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Introductory Chapter: Concept of Food Security and Its Overview

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1. Introduction

Food security is a primary concern of significant interest to practitioners, academics, and policymakers all over the globe. Food insecurity is also imperative due to its practical influence on each aspect of social life [1]. Food security is significant as successive food shortages and the food price crisis from 2007 to 2008 brought attention to the substantial importance of food security to ensure political constancy. The importance of food security to public health is incontestable due to the fact that 870 million people throughout the world consume less amount of calories than their requirements, and a plethora of mental and physical health repercussions are associated with such deprivation [2]. Food insecurity assessments and projections determine government policy like Feed the Future Initiative and aid decisions that affect billions of people. Food security helps to maximize economic potential because a malnourished population is less productive. In 2012, Barack Hussein Obama declared that food and nutrition security is an economic concern for the well-being of human beings. Thus, food security is also important from the moral viewpoint that everyone has the equal right to food, clothing, a place to live, and medical care that are good for their health and well-being as described in the Universal Declaration of Human Rights (article 25) [3].

Over the last few decades, the idea of food insecurity has developed and expanded in scope. Initially, the primary emphasis was on the availability and production of food [4]. Subsequently, the scope of the concept was broadened to incorporate not only the availability of food but also its production and availability from various ways like sociocultural, physical, and economic perspectives and the utilization of food. Finally, it was extended to incorporate the stability of these measurements [5].

The term “sustainable development” refers to an approach to economic growth that satisfies the requirements of the current situation without affecting the capacity of the next generations to satisfy their requirements [6]. It has been brought up in the context of international debates in order to introduce the concept of sustainability [7]. Sustainability involves a dynamic nature to prescribe the export-related issues occurred during social, economic, and environmental aspects.

According to FAO, [8] food security states that when everyone has physical and economic access to enough, nutritious, and safe food to suit their food choices and dietary needs for a healthy life. Food security involves various factors like suitable food choices, fair prices, advancement in food safety, accessibility to open as well as competitive markets, healthy diets, and a more sustainable food supply chain [9]. Food security is a combination of various problems interlinked with food utilization, accessibility, and availability [1]. Various other issues like water pollution, economic collapse, currency fluctuations, HIV-AIDS, climate change, trade contracts, and political conflicts affect these factors. Some factors play a pivotal role in causing food insecurity, including poverty, low income, lack of education, high food prices, high unemployment rates, scarce property rights, and partial access to markets [10].

2. Food security terminology

Food security is a multidisciplinary and multisectoral approach; despite its importance, food security has many meanings and operationalization. In fact, a vast range of terminology has been used to debate, measure, and intervene in food security. A wide variety of academic fields like economics, nutrition, agriculture, anthropology, public policy, and sociology, as well as a large number of governmental and nongovernmental as well as national and international agencies, have been actively involved within it. The concept of food security is stated in various contexts, each of which has been accompanied by its particular jargon. Hunger is also associated with food insecurity; the concept of hunger is probably so emotionally intense [8].

The definition of food security is described in the World Food Summit, 1996, which is being commonly used. According to it, food security is accomplished when all people have economic and physical access to a safe, nutritious, and adequate amount of food to accomplish their dietary requirements as well as food choices for a healthy life [11]. According to the definition, food insecurity occurs when one or more of the above conditions are not met. Food insecurity is categorized into three types: chronic, seasonal, and temporary food insecurity. The most severe form is chronic food insecurity, whereas transitory food insecurity is the least severe [12].

People sometimes use the terms “food security” and “nutrition security” synonymously, but the definitions of each are much different. Food security is necessary for nutrition security, but it is not enough. Aside from food, nutrition security also looks at care, health, and hygiene practices. According to FAO, nutrition security is stated as when everyone in a household has easy access to a healthy, well-balanced diet, a clean environment, and good health services and care. This makes sure that everyone is healthy and able to live a good life [2].

3. Evolution concept of food security

The notion of food security started about 45 years ago when there were food shortages all over the world. At first, it focused on making sure that there was enough food and that the prices of basic foods were stable around the world and in each country. This happened because agricultural commodity prices were very unstable in the early 1970s. This was caused by a disarray in the monetary systems and financial marketplaces as well as various other unfavorable conditions. The attention to supply constraints was a result of the changing structure of the global food economy, which

is thought to be the cause of these economic problems. Hunger, food crises, and famine emphasized to develop the definition of food security that considers the most important needs and actions of people who might be affected [13, 14].

In 1994, UNDP Human Development Report examined human security in which seven key threats were recognized including food, economic, environmental, communal, political, personal, and health security [15]. Human rights entered the concerns about food security around this time [16].

Food insecurity is a problem that ranges from the household to the international level, despite the fact that it is primarily addressed at the national level by policy-makers. At the household level, the measurements of food security occur in order to take into account individual dietary preferences; thus, it is considered that food insecurity is a problem that affects the whole world. By 1993, food security had nearly 200 definitions [17]. This unpredictable condition showed that food security studies depended on the technical opinions, context-specific and policy issues being considered.

The subsequent momentous occasion occurred when the World Bank published the foundational report entitled “Poverty and Hunger” in 1986 [18]. A difference between chronic food insecurity and temporary as well as acute food insecurity, which is associated with poverty and human-made or natural calamities, was observed, respectively. This resulted in the introduction of a temporal scale for measuring food security. This was considered when expanding the idea of food security to include the following parameter: availability of sufficient, safe, and nutritious food to people at all times for a dynamic and healthy life [19]. The second edition of the notion took place in 1994, in response to the Human Development Report issued by the UN Development Program, which examined the prerequisites for human food security. In this situation, food security, which was part of the overarching concept of social security, involved the conversion of human rights.

After the World Food Summit (1996), a very well-organized and systematic work was endorsed in which the organization’s members tasked it with monitoring the progress toward decreasing the number of malnourished people in poor countries by 2015 [20]. In the middle of 1990, the term food security was replaced by nutrition security and food and nutrition security to elaborate on the current scenario [21]. The annual flagship report of FAO, entitled *The State of Food Insecurity in the World*, was published in 1998 and used to evaluate the whole monitoring process.

The statement of food security was improved by *The State of Food Insecurity in the World 2001*; according to this statement, food security is a discipline ensuring that all the people at the same place have equal rights to sufficient, hygienic, nutritious, adequate, and safe food to fulfill their dietary needs as well as food choices with physical and economic access for a healthy life. Furthermore, improving poverty is mandatory in addressing food security but is insufficient [22, 23].

Various topics like investments in agriculture, social safety, food losses and waste, land tenure, biofuels, and price instability impacted the food security recognized by the Committee on World Food Security (CFS) in 2009 reforms. These topics were discussed in the sustainable concerns about fisheries, aquaculture, and food systems based on the High-Level Panel of Experts on Food Security and Nutrition (HLPE) discussion. At last, in 2014 and 2015, HLPE reports requested by CFS revealed progressive incorporation of sustainability into food and nutrition security [24].

It was acknowledged that eliminating poverty is crucial for achieving this goal but that doing so will not be adequate on its own [23]. During the World Summit on Food Security in 2009, the concept of food security received its most recent formal

revision, which included the addition of the fourth dimension of stability [5]. In more recent times, a fifth dimension has been also proposed, which would be sustainability, to be added in order to integrate the long-term sequential aspect [19].

4. Food security and its dimensions

According to the definition, there have been identified four different aspects of food security [12]. Availability of food is the first dimension of food security that deals with the production of food locally and bringing it in from other countries. Second is the accessibility of food to everybody. The consumer is able to pay for the food, and the food can reach the consumer.

Along with such financial and physical availability, sociocultural availability assures that the food is appropriate for the culture, and social safety networks are available to help those who are less fortunate. Utilization is the third dimension that describes that a person realizes his extraordinary potential and lives a successful as well as healthy life; they have sufficient amounts of food both in terms of quantity and quality. The ability of a nation, community, and a person to absorb the shocks of the system of the food chain, whether those stresses are generated by natural calamities like climate change and earthquakes or those that are man-made, also underlies the domain of stability, which describes specific topics like wars and economic crisis. Sustainability indicators at a global or local level include biodiversity, climate change, and ecology in addition to socioeconomic and sociocultural variables [19].

5. Food security and sustainability

Sustainability is a generic notion applicable to food security as a whole, representing more than its particular dimensions. The idea of sustainability emphasizes that continuous healthy well-being across the lifetime and future generations is the objective of long-term food security [25]. Food insecurity can happen whenever there is an interruption at any step along the pathway from availability to use and consideration to stability because the four dimensions are linked and interdependent. However, the most significant complication and tragedy arise from these considerations. As can be seen from the definitions of each term, the concept of “sustainable diets” is an attempt to bridge the gap between “sustainability” and “food security” in order to create “holistic, sustainable food systems.” Diets are considered sustainable if they “have preventive aspects, reverential of biodiversity and ecosystems, socially desirable, available, economically sustainable, low-cost; nutritionally adequate, hygienic, and healthy; and enhancing human as well as natural resources” [23]. Whereas “a sustainable food system ensures Food Security and Nutrition for everyone in that way which does not hurt the social, environmental and economic bases for ensuring FSN for future generations” [26].

The widespread consensus among nations worldwide is that climate change poses a risk to the permanent viability of food security. However, the processes included in food systems are responsible for approximately (20–30%) all greenhouse gas emissions related to human activity, and as a result, climate change occurs [27]. It was observed that a relationship that might be described as a “trade-off”

exists between reducing human-caused greenhouse gas emissions and ensuring food security within the context of the food system that is already in place. As a result, a systematic and comprehensive method is required in order to satisfy the immediate and long lasting needs of food security while also reducing the adverse effects on the environment caused by greenhouse gas emissions caused by the activities involved in the food system itself. Our understanding is always expanding, despite the fact that it is not entirely obvious what sustainable food systems might look like in practice [28].

6. Concept of food insecurity

Food insecurity will happen when there are problems at any one level of the food production-consumption pathway. The FINS level upstream has a big effect on those downstream. Food insecurity is when adequate, safe, and nutritious foods are unavailable or when there is uncertainty about how to get acceptable foods in a socially acceptable way [29]. In the United States, food insecurity occurs when the access and availability of food for the future are uncertain, not enough food for a healthy lifestyle, or there is the need to adopt unethical methods to obtain food [30]. Food insecurity can occur for several reasons, the most common of which is a lack of financial resources; however, it can also occur when food is readily available and easy to obtain, but it is unable to be consumed due to physical limitations, like the partial physical functioning of the elderly and disabled individuals [30]. Despite this, given the current emphasis on health fairness, priority should be given to individuals living in the most precarious conditions. They are being put under pressure by a variety of calamities, both natural and artificial, like droughts, wars, floods, and conflicts. There is an imperative need for improved methods of managing the precarious state of food supply. In a perplexing turn of events, the populations with the highest levels of food insecurity, like immigrants, the homeless, and displaced persons, are typically excluded from food security surveys, which leads to an underestimation of the extent of the issue.

7. Measuring food security

7.1 Food security at national level estimates

Food security measures that are meant to be used at a national level often focus on how easy it is to get food. Food balance sheets, which are used to figure out how much food is available, have traditionally been based on national data on the total amount of food produced and imported (food supply) and the amount of food that is exported for many reasons, such as to be used as seed, to feed livestock, to process food and nonfood, or to be lost during storage and transportation [31]. The FAO's main way to measure food security is by the number of people who are undernourished. These data are used to make that number.

Food supply and usage data are valuable for anticipating food shortages and surpluses, projecting future food demand, and setting agricultural output targets [31]. It was observed that the average dietary energy intake was equal to the mean value of calorie consumption of the whole population [2]. This is an unjustified and

inconsistent assumption. Despite the deficiency of comprehensive information on food distribution balance and losses, considerable differences were detected between these data and USDA estimates of food-insecure families [32]. The USDA uses income distribution statistics and aggregated food supply estimates to project the consumption of calories for different income groups [33].

7.2 Global food security index

Food Security Index at the global level is another way to measure food security on a national level. It is based on a number of different factors. It was thought up and made by the Economist Intelligence Unit, which is one of the many parts of the Economist Group, a publicly traded multinational company. The project was paid for by the company DuPont. A total of 30 different variables were used to provide a standard for comparing the food security of different countries. These indicators are split into three groups: availability, affordability, and quality and safety, each of which has 10, 6, and 14 indicators [34].

The Global Food Security Index assesses the success of countries in accomplishing food security, much like other national-level metrics; however, it does so by utilizing quantitative and qualitative measures that represent not only food availability but also food access (for example, food intake as a proportion of total household expenditure and proportion of population living below or close to the global poverty line, food costs) and diet quality such as dietary availability of micronutrients. The GFSI is adjusted every quarter to account for changes in the data about food prices.

The Global Food Security Index is computed on a regular schedule in response to changes in the data on food prices. The GFSI uses data from the World Bank, the Food and Agriculture Organization of the United Nations, the World Food Program, the Economist Intelligence Unit, analysts and expert panels, and public as well as academic sectors. These experts give the subjective scores that are used to make many of the qualitative indicators that are used to make the index. They also decide which indicators will be in the index and how much weight each one will have. The reliance on consensus and expert opinion is different from the methods used by FAO and IFPRI. However, personal data interpretation is often used when making food security measures, as explained below. Because of the complexity of food security indicators and the need for context to understand them, some institutions focus on consultative methods when making the tools for measuring food security.

FAO, the World Food Program, and the International Fund for Agricultural Development have come up with signs for food security in the past few years [23]. Several indicators describe each aspect of food security. A lot of work is also being done to combine these indicators into indices. These were chosen from many different indicators based on how important they were, how easy they were to get, and how often they were measured.

7.3 Vulnerability analysis and mapping methodology

When conducting analyses on food security, the WFP makes use of various types of evaluations, collectively referred to as vulnerability investigation and mapping. The CFSVAs stand out as the most important of these evaluations. These studies are conducted in nations that are prone to crises and suffer from food insecurity in order

to evaluate the current state of food security and investigate the underlying causes of susceptibility [35].

They obtain primary data by surveying households and rely on secondary data analytics for their research. These surveys contain 13 basic food security evaluation systems, which exemplify the complexity of measuring food security. These modules include food consumption patterns, water sources, sanitation access, household assets, household composition, housing materials, sustainable income livelihood, education, credit availability, livestock, agriculture, external aid, shocks, and coping mechanisms [35]. WFP conducts a variety of methods like food security monitoring ways, crop availability assessment operations, market assessment, emergency food security evaluation, and combined assessment operations as part of its goal to increase governments' ability to decrease hunger [36].

7.4 Household measuring food access

Some of the more talked-about ways to measure food security only describe the national food supplies. But because they focus on estimates and trends at the national or regional level, they do not pay much attention to how households act and other factors that affect food access. At the household level, there are a number of tools that can be used to measure changes in food security between and within households. Because these measures use information from household surveys, they can measure the "access" part of food security more accurately than those measures that use information from the whole country. But various methods used to measure food access actually measure how people get food or how much food they eat. Food access means being able to get food both physically and financially. However, numerous tools are used to measure food access to measure how much food is bought. It is a standard practice to use both terms interchangeably when referring to food access; nonetheless, it is vital to differentiate between the two for the sake of measurement [37].

7.5 Food security and dietary adequacy

The evaluation of a nation's ability to ensure its own food supply has expanded beyond the simple assessment of the quantity of food available to encompass other evaluations of economic access. On the other hand, the same level of focus has not been placed on evaluating the quality of diets. If the data from HCESs are collected correctly, it may be possible to estimate the quality of the diets of a whole population. Some of the data collected to help make CSIs may also tell us about the quality of people's diets. Most food security assessments do not use more severe measures of diet quality like 24-h dietary recall and food questionnaires because it takes a lot of time and money to collect and analyze these kinds of data.

Another component of food availability, that is, the embarrassment that comes along with acquiring food in methods glared upon by society, is noticeably inattentive from the metrics examined here, in spite of the fact that social unacceptability has been established as a shared domain of food insecurity across a wide variety of cultural contexts [38, 39]. In point of fact, a query investigating it was included in the early development stages of the HFIAS; however, it was removed from the completion of the measure due to the delicate nature of the subject matter and the trouble in obtaining precise reports [40]. Limited surveys inquire about food acquisition acceptability; hence insignificant data is available to examine this food security section.

Food safety is generally excluded from food security metrics despite growing issues about mycotoxin contamination, chemical pollutants, foodborne illness, and zoonotic disease [41].

7.6 Categorization of food insecurity

Determining acceptable parameters to employ both within a setting and when comparing results from other areas or countries is another challenge that must be overcome when attempting to quantify food security. Several different food security indicators clarify the plan of limitations for determining levels of food insecurity, which provide precise information on the topic.

The IPC provides precise classification standards since this classification directly defines the priority response objectives it strives to achieve. Food insecurity is classified into categorical groups that are not as significant for other measures, such as the CSI, FCS, and HFIAS, which provide quantitative scores. Instead, comparing values' fluctuation across a specific population may be more helpful. It was observed that the persistent and present food insecurity complications are associated with severe and moderate food insecurity parameters. A variety of food insecurity conditions like chronic, moderate chronic, severe transitory, and transitory food insecurity are briefly described by Devereux [42]. It is essential to accomplish the limits, and the classification of food insecurity is described well, regardless of the approach used for measuring and categorizing food insecurity.

7.7 Future agenda for food security

In the next century, to measure global food security, we need to evaluate the effect of climate change in the food production capacities. A broader definition of food security increases the bar for success and gives numerous paths to achieve it. We should also talk about how income is shared, what people eat, and how much food is lost or wasted. Better education about health and nutrition will help people, families, and communities get more food. By making emergency response systems and other social safety nets stronger, we can reduce food insecurity and make society more resilient as a whole.

Overall, food delivery must expand to accommodate population expansion and improving diets. Long-term growth must match the past 50 years if the population doubles in 66 years. Food production efficiency could contribute to this growth. Ongoing discussions over the sustainability of historic growth rates bring such continuous growth into question, especially in light of climate change. Without this growth, achieving global food security would be challenging. Even with the more extensive food availability and access and projected rises of 3 to 4 times in food production and four to six times in income, ensuring food security will need consolidating the human right to food, a much enlarged safety net, and an improving ability to adjust to surprise. Social institutions, value changes, and increasing flexibility already exist.

8. Future prospects

If the amount of food that can be produced in the next 40 years needs to increase by 50 percent despite the amount of available land decreasing, then this will require a massive and ongoing investment of money, struggle, and time. Similar to the

historical achievements of global agriculture, which resulted in the “green revolution” and prevented millions of people from dying of starvation, a significant portion of the solution will need to originate from technological advancements. Thus, this advanced technology will aim to ensure safe, sufficient, and nutritious food to fulfill the dietary needs of the worldwide human population. Such technologies are beneficial to produce, distribute, and process food at the market level for easy access of consumers. Therefore, the investment in the development of agriculture and long-term neglected worldwide research should be double for the proper application of development of these technologies.

Any debate of food security is insufficient without addressing the trade and complicated network of sociopolitical and other challenges, which are more precise as compared to processing and production. The effects of plant diseases on food production, quality, and safety were mainly mitigated by climate change. The overview of this chapter emphasizes plant protection professionals share their scientific knowledge to inform policy debates. To boost productivity and quality, research must be communicated beyond the farm gate to policymakers and the public.

There has been limited experimental observation on plant diseases under field conditions that accurately imitate climate change, limiting opportunities to improve crop adaptability or disease management. In addition, through the use of models, a significant amount of information regarding the potential effects of global climate change has been acquired. Initial assessments are available for a select number of nations, regions, crops, and diseases. Thus, food security is a necessary measure to ensure safe, sufficient, and nutritious food for human beings all over the world.

Many climate change worrywarts assume a changing climate would make food security more challenging. If climate changes occur, they could affect food production and revenue. Climate change mitigation or adaptation may slow output growth or redirect funds from poverty or food insecurity relief. Adapting to climate change and making sure there is enough food can both help each other. As places build up their agricultural infrastructure over the next few decades, they may be able to take advantage of their great growing conditions. Second, the fact that climate change affects the whole world encourages everyone to do their part and work together. During talks between rich and poor countries about possible preventative and adaptive actions, food security could be used as an example of a low-cost goal with a high return in terms of building international cooperation and creative skills. Food security for industrialized and developing countries will require proactive policies, programs, and institutions.

9. Conclusion

The importance of food security to public health is incontestable due to the fact that 870 million people throughout the world consume a smaller number of calories than their requirements. There is an imperative need for improved methods of managing the precarious state of food supply. Food access refers to economic as well as physical access to food; though numerous tools are used to measure food access to measure food procurement, food safety is generally excluded from food security metrics despite growing issues about mycotoxin contamination. Many climate change worrywarts assume a changing climate would make food security more challenging.

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