

Food Security and Transition towards Sustainability

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For decades, food security and sustainability have been considered separate concerns, with the concept of food security having a more significant connotation with sustainability dimensions such as environmental, economic, and social–cultural aspects that interpret human well-being. Food security is highly connected to food sustainability and environmental protection. Additionally, food security exists when all people at all times have physical, economic, and social access to sufficient, safe, and nutritious food.

sustainable development goals

domestic materials consumption

food systems

1. A Food Systems Perspective for Food Security and SDGs

First of all, food production and consumption are the key components of achieving food security, and the positive correlation between sustainable production and consumption and global food security has been verified in many studies [\[1\]\[2\]\[3\]\[4\]](#). Different factors influence food security such as food availability, accessibility, utilization, and stability, which has evolved from the refined concept of food security theory. According to the definition of the FAO “food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” [\[5\]](#).

The food security concept is a fundamentally transdisciplinary subject that impacts both societal and environmental sectors. The United Nations’ SDGs are challenged by food-related issues [\[6\]\[7\]](#). It is important to investigate the connections between food security and the SDGs to understand the food system’s potential as a framework for sustainable transitions.

Food systems intersect in the “food production” sector with agricultural systems, which contain various services, technologies, and activities regulating manufacturing, distribution, transportation, accessibility, and “food consumption”. Food systems have an influence on the consumption and production of foods as well as on the future attitude of people and on their opinion about how healthy and nutritious their food is [\[8\]\[9\]](#). These two narratives are the tangible obstacles to “sustainable food security” polarizing unreasonable discourse, which has been overshadowed by stress and uncertainty. The first conceptualization of food security is a production issue that needs to be addressed from the supply end of the food chain. In contrast, it should also be considered a consumption issue from the demand end. Nevertheless, the overarching concerns underpin the impact of various adaptation options on food security and SDGs. The long-term ability of the food system to provide adequate nutritious food can lead to the sustainability of food production and consumption. Although, the sustainable development (SD) and the sustainable consumption and production (SCP) concepts were gradually popularized and established at the 1992 Earth Summit UN Sustainable Development Conferences [\[10\]](#).

A variety of factors affect food production and consumption—for example, geographical location, demographic trends, urban development, and globalization. Additionally, socio-economic background, income level, consumer behavior, religion, and culture influence at the national, local, and household levels [\[11\]](#). As part of the federal and municipal initiatives to achieve sustainable development, policies and strategies for local and regional food systems are shifting [\[12\]](#). Besides, urban and rural viability can be improved via the food systems, e.g., new job creation, new food industry establishment, and reclaiming the value of regional goods [\[13\]\[14\]](#).

A key attribute of the SDGs is that their goals and objectives for growth are largely interdependent yet interlinked [\[15\]](#). The SDGs were argued to include congruence or synergies as well as trade-offs or contradictions with consequences for national and global perspectives. Because of its interdependencies, several issues might be alleviated at once by reaching a single goal. Tackling climate change problems, for example, will have co-benefits for energy security, health, ecosystems, and

biodiversity [16]. Almost all SDGs are directly and indirectly involved with food security issues, and targets have to be achieved to solve them.

Our first conceptualization of food security as a production issue complies with SDG 2, because it claims a radical revamping of food systems and offers small-scale agricultural farmers an important role. The SDG 2 includes targets to end hunger and ensure food accessibility for all (target 2.1) and better nutrition by reducing all forms of malnutrition simultaneously (target 2.2). SDG 2 has dedicated itself to fostering sustainable agriculture and incomes of small-scale food producers (target 2.3) to accomplish that aim [2][17].

Alongside this, the second conceptualization of food security as a consumption matter conforms to SDG 12, because it gives the standalone priority of "ensuring sustainable consumption and development patterns". Eight specific targets are included in SDG 12. Sustainability is explicitly viewed through the production efficiency perspective, concerning the utilization of natural resources (12.2), food losses related to production and supply (12.3), chemical and waste management (12.4), sustainable business practices and reporting (12.6), and sustainable public procurement (12.7). The waste generation minimization goals (12.5) and the justification of subsidy for fossil fuels (12.c) may cover both production and consumption [18].

Multiple associations exist between food production, processing, supply, and consumption from a food systems perspective. Changes in food consumption, such as a preference for more meat and dairy, result in changes in production decisions and DMC in an increasingly resource-constrained world [1]. The food production and consumption patterns are directly or indirectly linked to various segments of the food system, and both have positive and negative associations that need to be considered to achieve the multiple goals of SDG 2 and SDG 12 simultaneously. Based on these concepts, Hypothesis 1 was drawn up as follows:

Hypothesis 1 (H1).

Changing production and consumption patterns has a positive impact on SDG and sustainable food security.

2. Transitions towards Sustainability?

Another influential force is the transition that is also related to improving sustainable food security. Sustainability refers to meeting the current requirements without jeopardizing the future generations' ability to fulfill their demands [19]. Achieving sustainability requires a transition, because transitions of sustainability aim to solve the crucial problems of contemporary societies by connecting environmental integrity, socio-economic viability, and intergenerational justice [20]. Many studies suggest that transition towards sustainability is positively associated with sustainable food security, which increases food availability, enhanced food accessibility, efficient food utilization, and increased stability in the food system and resilience [21][22][23]. The inequalities in the accessibility of resources across diverse populations and cultures at local, regional, and global levels are the main concerns, therefore, calling for cross-sectoral and cross-scale societal improvements. Additionally, excessive domestic material consumption and less circular material use rate affect sustainability [24]. The old sustainability concept was related to the view that innovation, technological work, and manufactured assets will substitute natural and biological resources.

On the other hand, the interpretation of the new sustainability concept is the recognition of globally scarce resources and a reduction in overall material use [25][26]. From the new concept, it is apparent that only agricultural improvement and increases in food production are not enough to fulfill the SDG 2 target. Rather than coping with sustainability, more focus should be placed on sustainable consumption and production, which can be fulfilled by SDG 12. The main goals of SDG 12 are directly related to sustainable food security, of which the primary goal (target 12.3) is to cut 50% global food waste per capita by 2030 at both retail and consumer levels. It is also important to minimize food losses through better management of production and supply chains, including "post-harvest losses" and "to minimize food losses" for sustainable consumption and production [17].

Moreover, the transformation narrative had the most extensive concordance with the various SDGs, including SDG 2 and SDG 12. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) assessment described the pathways and the transformation movements narrative involving shifts in relational principles towards resource-saving lifestyles such as food and energy and non-GDP growth. Extreme poverty coupled with resource scarcity and unequal access to resources can lead to unsustainable natural resource usage and negative impacts on GDP. These interconnected

factors contribute to high poverty rates and impede people's ability to establish local strategies to deal with increasingly severe episodic or chronic food, water, energy, and physical security shortages [27].

By integrating traditional and indigenous knowledge with modern technological advancements, different innovative types of agriculture were being developed, for example, agroecology, agroforestry, organic cultivation, urban agriculture, transportation, and energy models. All of these reduced the impact on the environment, atmosphere, and water. In particular, enhancing quality of life by adopting SDGs was complemented by focusing on employment creation and reducing social inequalities [28].

The historical evolution of concepts of food sustainability has been connected to food security. The international discourse was primarily implemented by concepts of sustainable development [29]. The statement included multiple facets, such as sustainable agriculture, sustainable diets, and sustainable food systems. For sustainable food production and transition, a systematic and comprehensive solution is advisable. Food analysis cannot differentiate between production and packaging, transport, recycling, and waste management without compromising the capability, current and future expense, advantages, contradictions, and dilemmas. A transition to sustainable consumption involves a deep commitment to establishing an interdisciplinary research strategy that incorporates the values of sustainable agriculture, climate, social, and health challenges. To achieve a sustainable lifestyle, diet and technology for consumption and food production structures must improve [30].

However, integrated strategies, actions of SDGs, and transition towards sustainability will ensure sustainable management, and efficient use of DMC and natural resources in production and consumption process will aid in achieving sustainable food security [24]. Therefore, it was logical to propose Hypothesis 2:

Hypothesis 2 (H2).

Efficient use of domestic materials has a positive influence on SDGs and sustainable food security.

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