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Editorial

Food and Agricultural Security: An Introduction to the Special Issue †

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Abstract: Food and agricultural security are important elements of sustainable development, especially in developing countries. This is because progress in agriculture is fundamental to the structural transformation of developing economies while food security is an important indicator of progress made in economic development. Indeed, agricultural security and food security are intrinsically linked in the development process, as recognized by the Sustainable Development Goals (SDGs) of the United Nations. The nexus between food and agricultural security is so vast. This special issue only attempts to highlight two important dimensions: (a) the role of resilience in mitigating the impacts of shocks on food and agricultural security and (b) unique challenges faced in sustainable agriculture development and the analysis of best practices. The other nine articles in this special issue cover a wide range, including (a) food security, sustainability and the achievement of SDG goals; resilience and conflict; forced displacement and agriculture; and shocks and structural transformation in sub-Saharan African (SSA) countries; and, beyond SSA, (b) food self-sufficiency, public perceptions about good agricultural practices, environmental impacts of alternate crops, gender issues in agroforestry systems and food system transformation. Collectively, these articles highlight the link between food and agriculture security, environmental sustainability and resilience.

Keywords: shocks; resilience; food security; agriculture; sustainability

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1. Food and Agricultural Security: An Introduction to the Special Issue

Food security is a state where "all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" [1]. According to the FAO, the four main pillars of food security are: food *availability*, food *access*, biological *utilization* and the *stability* of supplies [2,3]. Attainment of food security via its four pillars depends heavily on the performance of the agriculture sector and its associated value chains, as well as adequate opportunities in other sectors which provide employment and income. It also depends on the ability of these systems to withstand shocks. Given the scarcity of natural resources and other related challenges, an efficient and well-functioning agricultural sector is key to achieving food security targets, particularly in developing countries.

In many developing countries, the recent outbreak of the COVID-19 pandemic dealt a heavy blow to their already grim food security conditions. In 2015, when the Sustainable Development Goals were conceived, the world was optimistic about the trajectory of progress made towards ending hunger and food insecurity by 2030. However, even before the pandemic, doubts had surfaced about the ability of our food systems to make significant inroads towards SDG target 2.1—ensuring access to safe, nutritious, and sufficient

food for all people all year round, or towards SDG Target 2.2—eradicating all forms of malnutrition [4].

The COVID-19 pandemic slowed down progress made in achieving food security. Worldwide, an additional 161 million people were added to the hungry population in 2020 alone. According to FAO et al. [4], nearly 2.37 billion people did not have access to adequate food in 2020—an increase of 320 million people in just one year. The number of people suffering from malnutrition also drastically increased last year, especially children under 5 years of age suffering from stunting, wasting or overweight. These recent setbacks associated with the pandemic have also brought to light some other recent drivers of food insecurity, such as armed conflicts, terrorism, organized violence and climate-related disasters. Such drivers are more broadly termed as shocks, defined as "external short-term deviations from long-term trends, deviations that have substantial negative effects on people's current state of well-being, level of assets, livelihoods, or safety, or their ability to withstand future shocks" [5].

The rising recognition that shocks can reverse some of the progress made in achieving food security targets was primarily driven by their growing incidence in developing countries, especially in SSA. Between 1997 and 2020, the number of armed conflict incidents in SSA increased from 2826 to 23,721, resulting in an increase in the number of fatalities from 20,118 to 36,154 [6,7]. Similarly, natural disaster occurrences more than doubled from 46 in 1990 to 110 in 2020 [8]. In addition, a recent increase in certain types of shocks, including farmer-herder conflicts, increased droughts and other climate-change related shocks have also raised concerns about the potential negative impacts on food security, especially in SSA.

Shocks can negatively impact almost every facet of a food system, including production, harvesting, processing, transport, financing, marketing and consumption [9]. More specifically, there is growing evidence of natural disasters having negative effects on farm income and consumption [10] and food security and nutritional outcomes [11,12]. These negative effects are primarily attributed to significant damage and losses inflicted by disasters to crop lands, physical input and output markets, livestock shelters and agricultural equipment, [13–16]. Similarly, empirical evidence also hints of the adverse impacts of armed conflicts on agricultural production [17], land use choices [18], cropping practices [19] and the nutritional status of children [20–22].

Countries, communities, households and individuals vary in their ability to withstand the impacts of shocks. Development literature has termed this ability *resilience*, defined as "the ability to withstand crises, recover from them, and adapt so as to better withstand them" [23]. Building resilience in countries affected by shocks has become a key objective of development partners and international agencies as it allows them to redirect resources allocated for repeated humanitarian aid programs to capacity building in affected countries. As SDG target 1.5 rightly points out, "By 2030 build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters".

The extant literature has identified many factors that are fundamental to resilience building. They include education, assets, access to social safety nets, access to credit and physical infrastructure, existence of social networks, health and good governance structures. However, there exists less clarity regarding the relative effectiveness of each of these factors to specific shocks and in specific geographic contexts.

As the above suggests, the achievement of agricultural and food security require constant of durable progress in agriculture and the overall food value chain. However, it also requires certain degrees of resilience to ensure that such progress is protected from extraneous shocks. However, consistent with the principles of sustainability, which is enshrined in SDGs, food and agricultural security also requires adequate efforts to ensure sustainable agricultural practices. In this special issue, selected papers touch on a variety of issues as the nexus between food and agricultural security, shocks, resilience, and sustainable agriculture.

The purpose of this special issue is to put together a collection of papers around food security and resilience, focusing on questions still unaddressed in the literature. By doing so, it hopes to bring more attention to the negative impacts of shocks in SSA by expanding the evidence base. While we focus more on armed conflicts because of their importance in the SSA context, we also address non-conflict related shocks and their impacts on environment. Articles in this special issue also provide evidence on the effectiveness of best practices which were effective in reducing the negative impacts. They also provide policy recommendations regarding ways to build resilience and promote sustainable growth in agriculture in the aftermath of shocks.

2. Papers in the Special Issue

Considering the environmental, social and economic considerations around them, both resilience and sustainability are two concepts which focus on improving the human quality of life. In general, they both refer to the temporal changes in the state of a system, but address the persistence of that system under normal conditions and in response to shocks and stressors [24]. However, while the nature of their relationship is highly debated in the development literature, they can be mainly classified into three categories: (1) resilience as a component of sustainability, (2) sustainability as a component of resilience or (3) sustainability and resilience as separate concepts [25]. Irrespective of the choice of framework, these two concepts are bound together by the host system, political actors involved, common research methodologies and common goals and objectives [25]. We arrange the papers in the special issue across two main sections: (1) resilience to shocks such as armed conflicts and natural disasters in SSA and (2) sustainable agriculture beyond SSA.

3. Resilience to Shocks in SSA

A major challenge facing the agriculture sector in SSA is the growing incidence of armed conflicts. According to FAO, people living in conflict-affected countries are more likely to be food insecure and undernourished [26]. As of 2018, almost half of all undernourished people live in countries struggling with conflict, violence and fragility. Recognizing this, the 2030 SDG agenda recognizes peace and lack of conflict as a vital condition for development, as well as a development outcome in its own right. This special issue has four papers which directly or indirectly focus on armed conflicts in SSA and their impacts on food security and agriculture.

D'Errico, Bori and Campos [27] investigate the role of resilience factors in explaining conflict exposure and the adoption of conflict-specific coping mechanisms based on household level data from Mali's Central Sahel cross-border area. Their findings suggest that wealthier agricultural households, measured by higher levels of agricultural assets and education, have a lower likelihood of exposure to conflict. Regarding coping mechanisms to conflict, the study finds that households either enhance their home's security or choose to move the entire household or some of its members once exposed to conflicts. Again, resilience building factors are fundamental in explaining the likelihood of adoption of coping mechanisms. Finally, the study underscores the importance of local contexts in explaining the association between exposure to shocks and adoption of coping mechanisms. For example, in the case of Sahelian states, climate change and the associated increase in competition for natural resources is key to explaining the agro-pastoral conflicts around the region [28].

Adelaja et al. [29] bring attention to the spillover effects of armed conflicts, specifically, the impacts of the internally displaced person (IDP) influx on key agricultural outcomes in host communities. While the direct impacts of conflicts are well-researched in the literature, the indirect impacts through forced displacements are largely overlooked. The study, placed in the context of the Boko Haram insurgency in Nigeria, examines whether the addition of IDPs due to insurgency, communal violence and natural disasters significantly affect agricultural outputs, employment, wages and land use. The results show that forced displacements result in reduced agricultural production due to lower land and labor

productivity, but mainly for insurgency-driven IDPs. They also find that IDP influx due to insurgency reduces the agricultural wages of farm workers and increases the reliance on male and female household labor.

In developing countries, the impacts of shocks and stressors significantly vary across sectors. This variation has important implications for the rate of structural transformation and economic growth. Structural transformation being a necessary condition for sustainable economic development, it is important to empirically investigate whether the impacts of shocks and stressors have larger and long-term development implications. Adelaja et al. (2021b) explore whether the growing incidence of terrorism, armed-conflicts and natural disasters slow the pace of structural transformation in SSA. Using the percentage contribution of the non-agricultural sector to GDP and employment as the main measures, the study finds that armed-conflict and terrorism-related shocks slow structural transformation. However, natural disasters have no significant impacts on the structural transformation. These findings are attributed to relatively more deep-rooted and endogenous impacts of armed conflicts as opposed to natural disasters, which are more extraneous in nature. The study also finds that resilience factors enhance the pace of agricultural transformation. However, resilience variables, as defined by the extant literature, are not particularly effective in mitigating the impacts of shocks.

Aliyu et al. [30] identify and analyze the role of major challenges to food security in SSA, examining the case of Nigeria. More specifically, they investigate the impact of value-added agricultural production, internally displaced persons (IDPs), per capita GDP, exchange rate policy/fluctuation, population growth and food inflation on SDG goal 2 using time series analysis. They find that increase in population growth, exchange rate fluctuations and food inflation acts as the sustainability of food security in Nigeria. The study also highlights the role of internal displacement and spill-over effects of armed conflicts in slowing down the achievement of SDG goals.

The four papers summarized above essentially show that shocks and stressors have adverse direct and indirect effects on food and agricultural security and that the effects are also threatening to longer-term sustainable development. The implication is that safeguarding the stability of agricultural and food systems through resilience building strategies can help to better insulate food and agricultural systems from shock.

4. Sustainability in Agriculture

The following articles are mainly focused on the concept of sustainable agriculture. The geographical focus extends beyond SSA, thereby addressing a broader set of issues worldwide. Brankov et al. [31] investigates the South-East Europe (SEE) countries' ability to fulfill the food demand of the population in the aftermath of shocks, especially pandemics, such as COVID-19. The study shows significant variability between SEE countries in terms of their agricultural production capacities. The paper also finds that the level of food self-sufficiency in the SEE countries is positively associated with trade openness and political stability. However, more populous countries are more likely to struggle to meet the food demands of their population. Given the within-country disparities in production capabilities, the paper reiterates the need for better regional cooperation at the political level to address the shortcomings and better prepare for future crises.

To address the public concerns associated with the chronic overuse of agricultural pesticides and their impacts on food safety, many member countries of the Association of Southeast Asian Nations (ASEAN) introduced national good agricultural practices (GAP) standards. These standards, primarily created and administered by the public authorities of respective countries, were expected to increase awareness of food safety and quality assurance among farmers. By combining sociological research on cabbage farmers' views and practices with laboratory analyses of pesticides, Amekawa et al. [32] examine the effectiveness of one such GAP program in Thailand. The study finds that while farmers' awareness of food safety assurance and pesticide use practices indicates progress over time, much more effort is required to achieve the key targets of the GAP program.

The negative environmental impacts of palm oil are well recorded in the literature, with large scale palm oil production being associated with high substantial greenhouse gas emissions and biodiversity loss. This has led to concerted efforts to substitute palm with alternative oil crops. While such crops may have a smaller environmental footprint per hectare than oil palm, Beyer and Rademacher [33] argue that their larger area requirements could imply that the total environmental impact associated with the production of one liter of vegetable oil is higher than for oil palm. By combining multiple global agricultural and environmental datasets, they show that, among the world's seven major vegetable oil crops (oil palm, soybean, rapeseed, sunflower, groundnut, coconut, olive), oil palm has the lowest average species richness and carbon footprint associated with an annual production of one liter of vegetable oil. The authors conclude that a simple substitution of palm oil with other vegetable oils in consumer products with the sole purpose of reducing impacts may have undesired outcomes.

Goncalves et al. [34] investigate whether agroforestry systems adopted by indigenous peoples has led to income generation and food security. By analyzing 92 articles published between 2010 and 2020, the study also examines the role of women in agroforestry productions among indigenous communities. The study finds that agroforestry systems are successful in guaranteeing food security for indigenous peoples via product diversification and income generation. Agroforestry systems also promote women empowerment because of their active participation in related agricultural practices.

The global agenda for SDG calls for eradicating poverty and hunger by developing sustainable agriculture and food systems. Existing farming systems that are promoted as ideal technologies for achieving these goals are focused mainly on per-hectare productivity. However, Sandhu [35] argues that such technologies can still have negative impacts on local culture and the environment. To make this case, the study explores the negative impacts of crop- and livestock-based farming systems on the Indo-Gangetic plains, as well as in the USA, China and South America. The author also proposes an alternate paradigm which relies on multiple parameters, classified into three major dimensions: technical (e.g., on-farm and off-farm technology), geographic (e.g., soil type, water availability and terrain) and social (e.g., taste preferences and dietary patterns).

5. Conclusions

Issues related to food and agricultural security are obviously so vast that devoting all articles in all issues of the sustainability journal for a full year will not adequately do them justice. In this special issue, the journal has assembled a handful of articles that highlight some of the emerging threats to food security, with a focus on Africa, while also more broadly exploring issues related to sustainability and food and agricultural security. On one hand, we draw attention to the growing incidence of shocks and stressors of several types in Africa, the threats they pose to food and agricultural security and the potential for mitigating these threats through resilience building strategies. On the other hand, we broaden our purview by looking at related issues such as sustainable agriculture, agricultural production capacity, food self-sufficiency, trade openness, political stability, regional cooperation, pesticide usage, food safety, good agricultural practices (GAP) standards and quality assurance, environmental impacts, greenhouse gas emissions and biodiversity loss, crop substitution and agroforestry systems. Indeed, the issue of food and agricultural security are multifaceted and the articles in this special issue essentially serve to highlight such inter-relatedness. However, they also provide a glimpse of areas where there may be gaps in the literature. We, therefore, suggest greater multi-disciplinary and inter-disciplinary efforts to explore issues related to food and agricultural security. As guest editors, we further thank the contributors to this special issue for their excellent contributions.

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