



Food Security in the Face of Climate Change: A Global Challenge

Dr. Nitasha Malhotra

Faculty Kamala Nehru College, University of Delhi

Abstract

Food security refers to the availability and access to sufficient and nutritious food for all individuals. However, climate change is posing a threat to global food security. As temperatures rise and extreme weather events become more frequent, agricultural production is getting impacted. Droughts, floods and heatwaves destroy crops and livestock leading to shortages, price fluctuations and famines. Vulnerable populations such as poor farmers and people need timely support from government agencies and scientific communities to combat the effects of climate change calamities. This is the global challenge being faced by most developing countries which have large number of marginalised populations.

Keywords - malnutrition, extreme weather events, vulnerable regions, climate refugees, diversifying diets

Introduction:

Food security is a global challenge that affects many countries around the world. Since food is closely associated with poverty and social inequality, it is a concern for the people in the developing countries. Here the lack of access to nutritious food can lead to malnourishment and health problems. A major challenge for Governments of these countries with large populations, limited resources and unstable economies is to ensure that affordable, safe and nutritious food is available to the citizens to meet their dietary needs. Such a crisis has been witnessed lately in countries like Ethiopia and Pakistan.

The UN, according to its second Sustainable Development Goal, wants to end hunger, achieve food security and improve nutrition for all people in the world by 2030. To reach this, one of the strategies is to improve soil fertility, increase production using sustainable farming techniques and improving the distribution and food management systems.

The world is in a very different place to where it was six years ago when it committed to the goal of ending hunger, food insecurity and all forms of malnutrition by 2030. At the time, many scholars and researchers were optimistic that with transformative approaches, past progress could be accelerated, at scale, to put us on track to achieve that goal. Today it is felt that the world has not been generally progressing either towards ensuring access to safe, nutritious and sufficient food for all people all year round, or to eradicating all forms of malnutrition. Conflict, climate variability and extremes, and economic slowdowns and downturns are the major drivers slowing down progress, particularly where inequality is high. The COVID-19 pandemic made the pathway towards SDG 2 even steeper according to Food Security and Nutrition in the World Report 2021, FAO.

Climate Change And Extreme Weather Events

Today climate change and extreme weather events associated with it poses one of the major threats to food security . This has been realised worldwide as the effects are glaring for everyone to see and experience.

Climate change has emerged as a pressing global crisis, impacting various sectors of the economy and threatening the basic necessities of life, including food. Agriculture and fishing, both critical sources of food, are particularly vulnerable to the adverse effects of climate change.

Impact on Agriculture

Climate change poses various risks to agricultural systems, threatening crop productivity, livestock health, and overall food production. Extreme weather events like droughts, floods, and heatwaves have become more frequent and intense, destabilizing food supply chains and causing crop failures. Unpredictable rainfall patterns also adversely affect irrigation systems, crucial for maintaining agricultural yields. Moreover, rising temperatures and changing weather patterns affect pollination, thus impacting the production of fruits, nuts, and vegetables. In many parts of the world cropping patterns are changing. The farmers are becoming more and more insecure about their produce in the face of unpredictable rainfall, droughts, storms and heatwaves leading to crop failures. Farmers are finding it more and more difficult to continue with this profession. They are constantly being challenged with the uncertainties being faced in the face of ecosystems getting degraded. Water, soil and air are becoming toxic and losing their capacity of natural cleansing.

Unsustainable farming practices have added to the problem with soils being rendered infertile because of overexploitation. Thus, anthropogenic effects on agriculture are becoming irreversible which is a threat to food security. Indiscriminate use of fertilizers, pesticides and genetically modified seeds have led to large scale pollution and toxicity of water and soils. They also have serious impact on food chains and ecosystems.

Vulnerable Regions

Certain regions are more vulnerable to the impacts of climate change on food security. Developing countries with predominantly agrarian economies, limited access to technology, and weak infrastructures are particularly at risk. These countries face serious and chronic problems of food distribution mechanisms and proper food storage systems. Sub-Saharan Africa, South Asia, and Southeast Asia are identified as high-risk regions, as they heavily rely on agriculture and are already dealing with hunger and insufficient food availability. Agrarian communities in many countries are still practicing subsistence farming and most vulnerable to any changes in climate parameters. Many of them have lost their means of livelihoods and loss of fertile coastal lands to rising sea levels. Poverty and hunger have gripped them and they are forced to become climate refugees.

Altered Oceanic Conditions and Food Security

Many human communities living in coastal areas are dependent on fish not only as an important component of their diet but also their social, cultural and economic life. Unfortunately, pollution, climate change and overexploitation of ocean resources has jeopardised the health of our oceans and seas.

For fishing communities dependent on marine resources, climate change poses substantial challenges. Rising ocean temperatures causes habitat shifts, impacting the distribution and abundance of fish species. This is related to changing sea surface temperatures and salinity of ocean waters. In many parts of the world the coral reefs are dying and their ecosystems are under serious threat. Coral reefs are the richest sources of marine flora and fauna. Any threat to them can have irreversible impact on the food chains and depletion of many varieties of diverse life under water. This can lead to depletion of fish populations in certain areas and force fishing boats to venture further offshore, increasing costs and operational risks. Acidification of the oceans due to increased carbon dioxide levels can also harm shellfish, impairing their growth and reproductive capabilities.

Climate change intensifies extreme weather events like hurricanes, typhoons, and cyclones, further threatening fishing industries. These events can damage fishing infrastructure, and disrupt supply chains. Communities that rely on subsistence and small-scale fishing are particularly vulnerable to the devastating effects of such events, as they often lack the means to recover and rebuild their livelihoods.

Climate Refugees

Climate change-induced disruptions can lead to large scale displacement and migration, as people are forced to leave their homes due to loss of livelihoods and lack of food security. Climate refugees are people who are forced to leave their homes due to the effects of climate change. This can include increasing temperatures,

rising sea levels and extreme weather events and other environmental disasters. Many communities that survived on subsistence agriculture and fishing have been rendered poorer than before. They find it difficult to rebuild their lives and livelihoods in the face of lack of resources and security. According to an estimate of UN there will be one billion climate refugees world over by 2050. Furthermore, the situation results in hostility and discrimination in their new habitats and lack of appropriate humanitarian aid. This displacement can place additional strain on resources in host communities and exacerbate social and political tensions.

Mitigating Strategies:

Addressing food security in the face of climate change requires a multi-faceted approach:

Sustainable Agriculture Practices

Sustainable agriculture practices focus on producing food in a way that is both environmentally friendly and economically viable. This involves implementing methods that reduce or eliminate the use of synthetic fertilizers, pesticides, and other pollutants. Sustainable agriculture also involves using renewable energy sources, such as solar and wind power, to reduce dependence on fossil fuels and keeping soils healthy and productive by using crop rotation, cover crops, and composting. Additionally, sustainable agriculture includes conserving water, protecting biodiversity, and encouraging farmers to adopt more efficient production methods. Overall, sustainable agriculture practices enable us to produce food with minimal environmental impact while still providing for our needs.

Promoting climate-smart agriculture practices, such as the use of drought-resistant crop varieties, efficient water management, and crop rotation, can help build resilience to climate change impacts.

Innovative Technologies

Embracing technological advancements like precision agriculture, agroforestry, and vertical farming can help optimize resource usage, reduce greenhouse gas emissions, and increase agricultural productivity. Innovative agriculture technology is revolutionizing the way farmers and producers work and produce food. New technologies such as precision agriculture, hydroponics, and vertical farming are all being used to maximize crop yields and reduce the need for pesticides and herbicides.

Precision agriculture is a modern farming technique that utilizes technology to optimize the yield of crops. It utilizes advanced tools such as automatic sensors, drones, and GPS systems to collect data about soil, weather, and crop conditions. This data is then used to inform decisions about when and how to fertilize, irrigate, and manage pests. Farmers can also use the data to create more efficient farming practices that can reduce costs and environmental impacts. Additionally, precision agriculture can help farmers to identify and address potential problems before they become major problems. As a result, precision agriculture can help to increase yields, minimize risks, and maximize profits.

Another innovation in agriculture which is fast replacing traditional farming techniques is Hydroponics. This type of farming can be practised in any region of the world irrespective of the quality of soil and scarcity of water. Hydroponics agriculture is a method of growing plants without soil. Instead, a nutrient rich solution is used to nourish the plants. This method of agriculture is advantageous because it requires less water, has a higher yield, and is more space efficient than traditional soil-based farming. Additionally, hydroponics agriculture is versatile and can be used to grow a variety of plants, from fruits and vegetables to ornamental plants. It is quickly becoming a popular choice among farmers, as it is more sustainable and environmentally friendly.

In many parts of the world farmers are adopting vertical agriculture as a revolutionary form of farming that takes agriculture to new heights. It involves growing crops in vertically stacked layers, such as in a skyscraper, using hydroponics, aeroponics, or aquaponics. This new form of agriculture offers numerous benefits that traditional farming cannot, such as the ability to grow crops in urban areas, eliminating the need for vast tracts of land, and the ability to conserve water and other resources. Additionally, the controlled environment of vertical farms can allow for year-round crop production and improved pest control. Vertical agriculture is an exciting development that could revolutionize the way we farm in the future.

These advances in agriculture technology allow farmers to produce more food while reducing their environmental impact. Furthermore, these technologies improve food safety and reduce the amount of water and energy used in agricultural production. By utilizing innovative agriculture technology, we can ensure a sustainable future for our food production.

Diversifying Diets

There is also a need to perceive food differently. Nutrition and good health are possible with opting for agricultural products which require less inputs. With rising temperatures, changes in precipitation levels, extreme weather, and other environmental impacts, the availability of food is becoming more unpredictable. Eating a diverse range of foods can help to mitigate the effects of climate change on food production, as a wider variety of foods require different types of soil and weather conditions to grow. Eating a diverse diet can also increase the resilience of communities to climate change, as it reduces the risk of food shortages due to extreme weather or crop failure. By diversifying our diets, we can also help to reduce the environmental impacts of food production, as there will be less reliance on a single crop or type of food. In addition, diet diversification can lead to a greater range of nutrients and vitamins, which can have a positive impact on human health.

Encouraging diverse dietary patterns, including the consumption of locally available and climate-resilient crops, can reduce dependence on a limited range of food sources and enhance food security.

The world populations can very easily be divided into wheat and rice eaters. However, heavy reliance on these two major crops can be unhealthy and unsustainable. Wheat and rice are high in carbohydrates and low in essential nutrients, like vitamins and minerals, which can lead to nutrient deficiencies. Moreover, relying on wheat and rice can lead to monoculture farming, which can damage the environment due to overuse of pesticides and soil erosion. Furthermore, wheat and rice are not drought-resistant, so they are vulnerable to climate change and water scarcity, making them unsustainable in the long-term. Therefore, it is important to diversify our diets and rely on alternative grains (millets), legumes, fruits, and vegetables for optimal health and sustainability.

Millets are an excellent way to combat the problem of climate change. They require significantly less water and fewer chemical inputs than other major crops, making them a more sustainable option. Additionally, their deep roots help to improve soil fertility and reduce erosion. They are also able to grow in dry and marginal climates, making them a useful crop in areas threatened by drought due to climate change. They also store carbon in the soil, helping to reduce the amount of carbon dioxide in the atmosphere. All of these factors make millets a great way to combat climate change.

In India millets such as jowar (sorghum), bajra (pearl millet) and jaun (barley) were consumed in arid and semi-arid areas in the past for a long time especially in the rural areas. However, with modern lifestyles and western food habits in urban areas, local and traditional foods have been forgotten. It is important to create awareness about our local food products both in terms of creating demand for these agricultural products and their usefulness for sustainability. This year, 2023, India is celebrating International Year of Millets to raise awareness of the nutritional and environmental benefits of millets. Millets are a nutritious, gluten-free staple food that is drought tolerant and can help bring about food security in India. The celebration also seeks to bring attention to the importance of traditional knowledge and practices related to millets, such as indigenous crop varieties, agro-ecological farming practices and traditional food preparation. The celebration will also focus on the economic potential of millets as an export crop and a source of income for smallholder farmers. Additionally, it will also highlight the potential of millets to improve nutrition security, food safety and sustainable development in India.

Food policy in Developing Countries

With limited access to healthy food and nutrition, people in developing countries face an increased risk of hunger and malnutrition. Additionally, food insecurity is often linked to poverty, making it even more difficult for people in these countries to access a nutritious, balanced diet. To address this issue, governments should develop comprehensive food policies that emphasize the importance of providing nutritious and affordable foods to all citizens. These policies should include initiatives to increase access to healthy foods, strengthen food safety measures, improve infrastructure for distribution and storage of food, and support sustainable agricultural

practices. Implementing such a comprehensive approach to food policy in developing countries will help to ensure that all citizens have access to a nutritious diet and are able to lead healthier, more productive lives. All governments and societies are concerned about the food production and the guarantee of access to the population. Any policy on the food sector has macroeconomics effects on cultural and social development.

Food security is an important matter for both, researchers and practitioners struggling to provide solutions for supplying sufficient food to the next generations. Numerous remedies and recommendations are given in the literature to bridge the gap between food supply and food demand for the next five decades years. To manage the whole scenario of food, nowadays the food security approach has increased its influence on the nation food policies. For instance, Russia has changed its food policy since 2015 from a food-import dependent country to a food-self-sufficient country, whereas China's long-term Food Policy Plan is to increase agricultural output through improving technology, and land and water management. The importance of the geographical origin of food and the preference for domestic products could also be one of the possible strategies to enhance food safety and sustainability. This would help reduce transportation costs and subsequent carbon footprints. Thus, many environmentalists are encouraging people to consume local and seasonal foods. It not only supports local farmers but also encourages them to produce diverse food varieties and conserve local biodiversity.

In India we have a holistic approach to food policy which takes into account the production, distribution, and consumption of food. The focus is on ensuring food security for all citizens regardless of their social and economic status. The primary objectives of India's food policy are to protect the public from hunger and malnutrition; provide a safety net for the vulnerable sections of society; ensure sustainable and equitable access to food; and promote the efficient production, preservation, and distribution of food. The salient features of the policy include the Public Distribution System (PDS), the Mid-Day Meal Scheme, the National Food Security Act (2013), and the National Food Security Bill (2015). The PDS enables the government to deliver and distribute food to those in need at subsidized prices. The Mid-Day Meal Scheme provides meals to school-going children, while the National Food Security Act (2013) and the National Food Security Bill (2015) ensure food security for all citizens.

All national food policies and strategies focus mainly on the food production component. However, that is not enough to achieve the end of hunger in developing countries, which have to solve conditions of access, stability, nutrition, distribution, demands, among others. The total amount of food produced should be enough to feed the whole population. Nevertheless, because of the deficient distribution systems and poverty, about 15% of the world's population, in developing countries, is undernourished. Besides the increase of biofuel demand and better returns from it is luring farmers to grow less food crops. The epidemic COVID 19 crisis caused major disruption to production, supply lines, distribution, investments, and consumer expenditures. Many nations have realised the importance of self - reliance on food production for sustainability.

Oceanic conservation for ensuring food supplies

The ocean is home to many different species that provide both food and economic benefits to people all over the world. In recent years, over-fishing and other human activities have damaged the marine environment, threatening the sustainability of oceanic ecosystems. To keep our oceans healthy and functioning, it is important to implement conservation measures that promote sustainable fishing methods and limit pollution. This will help to ensure that future generations will have access to the same resources and food that we do today. Additionally, protecting and restoring oceanic ecosystems is key to preserving the biodiversity of the planet and maintaining a healthy planet for us all.

International Cooperation:

Collaboration among nations is essential to developing climate-resilient agricultural practices, supporting sustainable land management, and facilitating the sharing of knowledge and resources. International cooperation is playing an increasingly important role in global food security. Through international collaboration, countries are able to share resources, technology, and knowledge, which enables them to increase food production, improve food storage and distribution, and reduce food waste. International organizations such as the Food and Agriculture Organization of the United Nations (FAO) are also working to coordinate global

efforts to improve food security. Through this collaboration, countries are able to better identify areas where food production is falling short or food distribution is inadequate, and they can develop strategies to address these issues. International cooperation has the potential to eradicate global hunger and malnutrition especially in the developing countries.

Conclusion:

Food security is intricately linked to climate change, with rising global temperatures and increasing weather variability posing significant challenges to agricultural production and food supply. Addressing these challenges requires a coordinated effort from governments, private sector actors, and individuals to implement climate-resilient cultivation techniques and promote sustainable consumption patterns. By taking decisive action, the global community can ensure a future where food security is no longer threatened by the specter of climate change.

References

- Intergovernmental Panel on Climate Change; 2019; *Climate Change and Land*; published in IPCC special report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, And Greenhouse Gas Fluxes In Terrestrial Ecosystems; Geneva, Switzerland
- Food and Agriculture Organization of the United Nations; 2020; *The State of Food Security and Nutrition in the World: Transforming Food Systems for Affordable Healthy Diets*. Rome, Italy: FAO.
- Springmann, M., et al; 2018; *Options For Keeping The Food System Within Environmental Limits*; published in *Nature*, 562(7728), 519-525.
- Parry, M. L., et al; 2007; *Climate Change 2007: Impacts, Adaptation and Vulnerability*; Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). Cambridge, UK: Cambridge University Press.
- Wilen, J. E., & Costello, C; 2016; *Market-Based Solutions To Ecosystem Management Dilemmas—Climate-Change Adaptation In The California Water And Agricultural Sectors*; published in *International Review Of Environmental And Resource Economics*, 9(2), 103-150.
- Bell, J. D., et al; 2018; *Adaptation pathways for seafood supply chains in a changing climate*; published in *Reviews in Fish Biology and Fisheries*, 28(4), 907-924.

