FOOD SUSTAINABILITY: PROBLEMS, PERSPECTIVES AND SOLUTIONS

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Abstract: *The whole food supply chain, from agricultural production to processing, distribution, retailing, home food preparation, and waste, plays a role in the global food system's major contribution to climate-changing greenhouse gas emissions. It also brings in other significant environmental impacts, such as biodiversity loss, overuse of water resources, and pollution. Policymakers are becoming more conscious of the need to address these issues, but they are also entrusted with ensuring that there is enough food to meet the requirements of a growing global population while dealing with a mounting weight of food security and nutrition-related issues.*

Key words*: global food system, greenhouse gas emissions, food security, food sustainability, agricultural production*

INTRODUCTION

Nowdays, more people need to eat better while causing less damage to the environment. How could this be accomplished? Three main "takes" or perspectives on the issues seem to be forming, broadly speaking. Depending on one's point of view, the issue might be thought of as:

• a production challenge, which calls for modifying the unit efficiency of food production;

• a consumption challenge, which calls for modifying the dietary drivers that influence food production;

•a socio-economic challenge, which calls for modifying the way the food system is managed.

As shown by carbon dioxide and carbon dioxide equivalents (CO2e) metrics, climate change ideas and data currently dominate the measurement and definition of food's (un)sustainability. These metrics have been the focus of early assessments of food and diet footprints [6]. However, more recently, compelling arguments have been presented to audit food in regard to embedded water, biodiversity, and land use [12,13]. The UK SDC recommended a multi-dimensional or "omni-standards" approach to sustainable food in its latest report to government, indicating that these concerns are not distinct but rather overlap and interact. Quality, health, social values, the environment, the economics, and governance were identified as the six primary issues for food sustainability, and several elements were categorized under those broad areas.

This is where the Social Nutrition tradition could potentially make a revitalized contribution. The expanding global interest in defining sustainable meals is one encouraging development. A stronger operationalization is now suggested by the UN Environment Programme, FAO, and Bioversity (a member of the Consultative Group on International Agricultural Research) [10].

A working definition of sustainable diets as "...those diets with low environmental impacts which contribute to food and nutrition security and to healthier lifestyle for current and future generations" has previously been put out by the latter two organizations. Diets that are sustainable protect biodiversity and ecosystems, are accessible to all people, equitable in terms of economic access and affordability, provide appropriate nutrition, are

safe and healthy, and make the best use of human and natural resources. Now, this must be converted into dietary recommendations for the general public.

Food security must be provided in order to achieve this. The United Nations defines "food security" as "the condition in which all people, at all instances, have physical and financial access to plentiful, safe and nutritious food that meets their nutritional requirements and preferences for an active and healthy life." We must lessen the negative effects of food production on the environment while ensuring food security. Food production will be impacted by future climate change. In contrast, agriculture is responsible for up to 30% of the anthropogenic GHG emissions that are responsible for climate change.

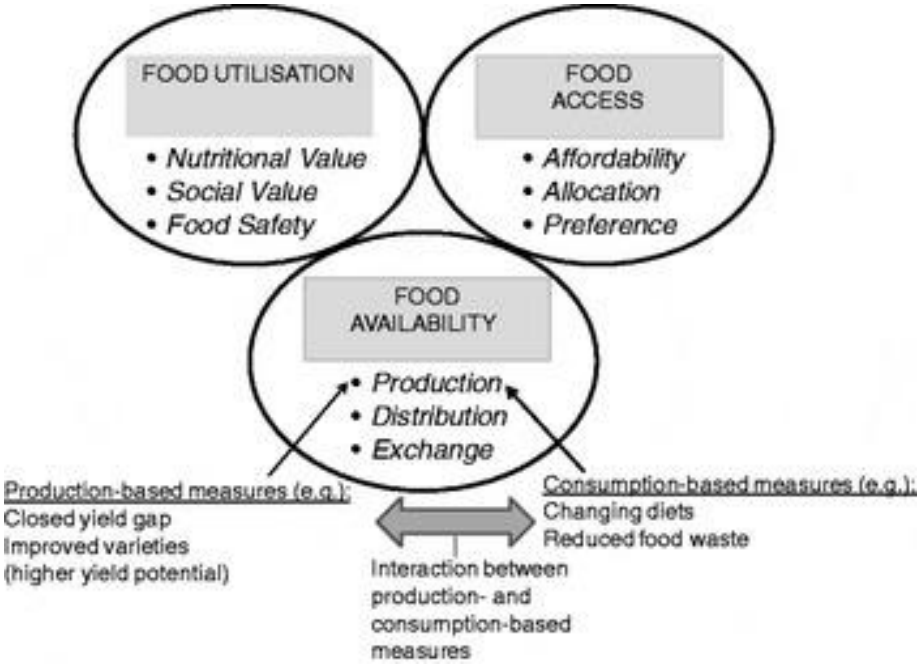

Figure 1. The interaction of food security, food production, and food availability are related.

It will be quite difficult to feed nine to 10 billion people by the year 2050 [15]. Protecting our freshwater resources, preserving biodiversity, changing to healthier diets, and minimizing the negative effects of food production on a wide range of ecosystem services are non-climate-related priorities.

The historical takeover of forests and other natural ecosystems by agriculture has greatly accelerated the loss of natural ecosystems. The realization that future increases in food supply must be met without extending the agricultural area, i.e., to obtain more agricultural product from the same area [15,3] has been further fueled by this. Increased yields per unit area will be the primary method of increasing crop output, with an increased number of crops planted in a seasonal cycle adding lesser.

THE FOOD SUSTAINABILITY CHALLENGE

The primary environmental issue we face, according to many decision-makers, is climate change, to which the food system contributes significantly. According to studies, the entire food system—from agricultural production to processing, distribution, retailing, home food preparation, and waste—contributes between 15 and 28% of the total GHG emissions in affluent nations.

There are indirect effects to take into account in addition to the direct effects of farming, which account for about 10–12% of world emissions [13] through CH4 and Nitrogen oxides emissions. Taking into consideration the emission of carbon dioxide into the atmosphere as a result of agriculturally induced deforestation increases agriculture's part of the load by an additional 6–17%. Agriculture is thought to contribute up to 30% of the total global emissions when both direct and indirect effects are added together.

Different diets contribute differently to the related issues of pollution, resource depletion, biodiversity loss, and climate change. According to numerous analyses of specific foods, meat and dairy products have a disproportionately high environmental impact, with GHG emissions being of particular concern. According to estimates, livestock production contributes between 12 and 18% of the world's Greenhouse gases [7] and roughly half of all food system-related impacts, with the contribution increasing when taking into consideration the effects of land use change [1,2].

There are other negative effects on the environment related to livestock farming. The industry contributes significantly to the release of carbon dioxide and the loss of biodiversity due to deforestation because it uses 30% of all arable land and 70% of all agricultural land. For instance, the main causes of deforestation in the fragile Amazon region are cattle ranching and soy farming (produced for animal feed) [6,8].

Around 35% of adults worldwide are overweight, with half of them being obese. People are becoming obese at younger and younger ages: approximately 7% of all children under the age of five, or 43 million preschoolers, are overweight today. Furthermore, obesity and the associated health issues are no longer just issues in developed nations. Although there are many other factors that contribute to obesity, energy-dense diets and sedentary lifestyles are the two biggest risk factors. Many people now have easier access to calorie- and fat-dense diets, including meat and dairy products that produce a lot of greenhouse gases [10,11] as well as processed foods with a lot of sugar and vegetable oils.

People's capacity to absorb the minerals found in meals is subsequently compromised by their poor health status, making them even more susceptible to illness. The adverse consequences of food production on health are most likely to afflict the poor, especially those who are most marginalized [4].

MATERIALS AND METHODS

The fifteen bibliographic references were studied as part of the study's approached methods, which also included data analysis and data synthesis in order to highlight the key issues concerning food sustainability.

RESEARCH RESULTS

This study presents the main aspects regarding the problems, perspectives and solutions related to the food sustainability.

As the human population expands and becomes more urbanized, we become net consumers, so a decreasing number of individuals will be engaged in farming in the upcoming years, at least as their primary activity.

With rising incomes, people's eating preferences are changing, driving up demand for dairy and meat products. By 2050, it may be necessary to expand food production by up to sixty to 110 percent to keep up with demand [13,14]. Additionally, it's critical to reduce the direct and indirect environmental damage that food production does to the ecosystem (such as deforestation). Additional food must be produced on the existing farmland in order to feed urban consumers while reducing harmful effects on the environment.

After harvest, emissions can be reduced by improving manufacturing, shipping, and refrigeration equipment. These are either more energy-efficient or use renewable energy sources.

Optimized inventory management cuts waste by changing serving and packing sizes. Additionally, by employing techniques that either lengthen food's shelf life or point consumers toward other ways to reduce food waste.

Initiatives toward moderation may be challenging for certain people given the economic importance of cattle and their nutritional value. The other components of food security and food quality are regarded to be equally important, but in reality, these other problems receive only a small amount of attention.

Product reformulations that deliver foods with flavors equal to the originals but lower in fat, sugar, or salt, or with improved nutrition (prebiotics, n-3 fatty acids), can guarantee environmental efficiencies [5].

Meat and dairy products have been connected to a multitude of harmful health impacts because to their high GHG intensity and complex health pathways. This frame of view contends that environmental and health problems can be solved technically. The per-unit environmental effect of the production of meat and dairy products can be reduced by studying techniques for avoiding methane emissions from ruminant animals as well as breeding, feeding, and housing procedures. It stands to reason and is healthy to offer consumers leaner dairy and meat products with less fat. At the same time, it's essential to motivate customers to choose these foods over those that are higher in fat [4]. With such a system, it may be possible to provide clients with essential micronutrients (Fe, Ca, and Zn) that have the same caloric value.

The emissions of CO2, CH4, and N2O into the atmosphere are considerably influenced by agriculture. The microbial burning or decomposition of soil organic matter and plant litter is the main source of CO2 emissions. CH4 is created when organic materials decompose in anoxic conditions, such as during ruminant cattle's fermentative digestion, when manures are stored, and when rice is grown in floodwaters. Soil carbon sequestration makes up the majority (89%) of the mitigation contribution, with only minor potential to lower CH4 (9%) and N2O (2%) emissions.

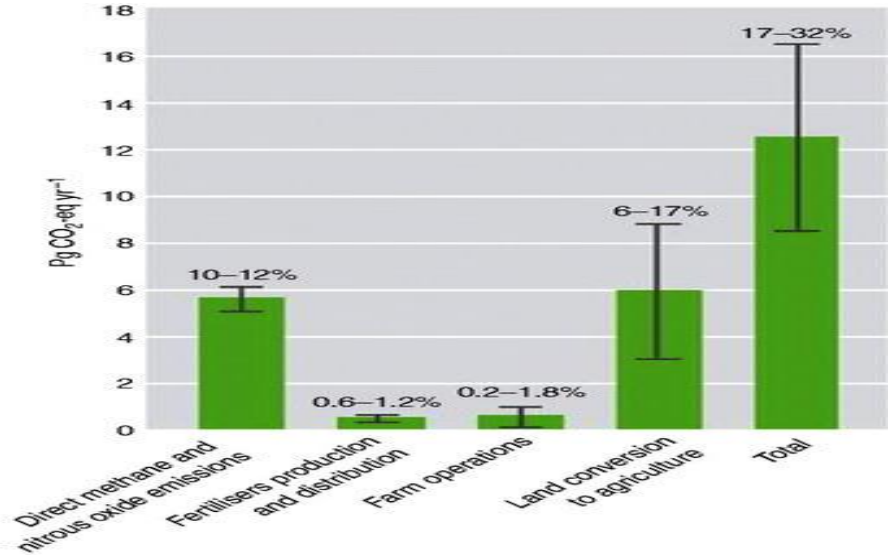

Figure 2. Cool Farming: Climate Impacts of Agriculture and Mitigation Potential

Price increases in maize, soybeans, rice, and wheat are all likely as a result of climate change. Due to the greater feed expenses associated with these, meat will cost more, and the growth in meat intake will be temporarily slowed. Additionally, the consumption of cereal will decrease more noticeably as a result of this.

Child malnutrition will rise by 20% in the developing world by 2050 compared to a world lacking climate change because food energy availability will be less there than it was in 2000.

Another essential requirement is to increase the quantity of solar energy that is captured for each unit of fossil energy consumed. Long a cause of worry, the amount of fossil fuel energy required to create food and grow crops. Due to the recent increase in energy prices, the need to develop low carbon agriculture techniques and concerns about Carbon dioxide emissions have come back to the top of the agenda.

CONCLUSIONS

The food system is not particularly efficient in carrying out its main duty of effectively feeding people. Some people overeat and suffer the health effects, while others go without food. Many more people go hungry because of concealed nutritional deficits. Population expansion, which results in more mouths to feed, and changing climatic and environmental conditions, which will make food production more challenging and unpredictable in the next years, exacerbate the issues of unsustainability and nutritional imbalance.

Although food is vital for our survival, the ecosystem is being damaged by its production. Our life-support system is made up of several different components, including clean air and water, good soil, the presence of many different kinds of other living things, and a climate to which we have become accustomed. The well-being of people is severely impacted by all of these outcomes in a negative way [15].

The rich overeat and become obese, while the hungry have to do without because they can't afford the food that is produced and suffer from malnutrition. Increasing the world's food output won't make these issues go away. Although the needs of the urban poor are now receiving more and more attention, the majority of the poor still reside in rural areas where they rely mostly on agriculture and allied activities for both their food supply and their means of subsistence. These regions are frequently characterized by a fragile and naturally depleted base of soil, land, and water resources, which makes it difficult or impossible to obtain capital for better agricultural and livestock husbandry [15]. It is unlikely that changing the way things are currently produced will be able to meet our needs for food and ecological services in the future. More significant adjustments to consumption, production, and diet are anticipated to be required during the coming decades.

While certain new developments and technologies are being created to boost yields, such as minimal and conservation tillage to enhance soils, precision farming to administer inputs while taking spatial variability into consideration, and acceptance of new hybrids, these are largely founded on "old" information and are hardly revolutionary.

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