COVID-19 and Farming Systems

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The coronavirus disease (COVID-19) spread rapidly across the globe, leading to global health emergencies and measures to curb the spread of the disease, which caused sharp declines in business activities, loss of employment and income and inevitable economic crises. COVID-19 restrictions on the international and domestic movement of people and economic activities have also had direct and far-reaching impacts on global food systems. Loss of income and the associated decline of purchasing power reduced the ability of people to access food, resulting in the decline of dietary diversity and consumption of nutrient-rich foods, disrupting agricultural input markets and threatening food production. COVID-19 could push millions of people to starvation and give rise to a global hunger pandemic [5] and potential social unrest. There are concerns that impacts of the COVID-19 pandemic may reverse the progress made in achieving the Sustainable Development Goals (SDGs), so a sustainable post-pandemic recovery is therefore key.

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1. Introduction

In many ways, populations and food systems across Africa are perhaps less vulnerable to COVID-19, compared to other regions in the world [1], given the persistence of subsistence food production and shorter food supply chains, lower rates of urbanisation and population densities in many areas, alongside a youthful population [2]. However, key vulnerabilities stem from high and chronic levels of poverty [3], a reliance on food import-export markets, the informal nature of local food supply chains and impracticalities with social distancing and lockdowns amongst labour-intensive farming systems and informal economies [4]. The majority of agricultural systems and farmers across SSA already operate under contexts of high vulnerability, uncertainty and variability. SSA is one of the most vulnerable regions to the impacts of global climate change and variability [5][6]. Uncontrollable and potentially devastating crop pest and disease outbreaks are not unusual [7], with their prevalence linked to climate change [8]. Recent food crises and associated civil unrest have also been precipitated by global economic shocks [9]. Health systems and livelihoods across SSA are already burdened by high rates of infectious diseases, such as HIV/AIDS, tuberculosis and malaria [10]. COVID-19 is, therefore, an additional system shock that populations across the region must continue to cope with and adapt to.

Farmers' ability to cope with and adapt to shocks is sensitive to the local context and dependent on their available capacities, resources, prior experiences and knowledge [11][12][13]. In the context of agricultural systems across SSA, the impacts of COVID-19 are likely to be varied and broad [14], owing to the heterogeneous nature and diversity of the sector and production systems across the continent [15]. Similarly, the capacity of farmers to respond to COVID-19 will also be highly contextual and dependent on, for example, climatic extremes, agroecological context, country-specific restrictions, farmers' socio-economic conditions, production model and supply chain integration and available formal and informal institutional support [16].

Emerging evidence has shown how COVID-19 is affecting agricultural activities by disrupting supply chains, labour mobility and availability and access to essential farm inputs, such as fertilisers and pesticides [14]. The timing of national lockdowns coincided with harvests and planting times in different countries [14], often delaying the time-critical activities and affecting the quantity and quality of produce. The impacts and long-term consequences are likely to vary across SSA [1], be complex, contextual and dynamic—determined by farm systems' characteristics and geographies [17]. However, the empirical evidence of the impacts of COVID-19 on agricultural systems across SSA is lacking [14], as are the compounded impacts of, for example, COVID-19, climate variability and pest and disease outbreaks.

Understanding the implications of COVID-19 and associated restrictions is necessary in supporting a sustainable post-pandemic recovery for farmers and farm systems across the region [18]. Investigating how COVID-19 impacted local-scale food production and how farmers adapted can support better understanding of farmer resilience. In turn, this can help inform coherent responses for a sustainable post-COVID-19 recovery [19].

2. Impacts of COVID-19 on Diverse Farm Systems in Tanzania and South Africa

The COVID-19 pandemic caused an *Anthropause*—global human confinement, providing an opportunity to evaluate the impacts of anthropogenic activities and assess the sustainability of systems that underpin human survival and well-being [20]. The pandemic also underlined the vulnerabilities of the world's food systems and food supply chains and has fuelled intense discussions about what constitutes a resilient food system [21].

These discussions involved debates on vulnerabilities and resilience of different production models and supply chains, e.g., large-scale vs. small-scale and local or domestic vs. global [22]. Here, large-scale means big enterprise farms ranging from 200–1000 hectares in size and mainly engaged in global chains by producing foods or agricultural raw materials consumed in another country. Small-scale farms are less than 10 ha, functioning as small and medium enterprises (SMEs) and mainly producing food for domestic consumption, i.e., local, regional or national markets. The emerging farms in South Africa are often classed as small-scale or SMEs as they mainly serve domestic markets even though they may be bigger in terms of farm sizes. The SMEs, categorised by domestic value chains, account for over 75% of the food consumed in Africa. In contrast, large-scale enterprises engaging in global chains contribute to ~20% of food consumption in the region.

It is found that more self-reliant farmers—Tanzanian smallholders—who grew food crops alongside cash crops coped better. This finding matches with observations in other similar studies across different geographies [23][24][25].

Furthermore, institutional and community support played an important role in reducing dependencies on external actors affected by the pandemic (e.g., buyers of cash crops or suppliers of food crops). Farmers in Tanzania often shared food products, labour and taught each other best practices (e.g., storage) to enable better coping. In contrast, South African farmers were more dependent on markets and were significantly affected by logistical bottlenecks in the value chain and the reduced market demands and buying power. SMEs in South Africa were more reliant on domestic markets and were severely affected when the buying power of the population was reduced due to income losses [19].

We explore how the different production models coped under COVID-19. Based on the insights obtained from the two countries and diverse range of production models, we propose policy actions, described below, to improve coping of food production systems to future value chain shocks.

2.1. Social and Financial Support for the Informal Sector

It demonstrated how COVID-19 movement restrictions and social-distancing measures triggered acute labour shortages, complementing the work of others [14]. Labour shortages affected on-farm activities, increased processing times after harvest and caused post-harvest losses as the produce was kept on-farm for longer durations and increased operation and storage costs [26]. Addressing labour constraints in the food supply chain is crucial for building food system resilience. By designating agriculture sector workers. both public and private, as critical, providing travel arrangements for essential workers and allowing for easy and on-farm delivery of work permits and identity cards required by the government, could allow movement for agriculture workers in times of travel restrictions and lockdowns.

Further, in most cases, workers' fear of contracting COVID-19 impeded their availability to work on the farms. Some of the farm owners sites in South Africa overcame this problem by taking measures to ensure the health and safety of workers. These farm owners provided transport and ensured lower worker density and sanitation in the farm and packing and processing facilities. Thus, awareness among farm owners and workers and ensuring safe working conditions could be the key to ensuring labour availability.

The pandemic contributed to unemployment and impoverishment due to unprecedented income losses. South Africa and Tanzania both responded to the crisis by announcing COVID-19 specific social assistance and protection in the form of regular cash or food transfers to unemployed adults (only in South Africa) and non-working vulnerable groups (the elderly, children and disabled people, both countries) [27][28]. COVID-19, however, impacted other groups of people, such as informal farmworkers and the self-employed who did not have access to any formal social protection. Furthermore, many vulnerable groups living in remote locations (e.g., small-scale farmers in South Africa) did not receive the social support announced by the governments. Implementation of social protection programs should therefore focus on ensuring that it reaches the eligible and vulnerable groups and expands to the groups most vulnerable to COVID-19 specific impacts. Sustainability impact assessments [29] may provide a structured approach to support the design and evaluation of post-pandemic initiatives, taking into account economic, social and environmental impacts.

2.2. Employment and Job Security in Agriculture

Interviews highlighted how some farmers struggled to hire labour because of lower farm income resulting from reduced agricultural activity, production and markets. Food, or food and cash for work schemes, may provide safety net opportunities for both farmers and labourers [30]. Such a system can be further adapted to allow triple benefits [17] by employing the labourers beyond planting and harvesting and engaging them in constructing infrastructure, such as food storage and water storage facilities to improve agriculture resilience under COVID-19, climate or similar shocks. In South Africa, farmers can only hire temporary, seasonal labourers at the minimum daily wage prescribed by the government (mean 146.28 Rands per day in 2020). However, this may be unaffordable for many farmers [31][32]. Where employing labourers beyond planting and harvesting is not feasible, policies must focus on capacity building of such temporary, seasonal labourers allowing them to develop skills and knowledge with a particular emphasis on managerial training, agro-processing and value addition of agro-products, which will allow them to become more employable in the food supply system. Furthermore, creating opportunities to facilitate an alternative workforce by drawing upon and training workers laid off in other sectors may also help manage labour constraints.

2.3. Infrastructural Investment and Support

Our findings highlighted how farmers relied on digital tools to access markets. With the availability of the internet and cheaper mobile devices, digital applications for communication in SSA are increasing rapidly. Digital solutions will play an increasingly important role in transforming agricultural ecosystems and value chains, and strengthening food supply systems [33], particularly in a post-COVID world.

A digitised marketing system, for example, where buyers, sellers and consumers can communicate directly, could reduce reliance on conventional markets and provide greater adaptability in buyer-producer access. Community marketing refers to partnerships formed among farmers and other local-scale actors (e.g., local extension officers) with the aim of reaching specific segments of buyers [34]. Governments play an important role in recognising and providing financial and technical assistance to such community-led innovative marketing schemes. There is, therefore, a need to focus on building institutional capacity by, for example, providing training to extension officers and farmers in guiding the community marketing schemes and collaborating with farmer groups to use information and communication technologies to support the mobilisation and identification of markets, and transportation of agri-products [35].

2.4. Diversifying Farm Systems

Farms in Tanzania were comparatively more diversified than farms in South Africa, with multiple crops and tree species being an integral part of the farm system alongside livestock such as dairy cattle and chickens. Diverse farming systems reduce dependency on a single farm commodity, e.g., spice trees, and provides additional benefits in terms of biodiversity-supported ecosystem services—pollination of crops to increase yields and biological control of crop pests and diseases (Altieri and Nicholls 2020b). Diversified mixed cropping systems offer yield stability with low external inputs, improve resilience as diverse agri-systems are able to cope better under environmental and ecological shocks, and reduce the cost of agriculture via provisioning of ecosystem services (MacFall et al., 2015). Promoting diversified agroecosystems is key for building resilience in food production systems, especially in small-scale systems, which occupy over 30% of global arable land and produce up to 70% of the food consumed [36].

COVID-19 intersected with other types of production disruptions in the sites; South African farmers dealt with drought [37], whereas Tanzanian farmers faced flash-floods [38] just before the growing season in November-December. These climate shocks impacted food production by destroying fields, causing delays in planting or shortening the crop season. The climate shocks also increased the cost of production, as farmers needed to spend more on inputs—such as irrigation during drought or fertilisers in the case of reduced soil fertility after flash floods. Building resilience in farm systems should, therefore, incorporate and strengthen farmers' ability to cope with climate shocks alongside other stressors [39].

3. Conclusions

We present an empirical analysis of COVID-19 impacts on the local farming systems and adaptation strategies employed by farmers in Tanzania and South Africa. Our findings provide evidence of substantial effects on agriculture and food security as a result of COVID-19, through indirect channels of influence leading to (i) income losses and reduced demand, (ii) supply chain disruptions, (iii) altered consumer responses and dietary shifts, (iv) interruptions in international and national trade.

Farmers' coping actions and strategies varied based on the enterprise size, production model, level of capital access and market engagement, and farm-system diversification. Diversified and mixed farming systems, such as those observed in

Tanzania, where farmers grew cash and food crops and were less dependent on international markets, were less impacted by COVID-19. Small-scale farmers in South Africa who grew cash crops for local markets and depended on buying food products from local shops, faced a loss of income and increased food insecurity as the variety of food crops they grew was limited. Large-scale commercial farmers dependent on cash and single commodity systems of apple and potatoes suffered economic losses due to market uncertainty and closure. Large-scale farmers with access to capital were able to buy agricultural inputs in advance, and those who had assets, such as livestock, managed to cope by selling those assets. However, the selling of assets in response to COVID-19 impacts may reduce the capacity to cope with future shocks, such as droughts in South Africa and flash floods in Tanzania.

In light of the impacts and coping mechanisms documented, we propose that policy actions should focus on the following: (i) providing temporary relief and social support and protection to financially vulnerable stakeholders, (ii) job assurance for farmworkers and engaging an alternative workforce in farming, (iii) investing in farming infrastructure, such as storage facilities, digital communication tools and extension services, and (iv) supporting diversified farming systems.

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