Achieving the SDG's of ending hunger and food insecurity: Issues and options

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1. Introduction

In 2015, all countries of the world agreed on a series of important development goals, the Sustainable Development Goals (SDGs), including ending hunger and achieving food security for all. But since 2015, the number of people considered undernourished around the world has *increased,* by approximately 153 million people, with the vast majority of that increase occurring in the aftermath of the onset of the Covid-19 pandemic. As the pandemic gradually comes to an end, it is time to re-assess how global food security can be enhanced and food production made sustainable, if the SDG agenda is to be met by 2030.

This background paper takes stock of global hunger and food security (sections 2 and 3). Section 4a introduces a set of four inter-linked concepts – settings, shocks and stressors, food systems, entitlements – that are helpful in understanding why hunger and food insecurity increased so much after the onset of the Covid-19 pandemic (section 4b). These understandings of the broader trends in food security and the immediate impacts of the pandemic inform the discussion of policy actions that national governments and the global community can take to ensure a faster recovery towards meeting the 2030 goal of ending hunger and achieving food security (section 5).

2. Food security and its relationship to the SDGs

Attaining food security and sustainable food production are elements of Sustainable Development Goal 2. SDG2 has three components:

(1) End Hunger and Achieve Food Security (Target 2.1)

(2) End all forms of malnutrition (Target 2.2)

(3) Promote Sustainable Agriculture (Targets 2.3-2.5)

Progress towards meeting the End Hunger component of Target 2.1 is assessed using a measure curated by the Food and Agriculture Organization (FAO) called the Prevalence of Undernourishment (PoU). In brief, FAO tracks, on an annual basis, food production and trade. This allows FAO to calculate per capita caloric availability. Separately, it calculates minimum caloric requirements. Caloric requirements are affected by age, sex, weight, and activity levels. FAO takes all these into account when constructing, on a country-by-country basis, minimum caloric requirements. Lastly, FAO estimate how caloric availability is distributed within a country; this distribution, when compared to caloric requirements, generates an estimate of the number and prevalence of undernourished individuals (FAO, 2015). The End Hunger Target 2.1 will be achieved when this measure of undernourishment falls to zero.

The 1996 World Food Summit defined food security as follows:

> "Food security exists when 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." (World Food Summit, 1996)

There are three specific components to this definition and a fourth that is cross-cutting (FAO, 2006). The three components are: Availability; Access; And Utilization. Availability refers to the physical availability of safe, nutritious food supplied either through domestic production or imports (including food aid). Availability is the "supply side" component of food security. More recently, it is seen as reflecting the functioning of national and global food systems. Access refers to the consumer or "demand side"; specifically, the extent to which households can acquire food through their own production, through purchase, trade, or transfers. These means of accessing food encompass notions of income, entitlements, and prices. Food systems and entitlements are discussed in section 4. Utilization refers to the biological process through which food is converted into the nutrients necessary for physiological needs. Utilization is a consequence of food intake, but also by good health, which in turn requires access to non-food inputs including clean water, sanitation, and access to health care. The final, cross-cutting component is Stability. As FAO (2006) notes, food security requires that food availability and access to exist at all times, even when adverse shocks (such as climatic or health events) or cyclical events (such as seasonal food insecurity) occur.

Progress towards achieving the food security component of Target 2.1 is measured through FAO's Food Insecurity Experience Scale (FIES) (FAO, 2016a). The FIES is based on the idea that food insecurity is not a binary state. Instead, it exists on a continuum that begins with concern that household resources are not sufficient to meet food needs, to coping strategies such as reducing diet quality and diversity, to skipping meals and ultimately going whole days without eating. Work done around the globe shows that these are universal responses to food insecurity (Corbett, 1988; Radimer, Olson and Campbell, 1990; Radimer et al., 1992; Devereux, 1993; Coates 2013; Ballard, Kepple and Cafiero, 2013; FAO 2016a). Based on this universality, FAO developed a simple eight question survey module which is now administered in more than 140 countries around the globe. Generally, households who answer affirmatively to one or more questions are considered to have some form of food insecurity; four or more of these questions are considered moderately-or-severely food insecure; and households that answer affirmatively to seven or eight are considered severely food insecure (FAO, 2016b).[1]

[1] Appendix 1 lists these questions.

The SDG2 Target 2.1 for global food security will be met when the prevalence of any food insecurity falls to zero.

We end this section by noting two additional points. First, the focus of this paper is on Target 2.1, working towards all SDG2 targets is immensely important. Meeting Target 2.2 - end all forms of malnutrition with particular focus on wasting (acute undernutrition) and stunting (chronic undernutrition) - is both intrinsically valuable (good nutrition for all is a good thing) and instrumentally valuable. Child wasting is associated with increased risk of avoidable death due to infectious diseases and so ending wasting will reduce infant and child mortality. Chronic undernutrition causes neurological damage. As a result, chronically undernourished children attain fewer grades of schooling and learn less than their better nourished peers. As adults, they earn lower incomes and are at increased risk of being poor (Hoddinott et al, 2013). Thus, meeting Target 2.2 will contribute to SDG1 (Ending Poverty). Good nutrition requires both good health (and good access to health services) and access to biologically adequate consumption of food, both in quantity (calorie) and quality (micronutrient) terms. Achieving Target 2.1 (ending hunger and food insecurity) thus contributes to Target 2.2.

Second, the definition of food security includes the phrase "sufficient, safe and nutritious food". The metrics used to assess progress towards meeting Target 2.1 focus heavily on the "sufficient" component. They pay less attention to the "safe and nutritious" element of food and do not link to the third component of SDG2, namely sustainable agriculture. There is increasing recognition that discourse around hunger and food security needs to go beyond a "quantity" focus and incorporate both dietary quality and environmental sustainability. Ultimately, the global food system needs to support "Sustainable Healthy Diets", "Dietary patterns that promote all dimensions of individuals' health and wellbeing; have low environmental pressure and impact; are accessible, affordable, safe and equitable; and are culturally acceptable" (FAO and WHO, 2019).

3. Hunger, food security and sustainable food production: Numbers and trends

We present five figures that illustrate global trends in hunger, food security and food production.

We start with Figure 1. Using data taken from the FAO database FAOSTAT (specifically annual data on food balance sheets), this shows the level of daily per capita caloric availability[2] at a global level

[2] In brief, this is calculated in the following way. Begin with a country, a crop and a year. Determine how much is produced (in quantity terms), how much has been imported, how much is exported and changes in stock levels (a reduction in stocks adds to availability; an increase in stocks reduces availability). Thus, Domestic supply = domestic production – exports + imports + stock adjustment. Adjust for non-consumption uses such as feed, seeds,

from 1961 to 2018 – that is, how much food (expressed in calories) is available to eat. As is clear from Figure 1, at a global level per capita daily caloric availability has increased, slowly but steadily, since the early 1960s. As of 2018, the last year for which we have data, daily per capita caloric availability was 2927 kcal/person/day. This is well above the minimum amount calories needed to sustain healthy body functions and to engage in a modest amount of physical activity. In other words, enough food is produced on an annual basis to meet the basic energy needs of everyone.

Figure 2 tells us what crops are responsible for this increase in caloric availability. Three food groups account for much of this change: cereals (most notably rice, wheat, and maize); oils and fats (driven primarily by increases in palm oil production and the extraction of oils from soy) and meat (meat is often fed cereals and so the increase in cereals production contributes to increases in meat production). By contrast, other food groups have grown more slowly and the per capita daily availability of one group, pulses, has declined since 1961.

Figure 3 is a screenshot taken from FAO (2021a). It shows trends in the number and prevalence of individuals considered undernourished. As part of SDG2 Target 2.1, the goal is that this prevalence should reach 0 by 2030 – zero hunger. Figure 3 shows that between 2005 and 2015, both the prevalence of undernourishment and the number of persons considered undernourished was falling in an almost continuous basis. (And not shown in Figure 3 is the fact that undernourishment was falling prior to 2005). But this benign trend stopped around 2015. The number of people considered undernourished began to creep up, from 606 million in 2014 to 650 million in 2019 and the prevalence of undernourishment remained essentially unchanged from 2014 to 2019. With the onset of the Covid-19 pandemic, it is not possible to determine exactly how undernourishment has changed and so FAO provides an estimated set of ranges: (a) from a lower bound of 9.2 percent to an upper bound of 10.4 percent with a middle projection being 9.9 percent; and (b) a lower bound estimate of 720 million people considered undernourished, an upper bound estimate of 811 million and a middle projection of 768 million. The middle range projection indicates that the onset of the pandemic is associated with an increase of 118 million people considered undernourished. The upper bound estimate suggests that all the progress towards eliminating the number of hungry since 2005 has been lost – the number of

losses during storage and transport and other non-consumption uses and so the amount available for human consumption = Domestic supply - Non consumption use. Convert this physical quantity to kilocalories using food composition tables. Add up these kilocalories, then divide by population size and again by 365 to generate daily per capita caloric availability. Do this for all countries and all years.

undernourished people in 2005 (810 million) is nearly identical to the upper estimate for 2020 (811 million).

Figure 4 is derived from data found in FAO (2021a). It shows, globally and by region, the prevalence of moderate and severe food insecurity for three years, 2015, 2018, and 2021, as measured by the FIES. Globally, 22.8 percent of people were moderately or severely food insecure in 2015. This rose slightly in 2018 and rose much more, to 30.4 percent, in the first year of the pandemic. This is equivalent to a 33 percent increase in just five years. Food insecurity is distributed unequally across the globe. The highest prevalence is found in Africa where nearly 60 percent of the population was food insecure in 2020. Latin America and the Caribbean say the biggest increase in food insecurity, with its prevalence rising by 9.2 percentage points between 2018 and 2020. By contrast, food insecurity has grown more slowly in Asia and has been essentially unchanged in Oceania, Northern America, and Europe. Note that Figure 4 aggregates across men and women. Work reported in FAO (2021a), however, shows that women are more likely to be food insecure than men. This is true in all parts of the world. With the onset of Covid-19, this gender gap has become especially pronounced in Latin America and the Caribbean.

Lastly, Figure 5 – taken from Willett et al (2019) – considers six biogeophysical elements of the food system: Greenhouse gas emissions; Cropland use; Freshwater use; Nitrogen applications; and Phosphorous applications. For each, Willett et al (2019) introduce the concept of "boundaries"; essentially maximum levels of use that global food production should stay within to decrease the risk of potentially irreversible damage to the earth's environment. Their modelling work shows that as of 2010, global agricultural production was already at, or close to, these boundaries. By 2050, under a "business-as-usual" scenario, all will be exceeded by wide margins with Greenhouse gas emissions – driven by significant increases in animal products - more than double their safe environmental boundary.

Some summary observations are helpful. First, from the perspective of policy discourse one or two generations ago, the global system of food production has been an enormous success. In the 1960s and 1970s, it was widely held that the world could simply not produce enough food and that, consequently, millions would starve. That did not occur. Instead, daily per capita caloric availability has grown by approximately 45 percent since 1961. There is now enough food produced to feed everyone in the world.

BUT simply because there is enough production (the "Availability" aspect of food security), does not mean that everyone has "Access" to sufficient food. The decades long trend of reductions in the number of individuals considered undernourished appears to have come to an end around 2015. After

rising slowly for several years, the onset of Covid-19 has coincided with a dramatic increase in the number of people considered undernourished (Figure 3) or moderately or severely food insecure (Figure 4). Below, we explain how the paradox of increased "Availability" and reduced "Access" can arise.

FURTHER, current patterns of growth in food availability – increases in cereals, oils and fats, and meat products (Figure 2) is not environmentally sustainable (Figure 5). Most concerning is the contribution that animal products – specifically beef – make to rising Greenhouse gas emissions. We return to this in section 5.

4. The causes of food insecurity: Concepts and Covid-19

(a) Concepts

Understanding four inter-linked concepts – settings, shocks and stressors, food systems, entitlements – are helpful in understanding the causes of food insecurity in a world that – unsustainably – produces enough food for all.

Settings

Food production and food consumption take place within five types of settings. The *physical setting* refers to natural phenomena such as the level and variability of rainfall, temperature, the natural fertility of soils, distances to markets, and quality of infrastructure. The physical setting has a direct effect on what types of foods can be grown in different localities. Aspects of the physical setting including distance to markets and infrastructure quality, also have a direct effect on food consumption (see below). The *legal setting* can be thought of as the general "rules of the game" under which economic activities take place; these are partly a function of the *political setting* that captures the mechanisms by which these rules are set. The *social setting* captures such factors as the existence of certain norms of behavior (for example, sharing within kin groups), of social cohesion and strife. Finally, there is an economic setting that captures policies that affect the level, returns, and variability of economic activity, including food production (Hoddinott and Quisumbing 2010).

Shocks and stressors

Shocks are events, either positive or negative, the timing and severity of which cannot be precisely predicted in advance. A stressor is a long-term trend that adversely affects a system and increases the vulnerability of actors within that system to shocks. Shocks emanate from the settings in which households operate (a covariant shock), or they could be restricted to only one person or household (an

idiosyncratic shock).[3] Shocks can vary in terms of speed of onset, duration, and intensity. Table 1 describes these in more detail, giving examples of shocks by the setting from which they emerge and their duration. Table 2 gives examples of how selected shocks affect the setting within which they take place and their possible impacts on other settings. Table 3 details how these shocks affect households, the economic activities they undertake and the availability and price of food. Take, for example, civil strife. This can have a direct effect on the assets that households own, leading to their destruction or confiscation. Households can be forced to re-locate or may lose access to labor as a result of abduction, conscription, or imprisonment. Ethnic strife can make it more difficult for households to access inputs needed for agricultural production; insecurity may make it more difficult to access markets where food surpluses can be sold. Finally, ethnic strife may interfere with the functioning of food markets, increasing the cost of food or resulting in some foods becoming unavailable.

FAO (2021a) emphasizes that many of these shocks are increasing in duration and frequency. For example, between 2010 and 2014, there were on average just over 500 recorded conflicts (both intra- and inter-state) per year in low- and middle-income countries. Between 2015 and 2019, this had risen to more than 750 conflicts per year and the percentage of time a low or middle-income country was embroiled in conflict increased from 30 percent (in 2010-2014) to 38 percent in 2015-2019. Over this period, the number of refugees in the world nearly doubled, to 80 million by 2020. Studies that have used the FIES scales find that nearly all refugees are either moderately or severely food insecure.[4] It is no coincidence that this rise in conflict coincided with the rise in food insecurity and undernourishment *prior* to the onset of the Covid-19 pandemic.

The number of number and intensity of climatic shocks is also increasing, a consequence of climate change. FAO (2021a) notes that the percentage of low- and middle-income countries exposed to climate extremes has risen from 76 to 98 percent between 2000–2004 and 2015–2020. The frequency, or number of years a country is exposed in each subperiod, increased by 42 percentage points over the same period and 52 percent of countries were exposed to three or four types of climate extremes (heat spell, drought, flood, or storm) in 2015–2020, compared with 11 percent in 2000–2004.

[3] The distinction between covariant and idiosyncratic shocks is not always clear-cut. A drought in only one locality might result in poor, rainfall-dependent households selling assets to richer, non-rainfall dependent households so, although the event was common to both, it adversely affected only the poor.

[4] Examples are: (1) Iraqi refugees living in Lebanon; 35% moderately food insecure, 44% severely food insecure (Ghattas et al, 2014); (2) Afghan refugees living in Iran; 28% moderately food insecure, 61% severely food insecure (Abdollahi et al, 2015); (3) Women asylum seekers in South Africa; 45% moderately food insecure, 47% severely food insecure (Napier, Oldewage-Theron and Makhaye, 2018); and (4) Refugees in northern Kenya; 84-93% are food insecure (Betts, Omata, and Sterck 2020)

Food systems

As exemplified by the recently concluded United Nations Food Systems Summit, there is an increasing appreciation that efforts to achieve sustainable food and nutrition and security requires a holistic approach. Unlike work that focuses solely on one component of the food system, say production or markets, a food systems perspective acknowledges interactions and interdependencies that exist among the elements of that contribute to food and nutrition security. The High-Level Panel of Experts convened by the Committee on World Food Security defined food systems as "… all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the output of these activities, including socio-economic and environmental outcomes" (HLPE 2017). There are other definitions in other reports and papers – see Brouwer, McDermott and Ruben (2020) - but they all contain common elements: production; processing; distribution; and consumption. They acknowledge that there are multiple foods within a food system each characterized by its own value chain. Food systems differ across and within countries. Distinctions between the elements found in food systems are not always clear cut – a notable example being households in low-income countries who are food producers, processors, and consumers of their own production.

Entitlements

While consumers are a component of the food system, it is helpful – in the context of understanding the causes of food insecurity – it is helpful to consider them separately. In the context of a market economy, access to food can be thought of as arising from what Sen (1981) describes as entitlements. A schematic based on these ideas is found in Figure 6. We start with the blue rectangles at the top of the figure. Households can produce agricultural goods – indeed, this is the dominant form of livelihood for the approximately 608 million family farms in the world that produce around 80 percent of the world's food in value terms (Lowder, Sánchez and Bertini, 2021). These agricultural goods can be consumed by the producing household (Sen's "production entitlement") in which case they form a direct part of the food consumed by the household, or they can be sold (Sen's "trade entitlement"). Households can work for themselves (operating their own businesses) or for others (receiving wages) – this is Sen's "labour entitlement". Finally, household can receive private transfers in the form of cash or food (think gifts of food or of domestic or international remittance) or they can receive transfers from governments, again either as cash or as food; think here of cash pensions or child support grants or food-for-work programs.

Both private and public transfers are examples of what Sen called "transfer entitlements". Food from own consumption, food received either through private or public transfers directly links to food available for household consumption. Revenues derived from sales, labour income and cash received from private or public transfers, is used to purchase foods from markets with the type of foods available ("physical access to food") and their price reflecting both the demand for these foods and the supply created by the food system. This, together with food from own consumption and food transfers determines the amount of food available for consumption.

(b) Food systems and food security in the time of Covid-19

Covid-19 has been a rapid onset, covariate shock of long duration. Its food security impacts have been severe, as evidenced by the data presented in Figures 3 and 4. The concepts discussed above are helpful in explaining why food security has deteriorated so sharply in the time of Covid-19.

We begin with the food system, specifically global food production. Figure 7, taken from the most recent (September 2021) FAO estimates of cereal supply and demand shows the following. Consistent with Figure 1, global production of cereals has risen steadily. Production has risen faster than use[5] and so global cereal stocks have risen by approximately 40 percent since the aftermath of the 2008/09 food crisis. At the outset of the pandemic, there were concerns that global food production would fall. While specific food commodities in specific places have seen reductions in production, often due to localized conditions such as drought or floods, global cereal production is projected to increase by 0.7 percent (18.7 million tonnes) relative to 2020 (FAO, 2021b).

Processing, trade, and distribution could be affected by Covid in at least four different ways. The first relates to restrictions on international trade in foods resulting from governments imposing export bans or licenses. Martin and Anderson (2012) argue that this was a significant factor in contributing to the rise in global food prices in 2008; noting that once a few countries started to do so, others quickly followed suit resulting in a cascade of export bans and subsequently panic buying by other countries that were dependent on food imports to meet domestic food security needs. Ultimately, 33 countries imposed some sort of export restriction leading to increasing rice prices by 40 percent, maize prices by 20 percent, and wheat prices by 10 percent (Martin and Anderson 2012). Possibly having learned from the policy mistakes made in 2007-08, fewer government-imposed restrictions on food exports; by late 2020, only 13 countries had done so. These affected only a minimal amount of the volume of food

[5] Use comprises human consumption, animal feed, and seeds.

traded globally, around one percent of global traded calories (Martin and Glauber 2020) and many of these have been subsequently rescinded.

Second, Covid could disrupt food transport. Looking across all categories of goods, maritime shipping accounts for about 90% of global goods trade. As Kim, Kim, and Park (2020) have noted, disruptions to maritime shipping affects the movement of food exports and imports. The pandemic has increased time and costs associated with cargo handling arising, for example, from health screenings for crews, prohibitions on disembarkation, and a shortage of workers to offload, clear and transport food. This has resulted in refrigerated storage being unavailable for fresh foods. Extended delays in accessing transport and reductions in the availability of refrigerated storage has led to perishables to spoil and food waste to rise (Kim, Kim, Park, 2020). A consequence of all this has been a rise in shipping costs and this is contributing to the increases in food prices observed in 2021. This has been exacerbated when there have been domestic disruptions to transport, either because of a shortage of drivers or vehicles, or because of the imposition of barriers that prevent the movement of vehicles across administrative borders.

Third, Covid could affect food processing. Discerning its effects is difficult because, partly because globally, the food processing sector is enormously heterogeneous, ranging from the large meat processing plants employing hundreds of workers to women grinding grain harvested from their own fields and partly because data on the processing sector is less readily available. Existing evidence suggests that labor-intensive food processing sectors, such as poultry and meat, were more badly affected than capital intensive sectors such as milling. Savary et al (2020) described the effects in the following way, “Labour shortages have also been an issue for large-scale food processors and suppliers. A growing number of workers are taken ill in food processing facilities where the operational model is not conducive to safe physical distancing. Consequently, a large number of food processing plants temporarily suspended production in Europe and North America” (Savary et al 2020, p 704). These effects seem to have been larger in countries whether the processing sector was more concentrated. That said, the availability of substitute sources of supply (for example, imports) and foods that are substitutes for those items experiencing a shortage meant that while the shocks described by Savary et al (2020) were disruptive – particularly for meat processing and packaging – the availability of other sources of animal source foods – lessened their impacts on consumers. Put differently, Covid led to disruptions in food processing, but these tended to be localized and short-lived.

Fourth, restrictions on movement and gatherings – imposed to reduce the spread of Covid-19 – may have led to the closing of markets and small shops that sell food. Wegerif (2020) reports that in

South Africa, government regulations aimed at slowly the spread of the coronavirus resulted in informal food traders being shut down. These primarily serve low-income residents with the result that those individuals had to travel further (thus incurring transport costs) and pay higher prices for food.

We now turn to the final component of food systems, consumers, and households. The onset of the Covid-19 pandemic increased global poverty. World Bank estimates suggest that the number of extremely poor households increased from 655 million in 2019 to 732 million in 2020 and is projected to decline modestly, to 711 million in 2021 (Mahler et al 2021). Nearly all this increase has occurred in low and middle-income countries. Three factors underlie these trends. Initial responses to the pandemic involved extensive use of lockdowns, closure of non-essential shops and factories and restrictions on gathering and mobility. This reduced economic activity in all countries but lower- and middle-income countries were affected not only by their own lockdowns but also by the loss of export earnings resulting from lower economic activity in high income countries. Third, international remittances fell sharply during the second quarter of 2020. However, the rebound in economic activity in high income countries has led to increased demand for low and middle-income country exports and has underpinned a rebound in international remittances (World Bank, 2021).

These data provide evidence of the broad trends in global incomes and poverty that had emerged during the pandemic. But they do not really explain why food insecurity rises for some, but not all. To illustrate these processes, we draw on insights from the entitlements approach described above and data collected by Ahmed et al (2021) in urban Bangladesh. The first cases of Covid-19 in Bangladesh were identified in early March 2020, setting in motion a range of policy responses to contain the outbreak, most notably a 10-day "general holiday" nationwide from March 26 to April 4, 2020 during which everyone but essential workers was expected to stay home, avoid nonessential movements, and practice physical distancing. Over time, restrictions on gatherings and travel were iteratively extended in phases, then lifted by the end of 2020, before being re-imposed in mid-2021 as the Delta variant became more widespread. Over this period, Ahmed et al (2021) tracked the impacts of Covid-19 on urban food security in Bangladesh. Specifically, they interviewed, by phone, households who had taken part in an in-person survey in 2019.[6] Crucially, both the in-person surveys and the two phone surveys (conducted in June-July 2020 (in the aftermath of the initial lockdowns) and a second in January 2021

[6] A concern with phone surveys is that they, by construction, do not include households that do not have a phone. Such households are usually poor and so this could potentially introduce bias in results that are reported. Using data from the in-person survey, Ahmed et al (2021) construct sample weights that correct for this.

after the lockdowns had been eased used the FIES described above; further the in-person surveys contained information on the types of employment that urban households engaged in.

These data show that the onset of the pandemic led to a dramatic increase in moderate and severe food insecurity. Prior to the pandemic, two-thirds (65.9 percent) of urban households were food secure and only 4.8 percent were severely food insecure. By June 2020, the prevalence of mild and moderate food insecurity more than doubled to 36.6 and 39.4 percent, respectively. Urban households reported a three-fold increase in severe food insecurity over this timeframe, from 4.8 percent to 15.7 percent. Figure 8 shows how food insecurity evolved by pre-pandemic occupation class in our urban sample. Initially, COVID-19-induced disruptions affected many households with steep increases in the prevalence of moderate or severe food insecurity across all occupational categories. Although food insecurity was pervasive in the urban sample, and high-skilled main earners were not immune to COVID-19-induced food insecurity, low-skilled workers were disproportionately affected. In June 2020, self-employed workers, and low-skilled salaried workers (e.g., housemaid, readymade garment workers, rickshaw puller, etc.) were among the most food insecure. Moderate or severe food insecurity was also prevalent among) individuals working with raw materials or in production (77.1 percent) (e.g., carpenters, masons) than high-skilled self-employed main earners (52.4 percent). Declines in income affected the demand for services provided by salaried or self-employed low-skilled workers (such as maids, porters, and rickshaw pullers), which increased unemployment among this occupational group and, in turn, nearly tripled food insecurity (pre-pandemic: 25.0 percent; June 2020: 71.1 percent). The prevalence of moderate or severe food insecurity was also high among urban day laborers and main earners operating small businesses (for example, operating a roadside stand or a tea stall)—64.2 percent and 52.2 percent, respectively. In other words, a collapse in own-labour entitlements among low skill and casual workers led to large increases in food insecurity. After the easing of the lockdowns and related restrictions on economic activity, moderate and severe food insecurity among urban households fell back towards pre-pandemic levels.

To summarize, the rise in food insecurity and undernourishment during the time of Covid-19 was driven primarily by the economic shocks associated with the pandemic. In 2021, some of these income shocks have continued, for example, where new lockdowns were imposed to deal with the delta variant, but they have diminished in magnitude in high-income countries. These income shocks were felt unevenly, with those reliant on informal wage labor or small-scale self-employment most badly affected. While incomes are recovering, food insecurity is now being exacerbated by a rise in global food prices. These rises are occurring because of difficulties in the physical movement and distribution of food;

unlike 2007-08, they are not a result of reductions in global food production (in fact, this is increasing) nor a consequence of government-imposed restrictions on food exports.

5. Implications for public action

What are the implications of this analysis for public action? Mindful of the fact that the Covid-19 pandemic has accentuated negative trends that had emerged pre-pandemic, we identify six areas of action.

(1) Renew political and social efforts to prevent and resolve both intra- and inter-state conflicts. Conflict is damaging to food security in multiple ways. It destroys lives, livelihoods, and markets, most perniciously when it results in forced migration. The rise in food insecurity since 2015 has coincided with the rise in the number and duration of conflicts as well the number of refugees. Hunger and food insecurity cannot be ended absent the prevention and resolution of both intra- and inter-state conflict.

(2) Tackle climate change. Extreme weather events are increasing in frequency, duration, and severity. They destroy crops, the land and infrastructure needed for their cultivation, and can act as a catalyst for conflict. Food security for all will be immensely difficult to achieve in the absence of measures to slow the growth in global temperatures. That said, as discussed in section 3, agriculture – especially animal source foods such as beef – is contributing to climate change. The structure and nature of agricultural production needs to become climate smart. Here, also note that efforts to promote healthy, balanced diets – those with lower levels of environmentally damaging consumption of animal source foods – will contribute to efforts aimed at tackling climate change (Willet et al, 2019).

(3) *Keep food trade open.* The contrasting experiences of the 2007-08 food crisis and the Covid-19 pandemic are instructive. Export bans and other measures hastily enacted worsened the crisis in 2007-08; the relative absence of these likely reduced the malign effects of the Covid-19 pandemic on food security.

In countries where there are significant restrictions on the movement of food (specifically food imports), shocks that disrupt domestic food production lead to rising food prices because there is no other source to compensate for the loss in production. The last 40 years have seen horrific famines in Ethiopia and North Korea. While both had multiple and complex causes, both were exacerbated by limited intra- and international market integration. By contrast, severe flooding in 1998 covered, at one point, 75 percent of Bangladesh but famine

was averted because of policy changes that allowed food to be imported from India (del Ninno and Dorosh 2001). Keeping food trade open, promoting the integration of national and regional food markets can also provide resilience to domestic food markets as well as potentially reducing prices.

That said, tensions exist between open and closed food systems. Food markets that are more regionally and globally integrated are more likely to be affected by shocks that occur elsewhere, see Bekkers et al (2017) for an example, but these can be addressed through mechanisms such as improved social protection (see below). Put differently, while integration into global markets that creates *dependence* on imports may result in a less resilient food system whereas *diversification* of food supplies so that they include imports (or the ability to import as needed) may increase food system resilience.[7]

(4) Increase investments in agriculture. Meeting the targets for SDG2 in a world with a population that continues to grow cannot be achieved without new investments in climate smart agriculture. The single most important, and most cost-effective way of doing so is through greater funding for agricultural research and development (R&D) at both the international level (through the Consultative Group on International Agriculture Research) and national levels Chichaibelu et al (2021). Past investments, most famously those associated with the Green Revolution, have a proven track record of increasing yields, thus increasing food availability without needing to bring new (and often environmentally marginal) lands into use. But new technologies are of only limited use if they are not made available to farmers, especially smallholders in low- and middle-income countries. Investments in agriculture knowledge dissemination through both traditional means such as agricultural extension services and approaches that leverage the transformative power of information communication technologies (ICTs) are also highly cost-effective investments with proven track records. Third, in a climate changing world, investments need to be made in those parts of the world where increasing frequency and duration of droughts threaten food production. For this reason, the expansion of small-scale irrigation in sub-Saharan Africa is also a highly cost-effective investment (Chichaibelu et al, 2021). These investments will help ensure adequate food supplies to meet a growing world population; the increases in income they provide to small-holder farmers will enhance production entitlements as well as providing increased demand for wage labor in rural areas.

[7] My thanks to Stephen Devereux for suggesting this phrasing.

They directly contribute to the Promotion of Sustainable Agriculture component of SDG2 and indirectly to the goals of ending hunger and food insecurity. To reach their full potential, however, they need to be gender sensitive – a point we return to below.

(5) Invest in social protection (Sen's [public] transfer entitlements). Social protection interventions – non-contributory transfer programs, typically either cash, vouchers or in-kind, have been shown to improve food security across a wide range of low- and middle-income countries (Hidrobo et al, 2018). In many countries, the advent of the pandemic resulted in the hasty implementation of social protection interventions, but most of these were short-lived, lasting on average just over three months, and about 40 percent consisted of one-time payments (FAO 2021a). By contrast, consider the results found in Abay, Berhane, Hoddinott, and Tafere (forthcoming). They assess the effectiveness of Ethiopia's Productive Safety Net Programme (PSNP) – a social protection program that had been in operation since 2005 - in mitigating the adverse impacts of the COVID-19 pandemic on household food security. They note that two thirds of respondents in their study reported that their incomes had fallen after the pandemic began and almost half reported that their ability to satisfy their food needs had worsened. On average, household food insecurity increased by 11.7 percentage points. However, participation in the PSNP offsets virtually almost all of this adverse change; the likelihood of becoming food insecure increased by only 2.4 percentage points for PSNP households. Bottan, Hoffman and Vera-Cossio (forthcoming) find comparable results in Bolivia.

In a world that is increasingly shock-prone, governments and development partners need to invest in social protection measures that are shock-response. This should include mechanisms that permit the rapid implementation of increased benefit levels to existing clients when needed (vertical expansion) and the ability to incorporate new beneficiaries into existing programmes (horizontal expansion) (Devereux, 2021).

(6) Ensure these actions are gender sensitive. Njuki et al (2021) write "Women are key actors in food systems as producers, processors, traders, and consumers of food. They do this work despite many constraints and limitations including lower access to opportunities, technologies, finance and other productive resources, and weak tenure and resource rights"; these constraints are both shaped and reinforced by social and structural inequalities in food systems. Consequently, gender inequalities are both a cause of food systems that fail to deliver healthy foods to all and a cause of undernourishment and food insecurity in large numbers of women around the world. Addressing this needs to occur at two levels. At a societal level, efforts are

needed to address both gender norms and inequalities. Laws, policies and institutions need to be changed so as to reduce the structural and normative barriers that women face as producers, processors and consumers of food. Put differently, efforts aimed at achieving SDG5 (Achieve gender equality and empower all women and girls) will contribute to efforts aimed at achieving SDG2. Within the food system, there are myriad actions that can be taken, with specifics varying by country context. Securing land tenure rights, improving access to credit, extension services for example all reduce barriers that prevent women from reaching their productive potential as farmers. Increasing women's income, both through farming and through social protection payments targeted to women, increases the resources they control and their decisionmaking power within the household, leading to more equitable food security across and within households (Njuki et al, 2021).

References

Abay, K., G. Berhane, J. Hoddinott and K. Tafere. Forthcoming. COVID-19 and Food Security in Ethiopia: Do Social Protection Programs Protect? *Economic Development and Cultural Change*.

Abdollahi, M., Abdollahi, Z., Sheikholeslam, R., Kalantari, N., Kavehi, Z. and Neyestani, T.R., 2015. High occurrence of food insecurity among urban Afghan refugees in Pakdasht, Iran 2008: a cross-sectional study. *Ecology of food and nutrition*, 54(3): 187-199.

Ahmed, A., M. Bakhtiar, D. Gilligan, J. Hoddinott, S. Roy, S. Anowar, J. Ghostlaw, and G. Thai, 2021. Signs of recovery: Patterns of livelihoods and food security before and during COVID-19 in rural Bangladesh. Policy Note April 2021. Washington, DC: International Food Policy Research Institute (IFPRI). https://doi.org/10.2499/p15738coll2.134351

Ballard, T., Kepple, A. and Cafiero, C. 2013. *The Food Insecurity Experience Scale: Development of a Global Standard for Monitoring Hunger Worldwide*. Rome, FAO.

Bekkers, E., Brockmeier, M., Francois, J. and Yang, F., 2017. Local food prices and international price transmission. *World Development* 96: 216-230.

Betts, A., Omata, N. and Sterck, O., 2020. The Kalobeyei Settlement: A Self-reliance Model for Refugees? *Journal of Refugee Studies*, 33(1): 189-223.

Bottan, N., B. Hoffmann and Diego Vera-Cossio. Forthcoming. Stepping Up During a Crisis: The Unintended Effects of a Noncontributory Pension Program during the COVID-19 Pandemic. *Journal of Development Economics*.

Brouwer, I.D., McDermott, J. and Ruben, R., 2020. Food systems everywhere: Improving relevance in practice. *Global Food Security*, *26*, p.100398.

Chichaibelu, B.B., Bekchanov, M., von Braun, J. and Torero, M., 2021. The global cost of reaching a world without hunger: Investment costs and policy action opportunities. Food Policy, 104, p.102151.

Coates, J. 2013. Build it back better: Deconstructing food security for improved measurement and action. *Global Food Security*, 2(3): 188-194.

Corbett, J. 1988. Famine and household coping strategies. *World Development* 16(9): 1099-1112.

del Ninno, C. and Dorosh, P., 2001. Averting a food crisis: private imports and public targeted distribution in Bangladesh after the 1998 flood. *Agricultural Economics*, *25*(2-3): 337-346.

Devereux, S., 2021. Social protection responses to COVID-19 in Africa. *Global Social Policy*, 1-27.

Devereux, S. 1993. Goats before ploughs: Dilemmas of household response sequencing during food shortages. *IDS Bulletin*, 24(4): 52-59.

Food and Agriculture Organization (FAO). 2021a. *The state of food insecurity in the world*. Food and Agriculture Organization: Rome.

Food and Agriculture Organization (FAO). 2021b. *World Food Situation: FAO Cereal Supply and Demand Brief*. September 2, 2021. Food and Agriculture Organization: Rome.

Food and Agriculture Organization (FAO) and World Health Organization (WHO). 2019. Sustainable healthy diets – Guiding principles. Rome.

Food and Agriculture Organization (FAO). 2016a. *Methods for estimating comparable prevalence rates of food insecurity experienced by adults throughout the world*. Food and Agriculture Organization: Rome.

Food and Agriculture Organization (FAO). 2016b. *Modeling Food Insecurity in Bivariate and Regression Analyses.* Food and Agriculture Organization: Rome.

Food and Agriculture Organization (FAO). 2015. *The state of food insecurity in the world*. Food and Agriculture Organization: Rome.

Food and Agriculture Organization (FAO). 2006. *Policy Brief: Food Security*. Food and Agriculture Organization: Rome.

Ghattas, H., Sassine, A.J., Seyfert, K., Nord, M. and Sahyoun, N.R., 2014. Food insecurity among Iraqi refugees living in Lebanon, 10 years after the invasion of Iraq: data from a household survey. *British Journal of Nutrition*, 112(1): 70-79.

Hidrobo, M., J. Hoddinott, N. Kumar and M. Olivier, 2018, Social protection, food security and assets, *World Development*, 101: 88-103.

Hoddinott, J. and A. Quisumbing, 2010. "Methods for microeconometric risk and vulnerability assessment" in *Risk, Vulnerability and Human Development: On the brink* ed by R. Fuentes-Nieva and P. Seck (London: Palgrave Macmillan- United Nations Development Programme).

Hoddinott, J., J. Maluccio, J. Behrman, R. Martorell, P. Melgar, A. Quisumbing, M. Ramirez-Zea, A. Stein, and K. Yount, 2013. Adult consequences of growth failure in early childhood, *American Journal of Clinical Nutrition*, 98: 1170-1178.

HLPE. 2017. *Nutrition and Food Security.* A report by the High Level Panel of Experts on Food Security and Nutrition. Rome: Committee on World Food Security.

Kim, K., S. Kim, and C. Park. 2020. Food Security in Asia and the Pacific amid the COVID-19 Pandemic. ADB Briefs 139. Manila: Asian Development Bank

Lowder, S., M. Sánchez, and R. Bertini. 2021. Which farms feed the world and has farmland become more concentrated? *World Development* 142: 105455.

Mahler, D., N. Yonzan, C. Laknerr, A. Aguilar, and H. Wu. 2021. *Updated estimates of the impact of COVID-19 on global poverty: Turning the corner on the pandemic in 2021?* World Bank data blog. World Bank: Washington DC.

Martin, W., and K. Anderson. 2012. Export restrictions and price insulation during commodity price booms, *American Journal of Agricultural Economics* 94(2): 422–427.

Martin, W., and J. Glauber. Trade policy and food security. COVID-19 and trade policy: Why turning inward won't work. In *COVID-19 and Trade Policy: Why Turning Inward Won't Work*, ed by R. Baldwin and S. Evenett. CEPR Press: London

Napier, C., Oldewage-Theron, W. and Makhaye, B., 2018. Predictors of food insecurity and coping strategies of women asylum seekers and refugees in Durban, South Africa. *Agriculture & Food Security*, 7(1): 1-9.

Njuki, J., S. Eissler, H. Malapit, R. Meinzen-Dick, E. Bryan and A. Quisumbing. 2021. A Review of Evidence on Gender Equality, Women's Empowerment, and Food Systems. In *Science and Innovations for Food Systems Transformation and Summit Actions* ed by J. von Braun, K. Afsana, L. Fresco, and M. Hassan. The Scientific Group for the UN Food System Summit.

Radimer, K.L., Olson, C.M. & Campbell, C.C. 1990 Development of indicators to assess hunger. *Journal of Nutrition*, 120(Suppl 11) Suppl (11):1544-8.

Radimer, K.L., Olson, C.M., Greene, J.C., Campbell, C.C. & Habicht, J.P. 1992. Understanding hunger and developing indicators to assess it in women and children. *Journal of Nutrition Education* (24) Suppl:36-45.

Savary, S., Akter, S., Almekinders, C. *et al.* 2020. Mapping disruption and resilience mechanisms in food systems. *Food Security* 12**:** 695–717.

Sen, A. 1981. *Poverty and Famines.* Oxford: Oxford University Press.

Wegerif, M.C., 2020. "Informal" food traders and food security: experiences from the Covid-19 response in South Africa. *Food Security*, 12(4), pp.797-800.

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A. and Jonell, M., 2019. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393(10170): 447-492.

World Bank. 20210. *Defying Predictions, Remittance Flows Remain Strong During COVID-19 Crisis*. Press Release, May 12. World Bank: Washington DC.

World Food Summit (1996). *Rome Declaration on World Food Security*.

Appendix 1: The Food Insecurity Experiential Scale Survey Module (FIESSM)

The questions in the FIESSM cover eight different experiences of food insecurity (FAO, 2016a). Respondents are asked "Now I would like to ask you some questions about food. During the last 12 months, was there a time when:

(Q1). You were worried you would not have enough food to eat because of a lack of money or other resources?
(Q2) You were unable to eat healthy and nutritious food because of a lack of money or other resources?
(Q3) You ate only a few kinds of foods because of a lack of money or other resources?
(Q4) You had to skip a meal because there was not enough money or other resources to get food?
(Q5) You ate less than you thought you should because of a lack of money or other resources?
(Q6) Your household ran out of food because of a lack of money or other resources?
(Q7) You were hungry but did not eat because there was not enough money or other resources for food?
(Q8) You went without eating for a whole day because of a lack of money or other resources?"

Table 1: Examples of shocks and their duration, by setting

	Duration of the shock		
Setting in which the shock takes place	Rapid Onset	Slow Onset	Prolonged
Physical	- Heavy rains; flooding - Landslides - Volcanic eruptions - Earthquakes - Hurricanes - Insect infestations	- Drought - Epidemics	
Social		- Breakdown in traditional commitments of trust and reciprocity	- Ethnic strife - Civil war
Political	- Riots - Coup d'etat		- Collapse of governance
Legal		- Changes in legal environment eroding or eliminating tenure security or title to property	
Economic	- Inflation, stock market or exchange rate collapse leading to loss of value of financial assets	- Loss of export markets - Collapse in prices of internationally traded agricultural commodities	- Changes in fundamental structure of the economy (eg. transition from centrally planned to mixed or market economy)

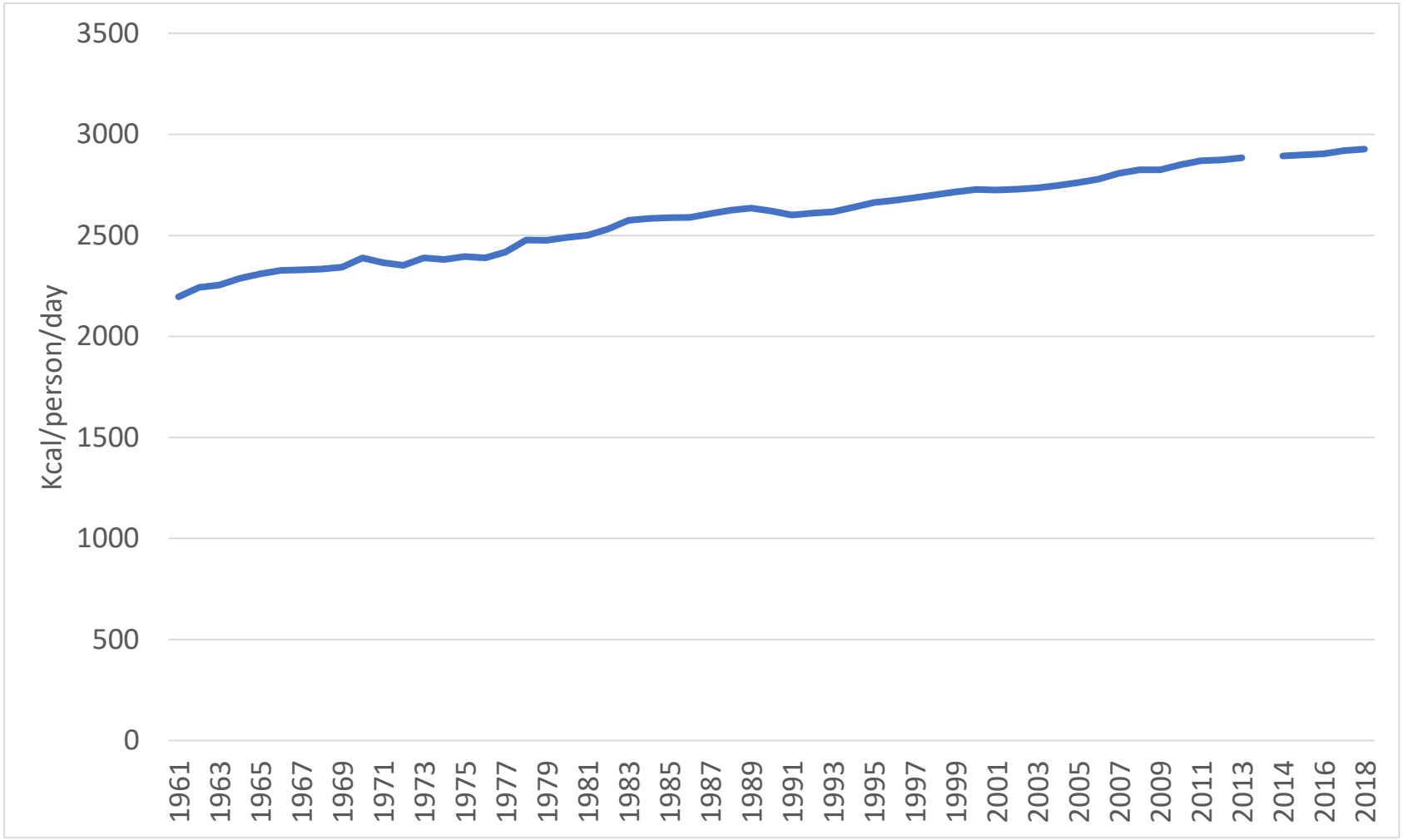
Table 2: Examples of impact of selected shocks on settings

Shock	Setting in which shock takes place/Impacts on that setting	Possible Impacts on Other Settings
Floods, landslides, earthquakes, hurricanes	**Physical:** Destruction of public physical infrastructure (roads, bridges, clinics, water systems, etc.)	**Economic:** increased prices of food and other goods **Social:** breakdown of social cohesion if recovery is not rapid
Drought	**Physical:** Reduced soil moisture for plant growth	**Economic**: increased prices, reduced availability of food; possible decisions by government to limit food trade
Ethnic strife	**Social:** Reduced social cohesion, increased violence	**Political:** More authoritarian government **Legal:** More restrictive laws; less personal freedom **Physical:** Destruction of public infrastructure **Economic:** Increased prices

Table 3: Examples of impact of selected shocks on household assets and transformation processes

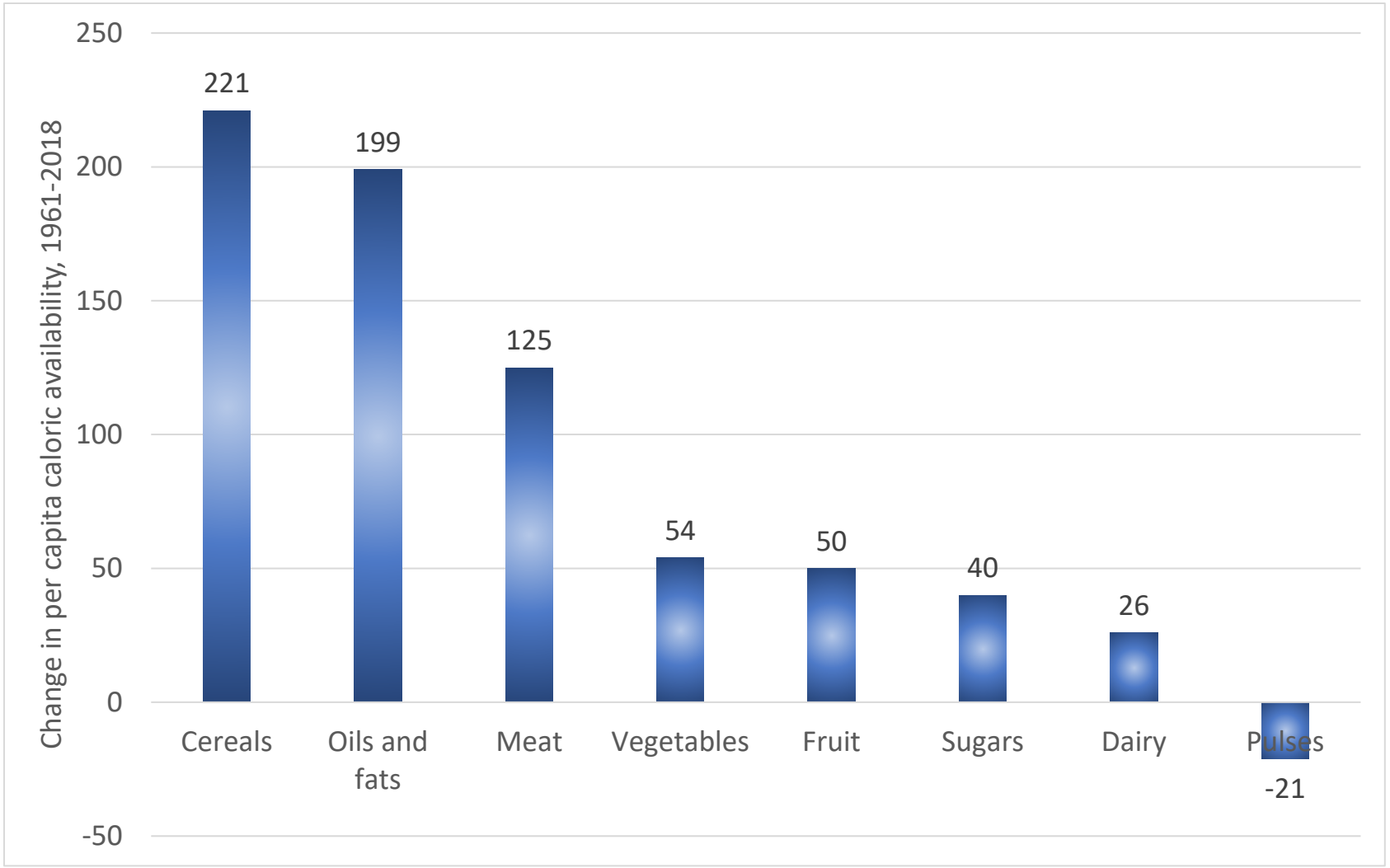
Shock	Impact on Household Assets	Impact on Activities and Outcomes	
		Availability of and Returns to Income Earning Activities	Food availability and price
Floods, landslides, earthquakes, hurricanes	• Damage or destruction of productive and other household assets	• General reduction in wage labor and other off-farm opportunities • Reduced access to agricultural inputs; inability to sell agricultural surplus	• Increase real costs of food and other goods consumed by the household • Some goods either unavailable or rationed
Drought	• None	• Reductions in returns to labor and other inputs in agriculture • Fewer wage labor opportunities in agriculture	• Increased real costs of food; staples may be unavailable
Ethnic strife	• Damage or destruction of productive and other household assets • Temporary/permanent confiscation of physical assets • Loss of labor through abduction, conscription or imprisonment • Forced relocation	• Reduced access to ag inputs; difficulty selling ag surplus • Reductions in returns due to insecurity, lower output prices • Reduced hiring of agricultural labor	• Increases in real cost of food and other goods consumed by the household • Some goods either unavailable or rationed

Figure 1: Daily per capita caloric availability, global, 1961-2018



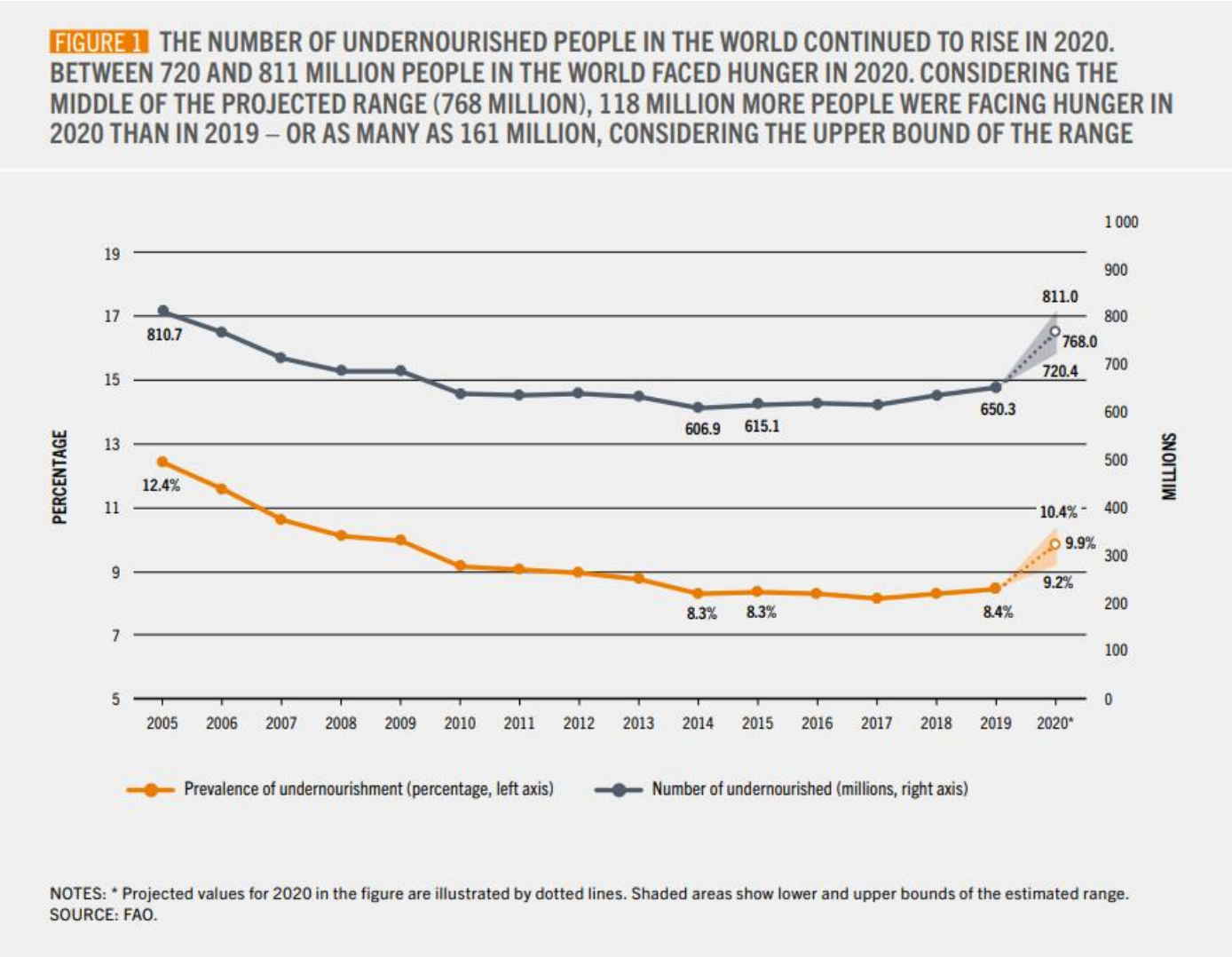
Source: Authors' calculations based on FAOSTAT

Figure 2: Changes in daily per capita caloric availability by food group, global, 1961-2018



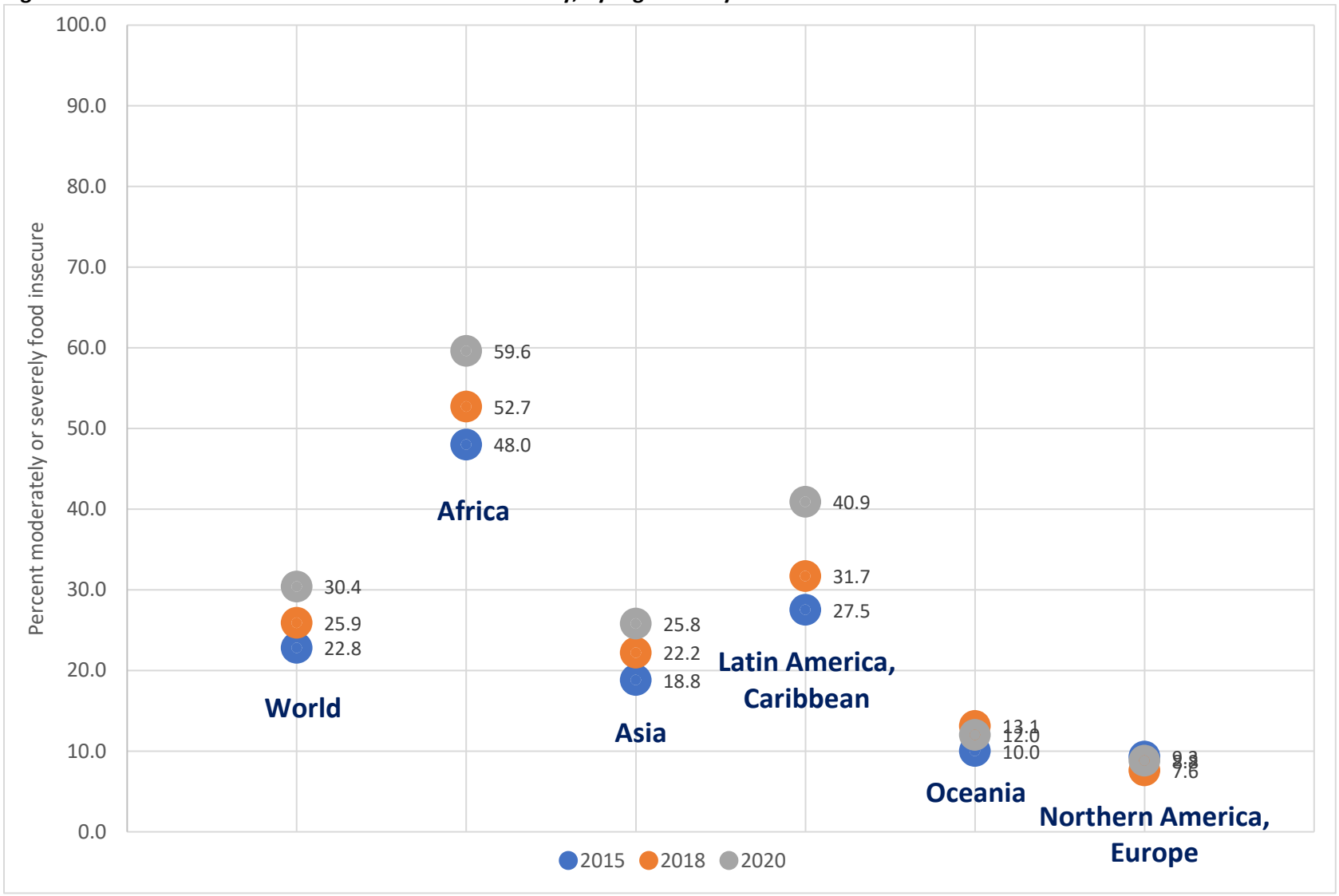
Source: Authors' calculations based on FAOSTAT

Figure 3: Trends in the number of persons considered undernourished, 2005-2020



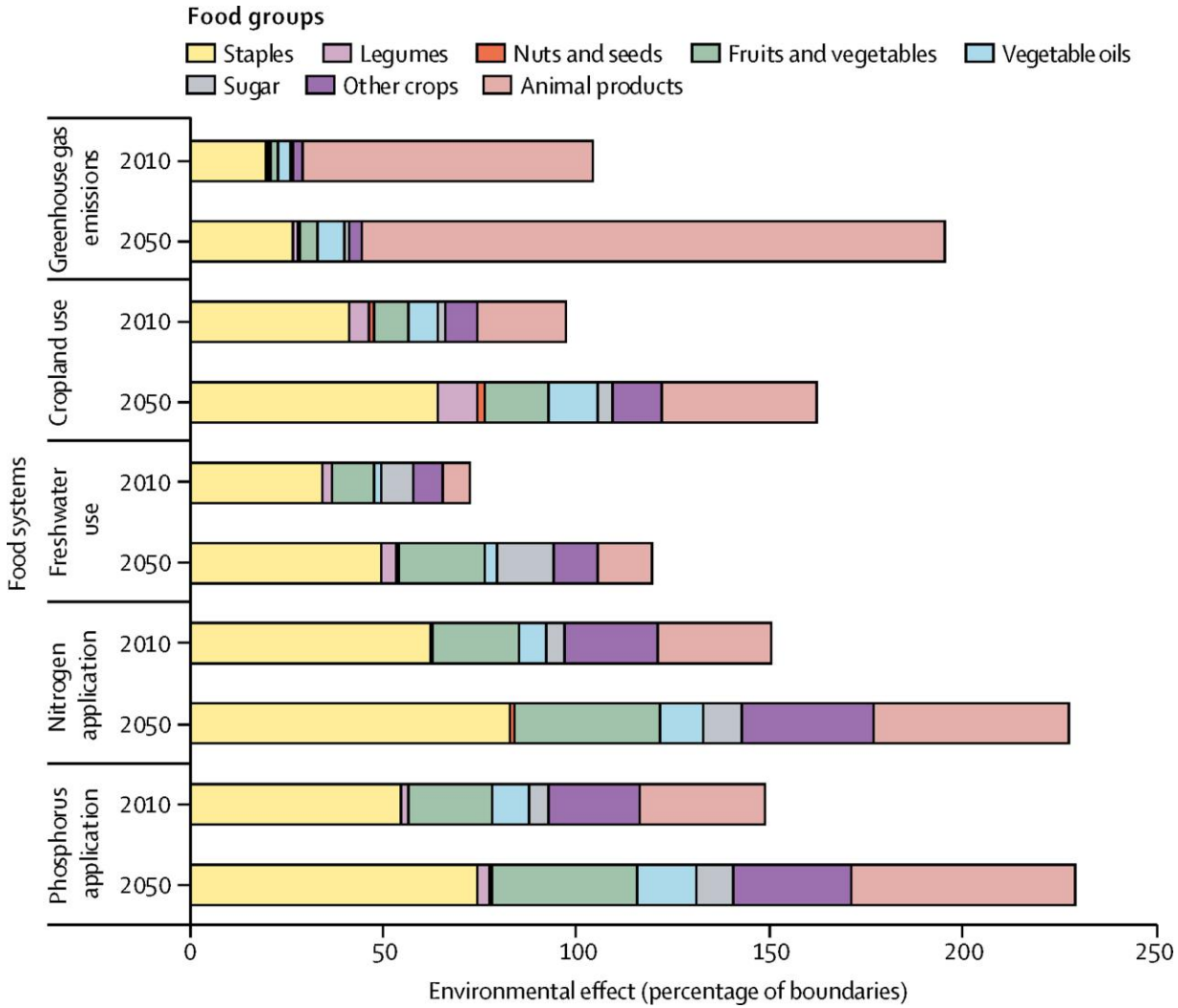
Source: FAO, 2021a.

Figure 4: Prevalence of moderate or severe food insecurity, by region and year



Source: FAO, 2021a.

Figure 5: Percentage of environmental boundaries by food group and food system component, 2010 and 2050



Source: Willett et al, (2019).

Figure 6: Entitlements, food systems and their links to food access

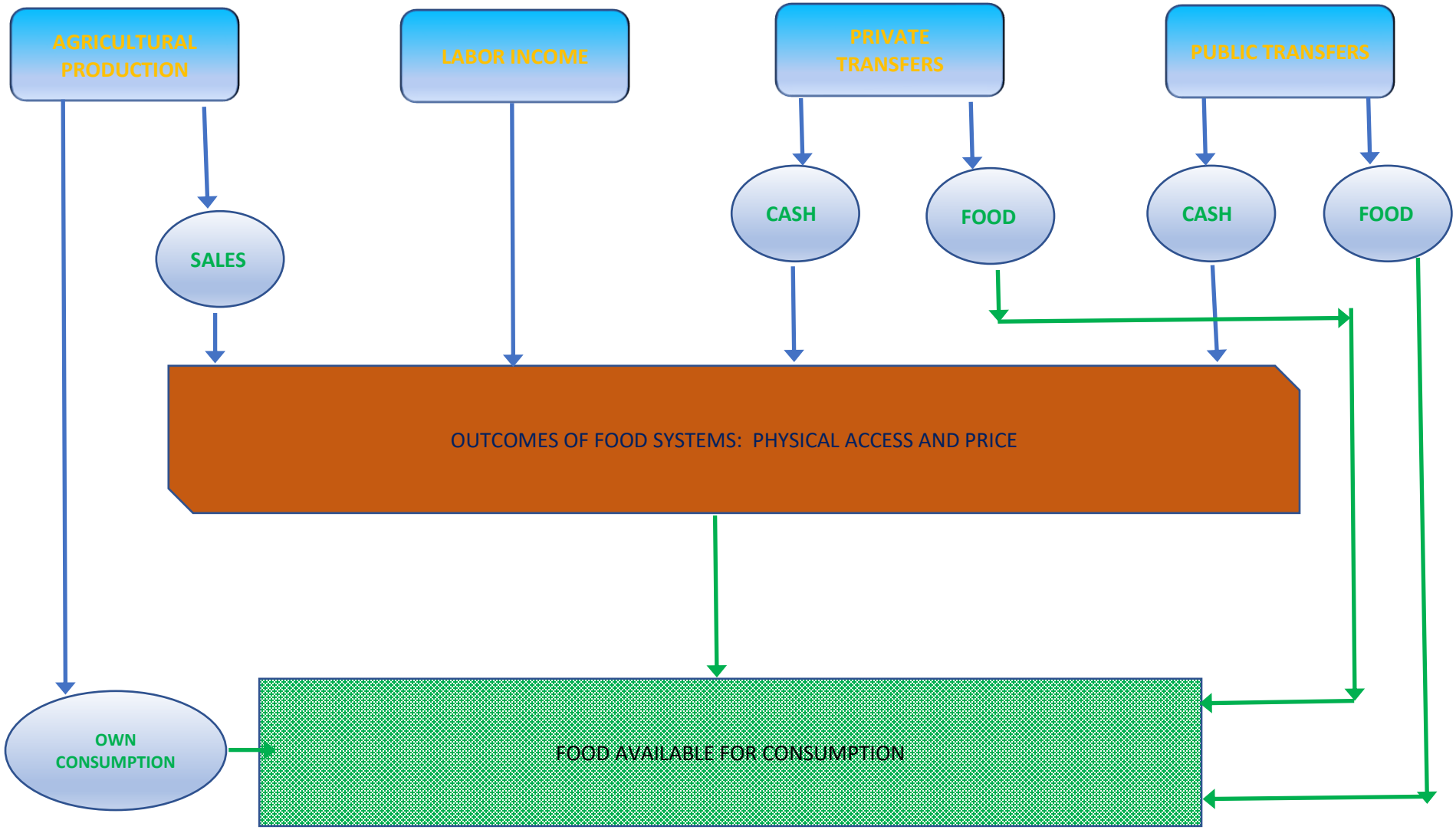
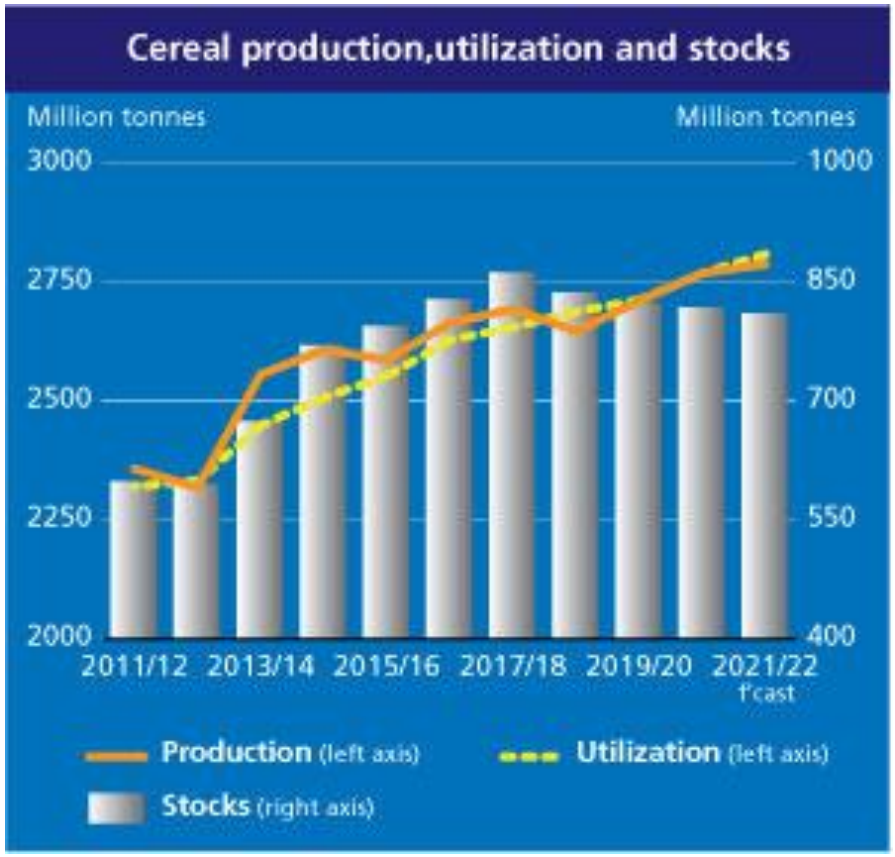
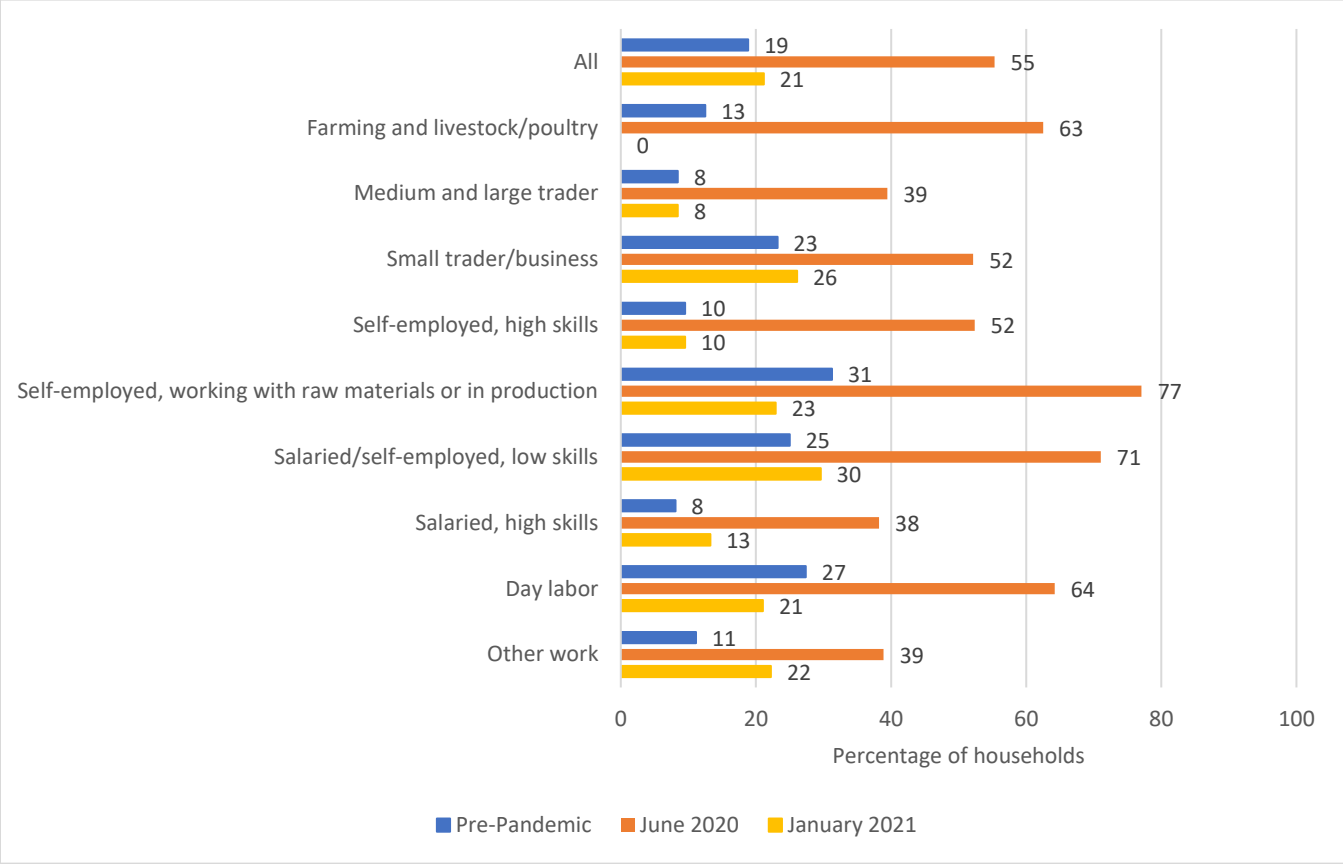


Figure 7: Trends in global cereal production, utilization, and stocks: 2011/12 to 2021/2022



Source: FAO (2021b)

Figure 8: Prevalence of moderate or severe food insecurity, in urban Bangladesh, by survey round and occupation



Source: Ahmed et al (2021).