COVID-19 and impacts on global food systems and household welfare: Introduction to a special issue

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Abstract
The food system, and those who depend on it, have been strongly but unevenly affected by COVID-19. Overall, the impacts on food systems, poverty, and nutrition have been caused by a combination of a generalized economic recession and disruptions in agri-food supply chains. This paper provides an overview of the contributions to this Special Issue of *Agricultural Economics*. The papers in this volume confirm that both income shocks and supply disruptions have affected food security and livelihoods the most where supply chains were more poorly integrated, and poverty and market informality had greater presence before COVID-19. Yet, as the pandemic still has societies worldwide in a stranglehold, outcomes remain uncertain and reliable data are still sparsely available. This Special Issue of *Agricultural Economics* provides new insights of the pandemic’s impact on food systems, household welfare, and food security, building on both model-based scenario analysis and new survey data. These methods have proven helpful in providing these insights amidst the unprecedented shock that the pandemic has caused to production systems and livelihoods worldwide. However, they also suffer from obvious limitations identified in this editorial overview paper and require substantial improvement in order to understand the changes in economic behavior and functioning of food supply chains induced by the pandemic.

KEYWORDS
COVID-19, dietary change, economy-wide models, food security, food value chains, poverty

JEL CLASSIFICATION
C68, C83, D12, D13, D22

1 | INTRODUCTION

COVID-19 has taken much of the world by surprise. Policymakers were not ready to respond to the challenges caused by the disease. Lacking vaccines and knowledge of cures, governments recurred to public non-medical interventions, such as social distancing and mask wearing. These interventions caused much economic damage. Discussions on the best-possible responses have proven controversial and are still ongoing (see e.g., Van Bergeijk, 2021). Understanding the trade-offs between saving lives and livelihoods across countries and population groups...
is essential to guide economic, social and health policy responses. However, evidence-based policy requires good data. Obtaining data was constrained by the lack of previous evidence on pandemics, while the lockdown itself complicated data collection. Face-to-face surveys have been suspended, in-store or at-market collection of prices has been difficult in many places because of closures or limits to mobility, and surveying businesses has been problematic as these were temporarily or definitively shut down and owners were not able to respond to questionnaires. More importantly, the pandemic has caused abrupt changes in economic behavior that call not only for much more timely and high-frequent indicators, but also rapid assessments to understand the changes in supply and demand behavior.

This was the case for both economies at large and agri-food sectors. The food system, and those who depend on it, have been strongly but unevenly affected by COVID-19. While there is still much uncertainty about the impacts, we do know some of the mechanisms driving impact. Overall, the impacts on food systems, poverty, and nutrition have been caused by a combination of a generalized economic recession and disruptions in agri-food supply chains.

The 2020 COVID-19 global recession was deeper than that of the 2008–2009 global financial crisis and resulted mainly from the blunt instrument of social distancing used in varying degrees across countries to slow the spread of the novel coronavirus and limit its human and longer-term economic cost. The resulting containment measures generally required businesses deemed “non-essential” to close and workers to stay home. Hundreds of millions of workers worldwide lost their jobs and those without access to social protection also most of their incomes. This had major implications for food security, nutrition, and welfare across the world (Laborde et al., 2021: this issue).

Disruptions in food value chains have varied significantly—both along the chain and across different chains and regions. Food services, such as restaurants, have been strongly affected, while other parts of the food system, including farming and food trading and retailing, have mostly been considered “essential.” Yet, being deemed “essential” did not imply pandemic proof and supply disruptions emerged along food value chains, varying strongly by commodity and country characteristics. In some places, they have faced severe disruptions caused by labor market shocks to production and distribution, trade restrictions, and shifts in the mix of products consumed. In other cases, major disruptions could be avoided or proved short lived. Initial responses like export bans on staple food exports or the restrictions on the mobility of seasonal migrant agricultural labor have been removed or mitigated in the course of 2020 (Laborde et al., 2020). In yet other instances, market disruptions were addressed by adjustments in business models or reorienting supply to different market segments, including through a notable expansion of use of digital technology to facilitate home delivery or adjusting market channels towards retail in response to closures of restaurants and other food services (Reardon, & Swinnen, 2020).

Early indicators suggest, and several papers in this volume confirm, that both income shocks and supply disruptions have affected food security and livelihoods the most where supply chains were more poorly integrated, and poverty and market informality had greater presence before COVID-19. As such, the pandemic has reinforced existing inequalities (Swinnen, 2020).

Yet, there is still much that we do not know, and many hypotheses have not been confirmed by substantive analyses and reliable data. This Special Issue of Agricultural Economics tries to fill some of this void by providing a series of peer-reviewed studies that provide new insights on COVID-19’s impacts on food systems and welfare, including analyses of agri-food supply chains, food prices, farmers’ incomes, rural livelihoods, and of poverty and food insecurity impacts more generally.

The new evidence and assessments provided in this Special Issue draw on a combination of different geographical and sectoral coverage and different methodologies. The studies vary in their analysis of global, country-level, and local impacts. Some focus on aggregate effects, others on impacts along the food value chains, and the majority of the studies measure household effects. They use several methodological approaches. Model-based scenario analyses and new survey evidence collected through telephone interviews are the most important ones. These approaches have advantages and disadvantages—as discussed in the next section.

The remainder of this paper is organized as follows. Section 2 reviews the methods deployed by the studies in the Special Issue and possible lessons for future pandemic (and post-pandemic) economic research. Section 3 summarizes the key findings of the papers contained in this Special Issue, organized by three main sub-themes: impacts on poverty, food security, and household welfare; food supply chain disruptions; and impacts on food demand and diets.

2 | METHODOLOGICAL APPROACHES AND LIMITATIONS

COVID-19 and the policy responses have importantly affected the capacity to undertake economic research because of constrained access to data and data collection. As mentioned, face-to-face surveys and other types of data collection have been complicated if not made impossible
by social distancing measures and other restrictions imposed on mobility and economic activity.

The studies in this Special Issue draw on two types of approaches to overcome these constraints: (i) model-based scenario analyses and (ii) new data collected through telephone interviews from farm and other rural households, as well as from traders and processors operating along specific food supply chains. The obvious advantage of these approaches is that they could be implemented during a pandemic as invasive as COVID-19. But there are disadvantages that are important to recognize.

With careful scenario design, the economywide modeling approach allows for constructing a proper counterfactual against which the (presumed) impacts of COVID-19 on agriculture and food security can be quantified and disentangled by its main drivers. The contribution by Laborde et al. (2021) to this issue uses a global computable general equilibrium (CGE) model linked to epidemiological models at one end and household models at the other to identify how the pandemic affects economies around the world through multiple channels. They then assess the differential consequences for poverty and food insecurity at the household level across countries and regions. Such assessments are useful as they allow identifying the potential magnitude of the economic impacts and, in the global model, how these spillover through trade, international distribution networks, finance, remittances, and labor migration. They also allow for quantifying the trade-offs between the intensity of social distancing measures and the degrees of economic impact and how those trade-offs may pan out across different contexts. The study by Schmidt et al. (2021) in this volume uses for a single-country context (Papua New Guinea; PNG) a microsimulation method and household model to estimate the potential impacts on food security of income and rice price shocks induced by COVID-19 through, respectively, national social distancing measures and the effect of trade restrictions elsewhere on world market prices.

These types of model-based scenario analysis are sometimes criticized for being “assumption driven.” This is an obvious limitation, rendering the findings as good as the model and scenario assumptions. Yet, the referred applications of CGE and microsimulation models both have numerical structures based on observed data and behavioral parameters derived from econometric estimations. All underlying assumptions are explicit and their influence on outcomes can be tested through sensitivity analysis. A more important objection could be that, as holds for most empirical economic analysis, the presumed economic behaviors in both the CGE and household models are based on past experience. Hence, the possible drawback is that the estimated impacts may not adequately capture actual adjustment behavior in a context of great uncertainty and unprecedented shocks as caused by COVID-19. However, this is hardly a critique of the methodology per se since it is impossible to model the unknown. The contribution by Ramsey et al. (2021) in this issue, in contrast, could build on during-pandemic high-frequency data to model vertical price transmission in United States’ meat markets, model vertical price transmission using both linear and threshold autoregressive models and vector error correction models. They assess the impact of COVID-19-related supply shocks by compare price movements during the meat sector supply disruptions in April–May 2020 with the model predictions based on past trends.

The second type of approach deployed by most other studies in this Special Issue tries to unmask some of the “unknown” through new, telephone-based surveys of impacts and adjustment behavior during the pandemic for samples of households, agricultural producers, traders, and other supply chain actors. This approach to data collection was necessary giving restrictions to in-person interviews. Telephone interviews have their drawbacks, however, including the condition that they need to be short to avoid high attrition rates, hence less detail is provided per interview. Also, inaccuracies in telephone information tends to cause further attrition and, where no response was caused by closure of food businesses, possible missing out on important information regarding the pandemic’s impact. Most importantly, self-reporting on COVID’s impact through recall questions may be additional sources of non-sampling errors if, for instance, the thus obtained information is not clearly distinguishable from other influences, such as seasonality in production and incomes. However, also if deemed reliable by themselves, such survey responses do not provide a solid enough basis for attributing the pandemic’s true impacts.

In several survey-based contributions to this issue, the samples for the telephone interviews were drawn as a panel from recent pre-COVID-19 surveys, thereby ensuring representativity and possibility of before-after-shock comparison of production and living conditions (see, the contributions by Ceballos et al., 2021: this issue; and Wang et al., 2021: this issue). Specific questions relating to how interviewees experienced COVID-19’s impacts further inform about the degree of impact and adjustment behavior. Some studies try to overcome the absence of a pre-COVID-19 baseline by using recall questions to assess the pandemics impact on production, sales, and/or livelihoods (as, for instance, in the contribution by Van Hoyweghen et al., 2021: this volume).

Clearly, this new practice of survey data collection requires much improvement in sampling and questionnaire design. The various papers using new survey data give due recognition of the limitations of their data...
collection methods and how to interpret their findings in the light of those limitations.

A third approach is adopted by Reardon et al. (2021) (this volume) who study how downstream agri-food businesses have adjusted business strategies and operations to cope with the impacts of COVID-19. They first develop a conceptual framework to explain this “pivoting,” as it is called in the business management literature (see e.g., Winston, 2014), in response to or anticipation of big shocks in food markets. Past shocks triggered important changes in value chains. For example, the liberalization of domestic food markets energized the ‘supermarket revolution’ in many developing countries or digital technology facilitated use of online platforms to organize retail sales and logistics. Similarly, COVID-19’s social distancing requirements are leading to major shifts in supply chain operations, including online platforms (like Amazon or Uber) entering food retail or home delivery food services. In their contribution, Reardon et al. (2021) provide case-study evidence of “pivoting” business operations before and after COVID-19 in a wide range of mostly developing countries to illustrate their conceptual framework. Lacking comprehensive and up-to-date sector data, this approach is useful to timely appreciate organizational innovations in food supply chains and implications for economic policy analysis. Such case studies are, of course, only the first step and will need to be complemented in the future by more representative empirical evidence to validate the conceptual framework or draw major inferences about the implications of the changes for future food-system resilience.

Despite these methodological caveats, a wealth of new information has been gathered providing new insights into both the nature and magnitude of COVID-19’s impacts on food, agriculture, and livelihoods, as well as on the adjustment behavior of food system actors during the pandemic.

3 KEY FINDINGS FROM THE STUDIES

We discuss the main contributions in the Special Issue related to (a) the impacts on food security and livelihoods, (b) supply disruptions and coping by farmers and other actors along the supply chains, and (c) the effects on food consumption and diets.

3.1 Impacts on food access, poverty, and rural livelihoods

Most assessments to date indicate that the main threat to global food security is posed by COVID-19’s impact on people’s reduced ability to access to food resulting from losses of income induced by the crisis. However, so far, lacking up-to-date household surveys for most countries, no precise estimates could be made regarding the global impacts on poverty and food insecurity. Laborde et al. (2021) (this volume) address this gap by assessing those impacts using IFPRI’s global CGE model in unique combination with epidemiological and household models to both assess the interactions between health-related impacts on labor supply and those of the social-distancing measures on sectoral output, prices, factor incomes, trade, and remittances to estimate the effects on household-level poverty and food consumption across countries and regions. They use detailed assumptions based on available evidence regarding the epidemiological profile of the pandemic, the degree of social distancing across sectors and countries, and expected adjustment behaviors by firms and consumers. In line with macroeconomic assessments (e.g., IMF, 2020), they project a global recession deeper than that witnessed during the Great Recession of 2008–9, with global GDP falling by between 5% and 7% during 2020. Their analysis suggests that around 150 million people could fall (or may already have fallen) into extreme poverty because of the recession provoked by COVID-19. While any such estimate should be interpreted with care given the still evolving nature of the pandemic, these projections involve substantial increases in global poverty, that is, about 24% from pre-COVID estimated levels of almost 700 million people living on less than PPP$1.90 per day. Most of the poverty increases would be in sub-Saharan Africa and South Asia.

An important aspect of the assessment by Laborde et al. (2021) is their accounting for the differential impacts on employment, incomes and prices across economic sectors, types of workers, and groups of households. These distributional effects would explain more than one third of the overall poverty impact and are not accounted for in other model studies that typically assume uniform income shocks (see e.g., the studies by World Bank, 2020, and Summer et al., 2020). By decomposing the pandemic’s impact on the world economy through different channels, they show that the economic fallout in the initial epicenters of the pandemic (China, Europe, and the United States) is severely hurting developing countries through declines in trade, oil, and other commodity prices, through restrictions on international travel and freight, and through remittances. These international effects are causing larger economic costs for poorer nations than their own COVID-19 related restrictions on movements of people and economic activity. They further confirm the earlier made presumption that the recessionary effects are strongest in non-agricultural sectors but the fallout in aggregate demand is also hurting farm incomes and rural livelihoods.

The importance of livelihood impacts caused by restrictions on labor movements and declines in remittances of...
migrant workers, both internationally and domestically, is consistent with findings from survey-based studies in this volume. Labor movement restrictions in China caused major rural income declines as many household members were separated from their work in urban areas due to the lockdowns. Wang et al. (2021) (this issue) studied the impact of COVID-19 on rural livelihoods in Hubei Province, China, the initial epicenter of the pandemic. They conducted telephone interviews among 726 randomly selected villages and village informants in seven provinces across China. The sample was drawn based on a previous nationally representative survey. Data for the present study were collected in February 2020. The findings confirm that the health-related effects on income-generating capacity have been minor, while the restrictions on labor mobility were reported as the main reason for substantial income declines. About 74% of informants reported that villagers had stopped working due to workplace closures and this percentage is even higher when including rural workers unable to reach workplaces due to restrictions on transportation and other constraints. In consequences, the vast majority of villagers (92%) had to forgo substantial income. While most villagers (about four in five) indicated they were still able to buy most types of food, their reduced incomes were the key reason for reducing food consumption as well as spending on healthcare during the first months of 2020.

Ceballos et al. (2021) (this issue) observe similar impacts in the case of rural Guatemala. Based on panel data for almost two thousand agricultural (smallholder) households, covering two survey rounds of November–December 2019 and May–June 2020, with the first round using in-person interviews and the second telephone interviews. More than three quarters of households report significant reductions in remittance incomes. More than half of households receiving such incomes report severe losses of non-agricultural incomes, while one third report substantial declines in farm income.

Ceballos et al. (2021) further find evidence of significant increases in food insecurity mainly caused by these income declines. Guatemalan farm households possess little-to-no coping capacity, forcing them to reduce food consumption, especially nutritious food. Other studies also confirm the limited though varying capacity of low-income households to cope with the income shock caused by COVID-19. Hirvon, de Brauw, and Abate (2021) found in Ethiopia that a rundown of savings was a first recourse as coping strategy, but also that only 20% of households possessed enough savings to meet their food needs for a month or more. Also, these households reduced food expenditures to cope with falling incomes.

Ragas et al. (2021) (this issue) also find that rural households to deploy multiple coping mechanisms. Their study, based on telephone interviews among rural households in central Myanmar, shows that households recursed to multiple coping mechanisms, as one in five had borrowed from friends or informal lenders, and one in six households had sold assets, such as gold, land, or jewelry. Yet, these options typically were insufficient to prevent increased food insecurity. The authors observe heterogeneous impacts across households, however. Fifty-one percent of the sample households experienced income loss from various livelihood activities and landless households were more severely affected by the crisis, mainly due to reductions in both farm and nonfarm wage employment and less business for their rural enterprises. The study does not find evidence of significant effects in terms of gender disparities. Women and men in these landless households were equally engaged in rural employment and both seeing wages drop and facing greater difficulty in finding farm or off-farm work. However, women living in landless households did report increased workloads at home and facing increased tensions within the household during COVID-19. Farm households with land tenancy, in turn, suffered from lower prices and lower demand for crops, and difficulties in accessing inputs for crop production. In their case, no notable change in gendered household task-sharing and work balance or intrahousehold relations were detected.

Coping mechanisms can also be provided by government programs. On the consumption side, social safety programs can play an important role by supporting consumer incomes or direct access to food. An interesting impact of government interventions on the production side is identified by Ceballos et al. (2021) (this issue) in their analysis of wheat and vegetable farmers in the state of Haryana in India. The authors collected new survey data from a panel of producers through telephone interviews, during the lockdown. The sample of producers was taken as part of an ongoing panel survey on agricultural risk management. Ceballos et al. (2021) find that wheat farmers suffered minimal losses as their output prices were guaranteed through state-led wheat procurement at fixed prices. Tomato producers, in contrast, suffered severe losses, largely due to a steep fall of their sales prices, as they were forced to shift from wholesale to local retail markets during the lockdown. To cope, tomato farmers borrowed money from informal lenders, but adjusted mainly by reducing (food) consumption causing them to face greater food insecurity. In this case, existing public procurement prevented wheat price declines and provided income protection to wheat farmers. The support reinforced existing inequalities and further exposed vulnerabilities of producers not receiving support and facing difficulty to access markets.

Government interventions to secure access to food to their consumers also have had adverse impacts in the form
of negative international spillover effects. Several countries imposed trade restrictions to avoid possible domestic supply shortages.\(^1\) This in turn provoked fears for a repeat of what happened during the food price crises in 2007–2008 and 2010, when world food markets were disrupted by export restrictions on staple foods in exporting countries that caused world prices to rise (Anderson et al., 2014; Laborde et al., 2020). During COVID-19, such fears proved largely unwarranted, as global markets for staple crops were well stocked before COVID-19 and production prospects remained good overall. Nonetheless, world market prices for wheat and rice were affected.\(^2\) World market prices of rice rose around 20% between January and May. Schmidt et al. (2021) (this issue) show the negative food security impacts for the case of PNG where over 95% of rice supply comes from rice imports. Rice prices in PNG were not only pushed up by the export restrictions in major producing countries, but also by domestic food market closures. The authors use a household model to estimate the impact of a rice price increase of similar magnitude. They estimate that a 30% rise in the world price of rice would cause a 17% fall in rice consumption for the poorest 40% in PNG and a 20% fall if also accounting for a 10% decline in incomes caused by the COVID-19-related slowdown in economic activity.

### 3.2 Supply chain disruptions and innovations

As mentioned, the impacts of COVID-19 on food production and value chains have differed strongly by product and region (Laborde et al., 2020). In high-income countries, production of staple crops tends to be highly mechanized with much inherent social distancing of workers. In these contexts, most farms deploy large-scale machinery and little labor for land preparation, sowing and harvesting of grain. More labor-intensive parts of agriculture, such as the production of non-staples like fruits and vegetables, require changes in practices to reduce the risk of disease transmission. Other labor impacts come from restrictions on movement of seasonal farm workers. These restrictions not only affect food production but can also have adverse food security effects by constraining remittance transfers by migrant workers to families back home (as observed in Guatemala’s case, for instance).

In developing countries, most farm production is much more labor intensive, with many processes such as rice planting and harvesting of staple crops bringing workers close together. While farmers in poorer countries are generally younger than in rich countries, the health systems are usually weaker and pre-existing health challenges may increase people’s vulnerability to COVID-19.

The vulnerability of food supply chains differs strongly across food systems, depending on their structure, government facilitation of the functioning of supply chains, and food businesses’ capacity to adapt to the shock and changed market conditions. For example, labor-intensive “traditional” value chains (mostly in low-income countries) are more affected than capital-intensive “modern” food value chains (mostly in rich countries, or in richer parts of poor countries).

Although many modern food value chains have continued to function well during COVID-19, some have been seriously affected. Though this is not generalizable (see Senegal’s case discussed below), the near-total closure of international passenger aviation seriously disrupted supply chains of specialized products relying on airfreight, such as high-value horticultural exports from parts of Africa (Laborde et al., 2020). Another difficulty arises from the need to adjust the mix of products and packaging when demand shifts from restaurants to households, with consumption of higher-quality meats, dairy products and vegetables declining as a result.

An interesting case is the meat processing sector. In the United States and Europe, tens of thousands of workers contracted COVID-19 during the first wave of the pandemic, causing meat processing plants to close or slow production. Ramsey et al. (2021) (this issue) studied the behavior of meat prices during the supply disruptions in processing plants caused by COVID-19 in the United States. The outbreak of COVID-19 caused a decline in slaughter of about 24% in beef and 21% in hogs during April 2020, followed by relatively swift recovery. By June, beef slaughter had recovered to levels earlier in the year. Pork slaughter continued to decline into May but increased in June of 2020. Over this period, there were major fluctuations in the prices of beef and pork, but they have normalized since. The authors identify the abnormal price movements as induced by a supply shock, but they conclude further that subsequent price stabilization notwithstanding the unprecedented magnitude of COVID-19 shocks is evidence of the remarkable efficiency and resilience of the United States meat processing and retailing industry.

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\(^1\) Some major staple food producers, such as Russia and Kazakhstan (wheat) and Viet Nam (rice) imposed export bans. During April and May about 20 countries had active food export bans affecting 5% of calories embedded in globally traded food. See Glauber et al. (2020) and IFPRI’s food trade policy tracker (https://www.ifpri.org/project/covid-19-food-trade-policy-tracker).

\(^2\) See the excessive food price variability monitor at IFPRI’s Food Security Portal, respectively http://www.foodsecurityportal.org/hardwheat-price-volatility-alert-mechanism for wheat and http://www.foodsecurityportal.org/rice-excessive-food-price-variability-early-warning-system for rice.
Comparing COVID-19 effects between modern and traditional value chains is not easy since they are often associated with different sectors and countries. An interesting comparison of impacts on modern and traditional value chains within the same sector and country is in the study by Van Hoyweghen et al. (2021) in this issue. They use phone survey data to study the impact of COVID-19 on different parts of the horticulture supply chains in Senegal and find significant differences between traditional and modern chains. The large fresh fruits and vegetables (FFV) companies in Senegal were hardly affected. These large companies are both vertically integrated in the value chain and oriented at export markets. During COVID-19, they managed to limit labor supply disruptions by providing their workers with protective gear, doubling the number of shifts (and thus halving the number of workers per shift), and investing in safer transport facilities to transport workers to the fields and collection centers. These businesses secured their input supplies and marketing channels, as well as their cooled storage and transport capacity.

Senegal’s domestic FFV supply chains, in contrast, were hit hard in the first months after the introduction of social-distancing measures to contain COVID-19. These domestic chains are dominated by many traditional, small-scale producers and traders. They showed little capacity to adjust and innovate in response to the shock and were deeply affected by the mobility restrictions, closure of shops and wet markets, and lack of access to credits and cold chain facilities. Senegal’s traditional horticulture producers and traders mostly faced lower output prices (caused in part by lower demand and quality loss) and rising input cost, squeezing profit margins as a reflection of a lack of resilience, rather than strength of local supply chains.

Hirvonen et al. (2021) (this issue) study domestic vegetable value chains in Ethiopia and find that the supply of vegetables in Ethiopia's urban markets was severely affected by disruptions in transport and in the supply of key farm inputs, as well as by trade restrictions. In telephone interviews conducted among traders, transporters, and processors, value chain agents indicated that their businesses were seriously affected by the COVID-19 pandemic. Most agents reported a decrease in demand, turnover, and clients, increased losses, less competition, higher transport costs, and changes in procurement areas.

The impact on farmers was mixed: some benefited and some lost. Those farmers who could sell into urban markets benefited as they faced less competition from other areas (locally or internationally) and higher prices, while those that could not trade to other areas in the country lost out. In a related study, Minten et al. (2020) found that smaller sized vegetable farms in Ethiopia appear to have been less affected than medium-sized farms by COVID-19 disruptions, as smaller farms rely less on hired labor. This finding is consistent with the hypothesis posited by Reardon et al. (2020) that vulnerability to reduced labor availability because of COVID-19 restrictions shows an inverted U-shaped relationship with farm size; that is, increasing initially with relative high dependence on hired labor among medium-sized firms to decrease where larger farm size comes with significant economies of scale and financial capacity to re-organize labor shifts and/or arrange for worker transportation to assure adequate labor supply, as observed in the case of Senegal’s large-scale vegetable agribusinesses.

In Ethiopia, vegetable farmers—more than consumers—were exposed to major price volatility because of domestic and international trade disruptions. Interestingly, Hirvonen et al. (2021) find that despite substantial hurdles in domestic trade reported by most value chain agents, increases in marketing—and especially transportation—costs have not been the major contributor to overall changes in retail prices. Marketing margins even declined for half of the vegetables studied, which could suggest these domestic value chains have been rather resilient as trade restrictions and disrupted inter-regional trade led to a more localized marketing system. Margins further may have been dampened by reductions in urban demand for vegetables caused by both income losses and the widespread fear that eating raw vegetables would increase the likelihood of contracting the virus.

While COVID-19 has exposed weaknesses in supply chains, it has also triggered a series of innovations in technology use and organization of value chains. Reardon et al. (2021) (this volume) provide a conceptual framework for how supply-chain actors tend to innovate business operations in the face of major demand or supply shocks. COVID-19 has provoked a major boost to the use of digital platforms to adapt food delivery and food service business to limits put on social mobility by COVID-19. This trend was already incipient prior to COVID-19, facilitated by the digital revolution, but was concentrated in developed regions of the world. With COVID-19 the shift to digital technology is spreading faster in emerging and developing regions. Many retailers and food service firms have “pivoted” by shifting to e-commerce plus delivery. These pivoting firms are being assisted by rapidly developing or emerging, often small-scale “e-intermediaries” (including “delivery intermediaries” and logistics and procurement platform intermediaries), to their mutual benefit. Processors pivoted by changing supply sources (over zones or countries) and diversifying their marketing from (faltering) retailers to direct sales to consumers. Some farmer groups have also started doing the latter. As with
3.3 | Impacts on food consumption and diets

Food shortages and lower incomes affect dietary choices. People expect that declines in incomes and increases in poverty in the order of magnitude predicted by Laborde et al. (2021) (this issue) will have large impacts on nutrition security and dietary quality (Heady et al., 2020). People in extreme poverty do not have enough resources to buy the food they need to avoid hunger and undernourishment and both poor and near-poor people will switch to cheaper and less nutritious food. As COVID-19 disrupts markets for non-staple, and especially perishable, foods more than staple foods, these disruptions reinforce the income-related problems leading poor households to shift their consumption away from non-staple foods, reducing dietary diversity and increasing the risk of adverse health consequences from the pandemic.

The scenario analysis by Laborde et al. (2021) confirms likely strong shifts in the composition of food demand. In their sample of 300,000 households in developing countries poor people spend over a quarter of their total income on staple foods (compared to 14% for non-poor households). Poor households spend nearly 50% of their incomes on unprocessed non-staple foods such as fruits, vegetables, and animal-source products. Declines in incomes are likely to force many poor households to cut back on these non-staples. The global scenario analysis indeed foresees that the COVID-19 recession provokes substantial food demand shifts away from more nutrient-rich non-staples and to lower-quality staples across regions and countries.

The study by Ceballos et al. (2021) (this issue) also shows that income declines cause increases in food insecurity and particularly reduction in more expensive but also more nutritious foods like fruits, vegetables, and animal-sourced foods. This is consistent with findings from a recent survey in Ethiopia (Hirvonen et al., 2021), which found that reductions in household food consumption mainly reduced purchases of nutrient-dense foods such as fruit, meat, eggs, and dairy. These adjustments limit declines in calorie intake but reduce dietary diversity and increase deficiencies of micronutrient consumption with potentially lasting adverse consequences for human health and development.

Several other studies in this volume provide indirect evidence of nutrition impacts as at the same time poor people’s incomes have declined and consumer prices of nutritious foods have increased, such as in the case of fresh vegetables in Ethiopia and Senegal (see Hirvonen et al., 2021: this issue; and Van Hoyweghen et al., 2021: this issue).

Finally, one may expect that even if the recession is relatively short lived, the impacts through inadequate nutrition could be long lasting, especially for young children whose human growth and cognitive skill development tend to be severely affected by spells of undernutrition.

4 | CONCLUSIONS, LESSONS, AND IMPLICATIONS FOR RESEARCH

COVID-19 is posing major challenges to food systems and food security. It is also posing challenges to economic analysis of the pandemic’s impacts and policy responses. Economic analysis has been handicapped by the lack of timely and reliability of data and shortcomings of economic theories. Evidence-based policy advise requires data and, unfortunately, economists were flying blind at least during the first part of the pandemic and evidence has remained patchy during most of 2020. Complete lockdowns, although novel for current generations, could be understood without much analytical complications, but for ‘intelligent’ lockdowns varying across sectors and areas, interpretation of the economic implications has been harder. As the contributions to this Special Issue of Agricultural Economics make clear, impacts on agriculture and food systems have been quite heterogeneous, not only because of differences in the intensity of the lockdowns, but also because of different degrees of sensitivity by type of production and context and capacities of governments and market agents to respond to a combination of supply and demand shocks of unprecedented magnitude. Model-based scenario analyses in this volume brought such heterogeneity to light owing to great detail in specification of sectoral structure, labor markets, and/or household. During a pandemic, applied models must rely on a combination of limited data and assumptions. This may limit predictive value of such models, but they do help us understand key interaction of the spread of the disease and social distancing measures, on the one hand, and economic impacts and adjustments, on the other. Such exercises are useful to inform policymaking and resource allocation, especially because they facilitate dimensioning...
the magnitude of the problem, identifying the most vulnerable, and understanding the trade-offs between saving lives and livelihoods. However, these models will require continuous updating as the pandemic evolves, as with heightened uncertainty and unprecedented size of the COVID-19 shocks, key model parameters may have shift in unpredictable ways.

Rapid phone surveys carried out since the beginning of the pandemic show that rural populations are particularly vulnerable to reduced incomes and limited coping mechanisms, as studies of the Special Issue also show. They also helped identify stark differences of agrifood businesses in adjusting to restrictions on labor mobility and reduced access to input and output markets. They also provided insights in shifts in food demand, both reducing overall consumption and more consumption of cheaper calorie-rich cereals relative to more expensive micronutrient-rich fruits, vegetables, and animal-source foods. These are by and large expected impacts but given the severity of the COVID-19 crisis, the livelihood impacts and adjustments in business operations and household behaviors may well be have permanent consequences. Follow-up surveys will be needed to make this clear, but the modified survey approaches will need improvement to understand better the drivers of observed behavioral changes, the nature of coping mechanisms and influences of migratory patterns and changes in market and business operations. Economic models, in turn, should re-assess and, as appropriate, revise key specifications and parameter estimates in the light of this new survey evidence.

The COVID-19 pandemic has been trying on people and their livelihoods worldwide. Nobody has the perfect framework for analyzing the precise impacts, let alone the perfect recipes to build back better. The contributions to this Special Issue do show there are many reliable building blocks to assess the drivers and impacts of the pandemic and provide starting points for the further research required to understand the implications which no doubt will leave a lasting imprint on the way people consume and produce food.

ACKNOWLEDGMENTS

The authors thank Christopher Rue for valuable research assistance and Awudu Abdulai for his encouragement in pulling together this Special Issue and for his advice and feedback throughout this project. We are further most grateful to all contributors to this Special Issue for offering their novel research into the impacts of the COVID-19 pandemic on food systems and livelihoods during a time when collecting new data and evidence has been more trying than ever.

REFERENCES

Anderson, K., Ivancic, M., & Martin, W. (2014). Food price spikes, price insulation and poverty. In J.-P. Chavas, D. Hummels, & E. Wright (Eds.), The Economics of Food Price Volatility. Chicago: University of Chicago Press. https://www.nber.org/chapters/c12818.pdf

Ceballos, F., Kannan, S., & Kramer, B. (2021). Reduced crop income during the COVID-19 pandemic in India: The perils of price risk. Agricultural Economics (this issue).

Ceballos, F., Hernández, M. A., & Paz, C. (2021). Assessing the short-term impacts of COVID-19 on food security and nutrition in rural areas: Evidence from Guatemala. Agricultural Economics (this issue).

Glauber, J., Laborde, D., Martin, W., & Vos, R. (2020). COVID-19: Trade restrictions are worst possible response to safeguard food security. In J. Swinnen, & J. McDermott (Eds.), COVID-19 and Global Food Security (pp. 66–68). Washington D.C.: International Food Policy Research Institute. http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/133762/filename/133971.pdf

Heady, D. Heidkamp, R. Osendarp, S., Ruel, M., Scott, N., Black, R., Shekar, M., Bouis, H., Flory, A. Haddad, L., & Walker, N. (2020). Impacts of COVID-19 on childhood malnutrition and nutrition-related mortality. The Lancet, 396 (10250), 519–521. https://doi.org/10.1016/S0140-6736(20)31647-0

Hirvonen, K., de Brauw, A., & Abate, G. T. (2021). Food Consumption and Food Security during the COVID-19 Pandemic in Addis Ababa. American Journal of Agricultural Economics, On line early access: https://doi.org/10.1111/ajae.12206

Hirvonen, K., Minten, B., Mohammed, B., & Tamru, S. (2021). Food marketing margins during the COVID-19 pandemic: Evidence from vegetables in Ethiopia. Agricultural Economics (this issue).

IMF (2020). World economic outlook, October 2020: A long and difficult ascent. Washington D.C.: International Monetary Fund. https://www.imf.org/en/Publications/WEO/Issues/2020/09/30/world-economic-outlook-october-2020

Laborde, D., Martin, W., Swinnen, J., & Vos, R. (2020). COVID-19 risks to global food security. Science, 369 (5603), 500–502 (July 31). https://doi.org/10.1126/science.abc4765.

Laborde, D., Martin, W., & Vos, R. (2021). Impacts of COVID-19 on global poverty, food security and diets. Agricultural Economics (this issue).

Minten, B., Mohammed, B., & Tamru, S. (2020). Emerging medium-scale tenant farming, gig economies, and the COVID-19 disruption: The case of commercial vegetable clusters in Ethiopia. European Journal of Development Research, 32(5), 1402–1429. https://doi.org/10.1057/s41287-020-00315-7

Ragas, C., Lambrecht, I., Mahrt, K., Aung, Z. A., & Wang, M. (2021). Immediate impacts of COVID-19 on female and male rural producers: The case of central Myanmar. Agricultural Economics (this issue).

Ramsey, A. F., Goodwin, B., Hahn, W. F., & Holt, M. T. (2021). Impacts of COVID-19 and price transmission in U.S. meat markets. Agricultural Economics (this issue).

Reardon, T., Bellemare, M. F., & Zilberman, D. (2020). How COVID-19 may disrupt food supply chains in developing countries. In J. Swinnen, & J. McDermott (Eds.), COVID-19 and Global Food Security (pp. 78–80). Washington D.C.: International Food Policy Research Institute. https://doi.org/10.2499/p15738coll2.133762_03
Reardon, T., Heiman, A., Lu, L., Nuthalapati, C. S. R., Vos, R., & Zilberman, D. (2021). Pivoting by food industry firms to cope with COVID-19 in developing regions: e-commerce and “co-pivoting” intermediaries. *Agricultural Economics* (this issue).

Reardon, T., & Swinnen, J. (2020). COVID-19 and resilience innovations in food supply chains. In J. Swinnen, & J. McDermott (Eds.), *COVID-19 and Global Food Security* (pp. 132–136). Washington D.C.: International Food Policy Research Institute. [https://doi.org/10.2499/p15738coll2.133762_30](https://doi.org/10.2499/p15738coll2.133762_30)

Schmidt, E., Dorosh, P., & Gilbert, R. (2021). Impacts of COVID-19 related income and rice price shocks on household welfare in Papua New Guinea. *Agricultural Economics* (this issue).

Sumner, A., Hoy, C., & Ortiz-Juarez, E. (2020). Estimates of the impact of COVID-19 on global poverty. WIDER Working Paper 2020/43. UN WIDER.

Swinnen, J. (2020). Covid-19 is exacerbating inequalities in food insecurity. In J. Swinnen, & J. McDermott (Eds.), *COVID-19 and Global Food Security* (pp. 20–22). Washington D.C.: International Food Policy Research Institute. [https://doi.org/10.2499/p15738coll2.133762_03](https://doi.org/10.2499/p15738coll2.133762_03)

Van Bergeijk, P. (2021). *Pandemic Economics*. Cheltenham (UK): Edward Elgar. [https://www.e-elgar.com/shop/usd/pandemic-economics-9781800379961.html](https://www.e-elgar.com/shop/usd/pandemic-economics-9781800379961.html)

Van Hoyweghen, K., Fabry, A., Feyaerts, H., Wade, I., & Maertens, M. (2021). The resilience of horticultural supply chains to the Covid-19 pandemic: Insights from Senegal. *Agricultural Economics* (this issue).

Wang, H., Dill, S. E., Zhou, H., Ma, Y., Xue, H., Sylvia, S., Smith, K., Boswell, M., Medina, A., Loyalka, P., Abbey, C., Friesen, D., Rose, N., Guo, Y., & Rozelle, C. (2021). COVID-19: Health, economic, and social impacts on China’s rural population. *Agricultural Economics* (this issue).

Winston, A. (2014). *The Big Pivot: Radically Practical Strategies for a Hotter, Scarcer, and More Open World*. Boston (MA): Harvard Business Review Press.

World Bank (2020). Assessing the economic impact of COVID-19 and policy responses in Sub-Saharan Africa. *Africa’s Pulse*, 21, April. [https://tinyurl.com/wfo9x59](https://tinyurl.com/wfo9x59)

**How to cite this article:** Swinnen, J., & Vos, R. (2021). COVID-19 and Impacts on Global Food Systems and Household Welfare: Introduction to a Special Issue. *Agricultural Economics*. 2021;52:365–374. [https://doi.org/10.1111/agec.12623](https://doi.org/10.1111/agec.12623)