibit 3: Information requirements and business processes offering opportunities for mobile applications along the value chain

- **Crop planning**
  - Buying inputs
  - Planting/growing
  - Harvesting
- **Transport retail**
  - Processing
  - Selling & transport
  - Packaging/storing
  - Knowledge decision support
  - Market info & interaction
  - Quality control
  - Business processes
  - Financial services

**What is the role of precision agriculture in sustainable agriculture intensification?**

Precision farming is an approach where maximum utilization of the inputs is done to get average yields as compared to traditional cultivation techniques. Precision agriculture (PA) plays an essential role in sustainable intensification. It contributes towards increasing the farming efficiency and environmentally friendly farming practices.

PA technology enables the crop farmers to recognize variations in the fields to which they can apply variable treatments with more precision than earlier possible. Sustainable PA is vital and innovative farm management based on using Information and Communication Technologies (ICTs). PA supports profitability and helps increase production, economic efficiency, and the reduction of side effects on the environment. Hence, PA, in food-insecure countries, is also a powerful tool when it is applied appropriately. The application of PA in such countries is based on local crop and site-specific conditions.
What the future of sustainable agriculture?

Sustainability takes into account all the aspects, which include economic, social, and environmental development. Sustainable farming practices include many examples such as; rotating crops and embracing diversity, planting cover crops, reducing or eliminating tillage, applying integrated pest management (IPM), and few others. Successful innovations would help the farmers to a greater extent and would ensure sustainable development on a global scale. The segment would further help in optimizing water and pesticide usage.

Incorporation of sustainable farming using the internet, AI and blockchain, and new technologies would facilitate the production of customized synthetic nutrition according to a specific plant’s needs. This will support better and healthy crop yield. The adoption of sustainable agriculture practices is equipped to fulfill the growing consumers’ demand for natural and chemical-free food.

Sustainable agriculture focuses on producing long-term crops and livestock while having minimal or no effects on the environment. Thus, sustainable agriculture represents a significant opportunity to generate change on the ground and deliver on sustainable development goals.

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