

Food and Water Security in the Context of Sustainable Development

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ABSTRACT

A review of food and water security in the context of sustainable development is the purpose of this study. Food and water security are complicated sustainable development challenges that are linked to both health and sustainable economic development through malnutrition. These are contained in the sustainable development SDGs such as 2 and 6 (Zero Hunger) (Sanitation and clean water). This paper is a review of food and water security that has to do with the conceptual issues, stylized facts on food and water security, food and water security nexus, factors militating against food security around the world, related empirical studies and way forward, Having pointed out some of the factors militating against food and water security such global warming/ climate change, disease outbreak and insecurity etc. strong conclusion and recommendation were made such as fight against insecurity and diseases outbreak, good sanitation and hygiene should also be promoted and sustained, good agricultural policy formation and implementation amongst other things will play out to promote food and water security, hence, to achieve sustainable economic development.

Keywords: Challenges, Food Security, Global Warming, Hunger, Insecurity, Nexus, Malnutrition, Sustainable Development, Water Security.

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I. INTRODUCTION

Food and water security are two sides of a coin issues that goes hand in hand Surface temperatures will be affected by changes in vegetation on a wide scale, as will regional rainfall patterns. As a result, shrinking and melting mountain glaciers may result in water shortages and increased food insecurity. According to Evans (2011), Food and water security are complicated sustainable development challenges that are linked to both health and sustainable economic development through malnutrition these are outlined in targets 2 (End Hunger) and 6 of the Sustainable Development Goals (SDGs) (Clean Water and Sanitation). This chapter is a review of food and water security. The subsequent sections capture conceptual issues, stylized facts on food and water security, food and water security nexus, factors militating against food security around the world, related empirical studies, way forward, conclusion and recommendations.

II. CONCEPT OF FOOD AND WATER

Food, according to Nagamani (2018), is any consumable substance that helps the body develop, heal, and maintain itself. Additionally, Encyclopedia Britannica defined food as any material ingested to satisfy an organism's nutritional needs; Protein, glucose, and fat are the main components of the material utilized in an organism's body to support development, repair, and important activities, as well as to provide energy. In other words, food which could be energy-giving, bodybuilding or body protective type is any substance which one consumes to support growth, repair and development of the human body. On the hand, water as a concept is a component of food. In affirmation. Vilakazi *et al.* (2019) noted that water plays a crucial role across the entire food chain, from production to processing to consumption. It is useful for man and animal. It helps in the metabolic process of other food intakes. According to Collins Dictionary, water is a clear, colorless liquid that serves as the basis for all living organisms. The primary component of the earth's hydrosphere and the fluids of all known living organisms is water, which is an inorganic, transparent, flavorless, odorless, and almost colorless chemical substance, according to Encyclopedia Britannica (in which it acts as a solvent). Even though it doesn't contain any calories or organic nutrients, it is essential for all known forms of life. A person without access to better drinking water must rely on surface water, unprotected and potentially polluted wells, or vendors selling water of

unknown origin and quality. Examples of these sources are protected borehole wells and municipal piped supplies. Even though a section which explores the link between water and food security is presented, in the context of this paper, food and water security will be considered in collective term, given that Food contains water, hence food security and water security are interrelated.

III. CONCEPT OF FOOD SECURITY

Outlined by the United Nations Committee on World Food Summit in 1996 Food security is characterized as a situation in which everyone always has physical, social, and economic access to an adequate supply of food that is safe, nutritious, and meets their dietary needs for an active and healthy life. It is also considered to be the “Adequate, healthy, diverse, balanced, and moderate world food supply of fundamental commodities are accessible at all times to sustain a steady development of food consumption and to counterbalance changes in production and pricing” (UN, 2003).

In more depth, the supply of food is related to its production, distribution, and trade (Gregory *et al.*, 2005). Land ownership and use, soil management, crop selection, breeding, and management, livestock breeding and management, and harvesting are only a few of the variables that affect food production. Temperature and rainfall fluctuations can have an impact on crop productivity (Gregory *et al.*, 2005). Food production can be impacted by the competition between users for the resources land, water, and energy that are used to grow food. Food access refers to the availability and cost of food as well as consumer and household choices (Gregory *et al.*, 2005). According to Abate *et al.* (2017), it is merely the capacity to obtain food (physically, financially, and socially). Meal use, according to Tweeten (1999), relates to how people process their food. It is referred to as the body's absorption of nutrients by Poppy *et al.* (2014). This demands that the food consumed by the person be secure and sufficient to suit their physiological needs. The ability to receive food over time is referred to as food stability. In a nutshell, a country's economy is considered to have food security when food is readily available, people can acquire it, and they can use it to always meet their nutritional needs.

IV. CONCEPTUALIZING SUSTAINABLE ECONOMIC DEVELOPMENT

According to Wikipedia, sustainable development is an organizational principle for achieving human development goals while maintaining the capacity of natural systems to deliver the natural resources and ecosystem services that are essential to the economy. Alternatively said, sustainable development is the process of addressing present demands without sacrificing the capacity of future generations to address their own needs. According to Edward (2015), the goal of sustainable development is to advance economic, social, and environmental development, all of which are linked. The UN Sustainable Development Goals address issues like poverty, inequality, climate change, environmental degradation, and justice and peace on a worldwide scale (United Nations, 2020).

According to Jhingan (2007), economic development is specifically understood as the sustained increase in a country's per-capita output or income that is accompanied by an increase in the labor force, consumption, and volume of trade. All in all, Edward (2015) Considers sustainable economic development to be primarily focused on enhancing the 'grassroots' material standard of living of the poor, which can be measured in terms of increased access to food, real income, educational opportunities, health care, sanitation, and water supplies, as well as food and cash emergency reserves. It is viewed as a national project built on the unique strengths of local economies to address specific difficulties and give quantifiable real-world benefits. It is a practical, implementable toolkit at tailor's strategies to work for local people, businesses and institutions. Thus, sustainable economic development encompasses a situation where people enjoy a sustained standard of living that is quantitatively and qualitatively enough to continuously enjoy a healthy life.

V. STYLIZED FACTS ON FOOD AND WATER SECURITY

151 million children under the age of five have chronic malnutrition as a result of food insecurity, according to a United Nations (2020) report. In terms of lost human and economic potential, this is a terrible loss. Almost 690 million people, or 8.9% of the world's population, are estimated to be hungry, up nearly 60 million in just five years, according to a survey published in 2020. Food insecurity increases the likelihood of several types of malnutrition, such as under nutrition, overweight, and obesity, as well as the degradation of food quality. More than 3 billion people worldwide lack access to a healthy diet.

A third of the food produced globally is reportedly lost or wasted as a result of inadequate food management. In a similar vein, according to the United Nations (2020), 2.1 billion people need access to

services for managing drinking water, while 4.5 billion lack such services for managing sanitation. The prevalence of unsafe hygiene practices exacerbates the negative consequences on people's health. More than 340 000 children under five die each year from diarrheal infections as a result of poor sanitation, poor hygiene, or contaminated drinking water, which equates to approximately 1000 deaths per day. This has a devastating effect on child mortality rates.

Focusing on Africa, the United Nations (2020) revealed that the highest prevalence of malnutrition in the world, 33 percent, is found in sub-Saharan Africa. The average daily calorie intake in one-third of African nations is still below the advised 2 100 kcal threshold (Ethiopia, Kenya, Rwanda, and Tanzania in East Africa; Angola, Madagascar, Mozambique, and Zambia in Southern Africa; Sierra Leone in West Africa). Vilakazi *et al.* (2019) claim that maps produced by international organizations (FAO, UNDP, and World Bank) have a high level of accuracy).

Vilakazi *et al.* (2019) accentuate the inconsistent performance throughout African sub-regions, as reported. North Africa, where less than 20% of the population is still undernourished and where the average daily calorie intake per person is significantly more than necessary, has the best performance. While West Africa also does well in terms of average calorie intake (over 2 100 kcal per capita in most of the nations and above 2 400 in some of them), the prevalence of micronutrient deficiencies and the proportion of malnourished individuals (above 20% in most countries) are still concerning. With a few exceptions, Central and Eastern Africa's situation is worse. Over 40% of the population suffers from malnutrition and inadequacies, and the daily calorie supply is far from enough. The mean availability per capita is below 1 800 kcal in a few nations, including Burundi, the Democratic Republic of the Congo, Eritrea, and Somalia, which is regarded as the minimal intake threshold. Over the past ten years, the situation has gotten worse in a number of nations, including Botswana, Burundi, DRC Congo, Gambia, Liberia, Madagascar, Senegal, Sierra Leone, Somalia, Tanzania, and Zambia, while Ghana, Malawi, and Nigeria show signs of long-term improvement. Only three countries in sub-Saharan Africa have malnutrition rates below 10%, and less than half of these nations (Gabon, Nigeria, and Namibia).

In specific terms, Jean-Marc *et al.* (2006) advanced the following nine (9) Stylized facts;

Factor 1: Malnutrition, in all of its manifestations, is most prevalent and chronic in Africa.

Factor 2: For a large percentage of households who are near to the food security (or "vulnerability") line, a food crisis that threatens household livelihood superimposes on chronic food insufficiency. Stylized fact number three: Food availability varies widely among nations, the majority of which fall along the "vulnerability" (or "food-security") line.

Factor 3: While temporary food crises are more frequently regionally unique, households with chronic food insecurity are broad and dispersed across areas.

Factor 4: Despite a major portion of the population consuming insufficient calories, imports from foreign suppliers fall short of the needs for complementary foods. To put it another way, the problem is not that there are too many imports, but rather that, given the level of national production, imports are too few.

Factor 5: The majority of nations show a strong reliance on climatic factors and ongoing output level instability.

Factor 6: Performance of countries with regard to food security is not determined by the share of foreign supply in total availability.

Factor 7: Chronic food insecurity and pervasive poverty along with low national income are related.

Factor 8: The problem of food insecurity is mostly tied to "access", according to poverty statistics and national income trends as measured by GDP. Food insecure households have limited financial resources to pay for imports and have restricted access to an adequate supply of food. (In a world where there is a sufficient supply of food worldwide, trade should theoretically give deficit countries the amount of food they need to adequately feed their populations).

Factor 9: Dependent on the revenue sources, household vulnerability increases with the proportion of agricultural income.

The following statistics, compiled by the Food and Agricultural Organization of the United Nations in 2020 (United Nations, 2020), are examined in relation to water security.

Water use grew in the last century at a rate that was roughly twice as fast as population growth. Although there is no global water scarcity, a growing number of locations are dealing with persistent water shortages. Due to institutional or infrastructure issues, other regions bear the brunt of unmet demand. On average, 70% of the world's freshwater withdrawals come from agriculture. In the past 30 years, there has been a more than 100% increase in food production. The FAO estimates that by 2050, an additional 60% of food will be needed to feed a growing global population.

As a result, water demand is expected to rise. If irrigation techniques are improved and yields rise, the FAO predicts that irrigated food production will rise by more than 50% by 2050, but water withdrawal for agriculture will only rise by 10%.

It is estimated that there are 1400 million cubic kilometers of water in all. The "freshwater resources" that could be used for drinking, sanitizing, agriculture, and industry only make up around 0.003% of this enormous volume, or about 45 000 cubic kilometers. Since some of this water goes into solitary rivers during seasonal floods, not all of it is usable. For the growth of 1 kilogram of cereal, between 1 and 3 tons of water are needed. A kilogram of beef requires up to 15 tons of water to produce. The FAO estimates that a person needs between 2,000 and 5,000 liters of water each day for their diet.

It is important to note that while food security does not equal self-sufficiency, self-sufficiency may bring about food security (Clemens, 2019). In other words, a self-sufficient country may be able to produce the quantity and quality of food required for the economy to be food secured. This can be computed in terms of the domestic per capita food production. Explicitly, however, food security goes beyond this narrow concept of domestic per capita food production to capture a condition where exports are sufficient to cover food imports required for the food need gap in the country (Clemens, 2019). A nation can achieve food security if it sells enough commodities and services to pay for its imports of food.

VI. FOOD AND WATER SECURITY NEXUS: TOWARD SUSTAINABLE ECONOMIC DEVELOPMENT

Succinctly, water and food are interdependently essential for sustainable economic development. This is confirmed by the global resource nexus model which expounded on the interconnectivity and interdependency of global resource, ranging from land, energy, minerals, and food to water (Frone & Frone, 2015). In the affirmative, Bleischwitz, *et al.* (2014) opined that water is an important input for food production vis a vis economic development as it is an irreplaceable economic good. Every life depended on water; food production depends on water supply and the availability of both food and water guarantees the sustainability of economic development. Breisinger *et al.* (2019) made an additional argument that water cannot be substituted because the globe requires large amounts of it to create food. An adult roughly needs 4 liters of water per day, but it takes 2000 liters (500 times as much) to produce the food we eat each day. This statistic supports the idea that 70% of the world's water use is for irrigation (Frone & Frone, 2015). This implies that the future of water shortage (or availability) will also mean the future of food shortages (or availability) (Bleischwitz, *et al.*, 2014). In addition, while Breisinger *et al.* (2019) predict that the population will grow by 70% by 2050, sustainable intensification of agriculture through increased irrigation water use is essential to meet this demand (Frone & Frone, 2015) and achieve food security, which is a prerequisite for sustainable economic development.

VII. FACTORS MILITATING AGAINST FOOD SECURITY AROUND THE WORLD

A number of factors today, trigger food insecurity. These factors are in some sense general, while some are specific to some locations or nations around the world. They are collectively presented thus.

A. Global Warming/Climate Change

The altering of the global temperature caused by human activity, such as burning fossil fuels, thinning forests, and other activities that raise the amount of greenhouse gases in the atmosphere, is generally understood to be the cause of climate change. In addition to the natural climate variability seen over comparable time periods, it is defined by the United Nations as any change in the composition of the global atmosphere that may be attributed directly or indirectly to human activities (Saina *et al.*, 2013). Over time, the influence changes the patterns of wind, rainfall, and average temperature. Food insecurity comes as a result of this having a detrimental impact on farm yield.

B. General Insecurity

The general global, national and regional unrest, ranging from insurgency, banditry, terrorism amongst others which have prevented people from actively engage in farming and production activities further aggravates the problem of food insecurity in the world today.

C. Health Issues/Diseases Outbreak

Health related issues also have negative effects on food security. Diseases outbreak which renders so many unhealthy resulted in low agricultural productivity. For instance, the COVID 19 pandemic with its restriction on movement amongst others vitiated food security.

D. Hygiene and Sanitation

People are forced to utilize subpar communal latrines or engage in open defecation, which results in poor hygiene, without better sanitation and proper hygiene. A facility that safely separates human interaction and waste is referred to as sanitary. If there isn't a facility like this nearby, waste will transfer back into people's food and water supplies, spreading dangerous diseases like cholera. Lack of efficient

sewage or waste disposal systems can contaminate ecosystems and cause disease pandemics outside of the town. That has detrimental impacts on the security of food and water.

E. Agricultural Production Time Lag and Ineffective Policy Issues

Agricultural production occurs with a time lag (Ijuo & Andohol, 2020). It takes a certain length of time for farm crops to yield. When relevant policy issues that will help to maintain the chain of production are not in place, the situation is worsened. The endpoint will be food insecurity.

F. Urban Sprawl/Urbanization and Industrialization

As places that were previously rural and farmland experience urbanization and growth of industries, farming activities are hampered, and as such food security is threatened. This is affirmed in a study conducted by Iortyom *et al.* (2020; 2022) on how increasing urban expansion has a detrimental impact on agricultural lands and, as a result, threatens food security.

G. Population Growth

Continuous population increase is another factor threatening food security. This goes in line with Malthusian Population theory which advocates that food production is in arithmetic progression while population growth is in geometric progression. While it cannot be statistically proven that this assertion is true in this present time, the fact remains that an increase in population growth negatively affects food security.

VIII. RELATED EMPIRICAL STUDIES

Iortyom *et al.* (2019), with a focus on the implications for the food security situation of maize farmers, it was examined how the rural enterprise development hub initiative intervened on the production of maize in Mqanduli. The study employed descriptive statistics (of mean and percentage change) and inferential statistics (of t-test) on a sample of 200 maize farmers to assess the 'before' and 'after' the project impact on food security. The study found out that while there exists an average increase in annual yield of farmers' output before Red Hub project, farmers were food insecure. Specifically, from the population studied, one farmer (0.5%) experienced mild food insecurity, 97 (48.5%) experienced average food insecurity, and 102 (51%) experienced severe food insecurity. However, following the introduction of the RED Hub project intervention, 3.5% (7) of people had food security, 104 (52%) had moderate food insecurity, 76 (38%) had average food insecurity, and 13 (6.5%) had severely low food security. It is evident that fewer farmers experienced severe and average food insecurity following the project's implementation, indicating the project's success. According to the study, after the project intervention, farmers had greater access to and affordability of extra meals to meet maize farmers' nutritional needs. In comparison to before and after the project intervention, beneficiaries had access to more food on average in amounts averaging 72.5 (29.2%) and 99.3 (47.6%), respectively. The overriding conclusion from this study is that such agricultural programs as this should be promoted to boost food production and ensure food security. It is important to note here that while several agricultural programs of this nature have been launched over the years in different parts of African countries, A number of issues, including but not limited to corruption, subpar execution and monitoring, weak governance, and inadequate finance, prevented the expected or desired outcome from being realized. To fully reap the rewards of such programs when they are implemented, appropriate safeguards should be put in place to offset this unpleasant aspect.

Additionally, Iortyom *et al.* (2018) examined the economic effects of the RED Hub Project (rural enterprise development hub project) on a sample of 200 maize farmers selected from 398 project beneficiaries in Mqanduli, South Africa, with the aim of identifying the availability of a market for the supply of maize produce by benefactor farmers and the change in annual income of maize farmers. The project's "before" and "after" analysis utilizing percentage, mean, and t-test results revealed that it connected farmers with markets for the selling of their produce, helping to increase their income levels. In other words, farmers' income grew dramatically as a result of the RED Hub project intervention. In order to ensure efficacy and efficiency in program execution, it can also be advised that agricultural programs be scaled down to suit the unique needs of the rural populace at the grassroots level. This will increase agricultural productivity and, as a result, food security.

Similar findings were made by Iortyom *et al.* (2021), who discovered that using a rural enterprise development centre led to a large annual improvement in maize yield. The main factors influencing a rise in maize yield in the research area were also identified by the study as fertilizers, seedlings, and capital. Based on a simple percentage and t-test analytical tool, the study focused on the "before" and "after" impact assessment of the Rural Enterprise Development Hub (Red Hub) initiative on beneficiaries' maize yield in Mqanduli, South Africa. Food security will be ensured by putting this study's policy

recommendations into practice and providing farmers with finance, better seedlings, and fertilizers. Iortyom (2022) also found out that the World Bank Assisted Fadama III Project contributed positively on the livelihood of the members of the participating Fadama III Community Associations which improved on their food security.

Iortyom *et al.* (2017) used simple percentages and a t-test to analyze the impact of rainfall onset and cessation trends on crop yields in Lafia town, Nasarawa State and found that the cessation of the rainy season has a more negative impact on crop yields than the onset of the rainy season. The results of this study emphasize once more how important water is to maintaining food security.

IX. WAY FORWARD: CONCLUSION AND RECOMMENDATION

Much attention ought to be given to food and water security by every government in the world. Having pointed out a number of factors militating against food and water security, as popularly alluded that the problem known is half-solved, concerted efforts toward addressing these specific factors are needed without which sustainable economic development is unachievable. For instance, global policy(ies) toward controlling or managing global warming/climate change should be embraced and sustained. Fight against insecurity, diseases outbreak, as well as the promotion of good sanitation and hygiene should also be promoted and sustained. Good agricultural policy formation and implementation amongst other things will play out to promote food and water security, hence, to achieve sustainable economic development.

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