Background Briefing Note for FCDO: Integrating Climate and Nature Sustainability into Food Crisis Responses

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Just Rural Transition

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Abstract

Russia's invasion of Ukraine has tipped the world's food system into crisis, exacerbating underlying fragilities and accelerating the rise of food, fuel and fertilizer prices. With the immediate threat that this will push millions more people into severe hunger, national governments and international organizations are mobilizing fiscal and trade policy action to make food more accessible and stave off pending production shortages.

However, measures to tackle underlying climate and environmental drivers of the food crisis – including extreme weather events, falling precipitation, soil degradation and water depletion – are far and few between. Far from using the opportunity to build longer-term resilience, reduce greenhouse gas emissions from agricultural production and boost ecosystem health to deliver sustainable and healthy nutritional outcomes, short-term responses run the risk of reproducing, entrenching and amplifying structural fragilities in the food system, undermining future food security.

This paper suggests a range of policy responses in the short and longer term that can maximize these opportunities and minimize the risks to achieve a triple win for people, climate and nature.

Executive summary

Tipping a fragile food system into crisis

The world is undergoing a food crisis that has been building for some time. The invasion of Ukraine has tipped the food system's capacity to deliver over the edge, but the underlying drivers – frequent and accentuated climate extremes, conflict and economic shocks – have increasingly undermined the resilience of the food system (FAO et al., 2022; Benton, 2022).

Global food prices have surged 65% since the start of the COVID-19 pandemic and by 12% since the Russian invasion of Ukraine began in February 2022 (FAO, 2023). By the end of October 2022, crude oil had become 132% more expensive than it was two years previously (Statistica, 2023), while fertilizer prices have risen nearly 30% since the start of 2022, following an 80% leap in 2021 (Baffes and Koh, 2022).

Moving from a crisis of access to a crisis of availability

These price hikes risk forcing millions more people into severe hunger and moving the world even further away from the global goal of ending hunger, food insecurity and malnutrition by 2030. The combined price increases have caused a "crisis of access" (Torero, 2022), pushing more vulnerable households – typically low-income, net food buyers in places where food expenditure constitutes a high proportion of their total outlay – into severe hunger in both urban and rural areas.[1] Additionally, farmers using fertilizers may see their margins squeezed, depending on whether output prices rise by less than fertilizer and fuel prices.

A "crisis of availability" (ibid.) is not far down the road as farmers react to fertilizer price increases by shrinking planted area of wheat and maize, reducing fertilizer use or switching to less fertilizer-intensive crops, such as soya (USDA FAS, 2022a). In some regions, high commodity prices may spur producers to increase the amount of land under cultivation, but there is uncertainty about yields given high fertilizer prices and unpredictable weather (USDA FAS, 2022b). Global wheat and maize stocks are currently at healthy levels but have declined over the last four years, constraining the food system's capacity to compensate for near-term production shortfalls.

Emerging fiscal and trade policy responses

Experience from previous crises[2] provides lessons about what could work and what to avoid in tackling immediate needs and smooth out price rises (Pinstrup-Andersen, 2015; Wiggins, 2022a; Glauber and Laborde, 2022). These include:

- Keep trade flows of food and inputs open and flowing with strong global coordination rather than restricting exports.
- Use direct, targeted support to get money to vulnerable consumers and farmers to support them until the price of food and inputs stabilize.
- Continue to develop an understanding of the drivers and impacts of the crisis, adapting responses as this understanding evolves.

[1] On average, households in lower-income countries spend 45% of their budget on food.
[2] Particularly the 2007/08 food price spike and the COVID-19 pandemic.

Emerging national responses do not strongly reflect these lessons – countries are typically placing restrictions on exports of food and fertilizer to reduce pressure on domestic prices (Laborde, 2022). Relatively few countries so far have taken steps to protect domestic consumers from rising food prices through targeted transfers and subsidies (Allianz SE, 2022).

Emerging responses from international financial institutions follow these principles more closely, emphasizing the need to promote open trade of food and making targeted support to meet the immediate needs of vulnerable people a central pillar of planned responses (African Development Bank et al., 2022).

Linking people, climate and nature in food systems

What is much less present in responses to the food crisis are short- and longer-term actions to address underlying drivers related to climate change and ecosystem health, and deliver sustainable and healthy nutritional outcomes. Extreme weather arising from climate change is an increasing driver of current and future food crises. Changes in temperature and rainfall, shifting pests and diseases, and increasingly frequent extreme weather events are already impacting production. With some climate-related changes already locked in, adaptation and the development of longer-term resilience will be key to food security.

Agriculture and food systems – currently based around production and consumption of a narrow range of staple foodstuffs – already generate a third of greenhouse gas (GHG) emissions and are the major cause of biodiversity loss, groundwater depletion and water pollution.

Particular causes for concern related to the current food crisis include:

1. **Fertilizer manufacture and use**: Fertilizer manufacture accounts for approximately 1% of global GHG emissions. If associated nitrous oxide emissions from (over-) applying fertiliser are also taken into account, the total increases to 2.5% of the global total (Zhang et al., 2017; Farm Carbon Toolkit, 2023). Excess application of nitrogen fertilizer has also caused surface and groundwater pollution (Singh and Craswell, 2021), posing a direct threat to human health and undermining aquatic ecosystem functions (ibid.).
2. **Soil health**: Soil erosion from agricultural fields is estimated to range from 10 to 20 times (under no tillage) to more than 100 times (under conventional tillage) higher than the rate of soil formation (IPCC, 2019).
3. **Methane emissions from livestock**: Livestock production has been responsible for 33% of total global methane emissions and 66% of agricultural methane emissions since 2000 (Zhang et al., 2017).
4. **Land use change**: The agriculture sector generates GHG emissions through land use change that, combined with land use change from other sources, such as logging, accounts for 10% of global GHG emissions; in 2001–2015, agricultural expansion resulted in the loss of 123 million hectares of forest (Curtis et al., 2018).

As a result of these aspects of the food system, “business-as-usual” production, processing and logistics will double GHG emissions from agriculture by 2040 and increase biodiversity loss, soil degradation and water depletion, both directly and through land use change. Furthermore, climate change is estimated to have slowed the rate of global

agricultural productivity growth.[3] The impacts of these factors further heighten risk to future food security.

In parallel, unsustainable and unhealthy food consumption patterns are increasing, related to (often unequal) income growth, the relatively high cost of a healthy diet and the location and marketing of food sales. Alongside the 820 million people who still lack sufficient food, many more consume either low-quality diets or too much food, "posing a greater risk to morbidity and mortality than unsafe sex, alcohol, drug and tobacco use combined" (Willett et al., 2019). This is pushing natural resource use beyond planetary boundaries.

The way through the crisis to a sustainable food system

Opportunities and guiding principles

Previous responses to food crises did not address these underlying drivers (Pinstrup-Andersen, 2015). Making the same mistake now risks reproducing and entrenching structural fragilities, undermining the resilience of food systems and aggravating the frequency and severity of future crises. It also misses the opportunity to transform the food system and achieve sustainable and healthy nutritional outcomes.

Compared to previous crises, we now have more information about what solutions could alleviate shortages; better awareness of the consequences of climate change and environmental degradation for human health and agricultural pests and diseases; and a stronger sense of the rapidly narrowing window for mitigating climate change and building greater resilience to changes already embedded. This knowledge and urgency need to be reflected in how policymakers decide to allocate scarce resources, both domestically and via international aid.

At the same time, political decision makers and policymakers need to avoid a kneejerk reaction to what are certainly alarming projections of worsening hunger and malnutrition and focus solely on short-term actions to shore up domestic food availability. Instead, they need to work in a globally coordinated manner to integrate climate and environmental considerations into measures to improve the availability of, and access to, food over the medium and longer term. Doing this when the world is fragmenting into blocs of geopolitical alliances around the Russia-China axis, the West and the "Rest" will be particularly challenging (von Hippel and Fry, 2022; Liao, 2022).

Some practical policy suggestions

In the short term, immediate actions are needed to protect vulnerable households from the sharp increases in prices of wheat, maize and edible oils. These include globally coordinated action between governments to smooth out price rises by facilitating trade flows from net exporting countries to net importers, and targeting poor households which are net buyers of food in both urban and rural areas with cash transfers to improve access to food.

However, decision makers will soon need to take steps to increase food availability to stave off impending reductions in planted area and yields. There are three ways this could be done: increasing production through improving yields or increasing planted areas; switching

[3] Global farm productivity growth since 1960 is estimated to be 21% lower than it could have been without climate change (Ortiz-Bobea et al., 2021).

grain out of other uses, such as animal feed; and changing diets to reduce the land, water and other inputs needed to produce food.

These approaches can have widely differing impacts on whether the agricultural sector accelerates or slows global warming, protects or erodes biodiversity and strengthens or weakens the long-term resilience of the food system. To take these impacts into account, policy responses need to address four areas:

1. Changing *how* food is produced;
2. Monitoring/controlling *where* food is produced;
3. Transforming *what* food is produced and consumed; and
4. Improving how food is *used*, *transported* and *stored*.

Possible actions for these four areas are explored in Tables 1–4. Annex 1 summarizes these actions in a matrix of policy dos and don'ts to ensure positive climate and environmental outcomes as well as food security.

Changing *how* food is produced

Many of the responses needed align with long-standing recommendations in agricultural development on how to strengthen resilience in farming and reduce negative climate and environmental impacts. These focus on: improving soil and water use and management to reduce and reverse degradation; making input use more efficient to avoid water pollution and damage to biodiversity; changing the type of inputs to those that contribute to a more circular economy; and changing production techniques to increase soil quality to boost yields, soil biodiversity and carbon retention. Policymakers could assess short- and long-term responses against these objectives and redouble efforts to tackle the political, economic and social barriers to producing food in a more sustainable way.

In the short term, policymakers and donors could use existing measures to amplify environmental benefits, including:

Using social assistance programmes to improve ecosystem management and build longer-term resilience

Employment-based social assistance or public works programmes can combine short-term, cyclical social protection needs with longer-term livelihoods interventions that focus (at least in part) on ecosystem restoration and climate mitigation, such as watershed management. Such programmes can offer multiple benefits in terms of improvements in local ecosystems and natural capital, carbon sequestration and local biodiversity conservation (Norton et al., 2020).

Relevant schemes could be scaled up to expand coverage and increase support during shocks, such as spiking food prices, while improving environmental outcomes and building longer-term resilience. Some schemes already have vast coverage and a roster of eligible households – or a participatory process to identify eligible households – which could be used and extended to cover others who have fallen into food insecurity due to the food price shock. Long-standing lessons about the need to strengthen institutional systems for delivering social assistance to enable a more effective combination of social and environmental objectives could be applied (Norton et al., 2020).

Improving fertilizer use and availability

Across-the-board cuts in fertilizer application are neither feasible nor efficient and fertilizers have a role to play in bolstering food security. Certain countries and regions, particularly in sub-Saharan Africa, need to use more fertilizer to reduce deforestation and degradation caused by agricultural expansion (Ritchie et al., 2022).

However, there are significant trade-offs to consider when taking short-term measures that entrench dependency on a limited number of fertilizer-producing countries. It is important that these measures do not incentivize fertilizer use efficiency or lock in inefficient production technologies and infrastructure, such as increasing broad-based fertilizer subsidies or financing new fertilizer plants that rely on conventional technology.

Measures that could help in the short and medium term to achieve both social and environmental objectives include:

1. **Provide targeted help through direct transfers to poorer farmers who currently use mineral fertilizers** and who are likely to cut back their fertilizer use, even when they know the returns outweigh the costs.
2. **Strengthen global cooperation on fertilizer use efficiency and environmental standards** to reduce emissions and pollution without impacting on crop yields.
3. **Accelerate projects to decarbonize the fertilizer supply chain** using technological improvements or by scaling up circular economy approaches.
4. **Scale up initiatives to increase access to and use of organic fertilizers and a circular economy approach between livestock and crop production**, using locally produced composted or fermented animal manure[4] to apply on fields instead of – or to complement – synthetic fertilizer.
5. **Change production practices for next planting season**, planting legumes either singly or intercropped to fix nitrogen in the soil.

Policymakers would need to assess conditions for accelerating and scaling up such initiatives in each context and the time needed to set up systems, establish infrastructure, understand incentives and manage the transition. The case of Sri Lanka is a cautionary tale in transitioning away from synthetic fertilizers too abruptly.

Controlling and monitoring *where* food is produced

The combination of rising food and fertilizer prices heightens the risk that incentives are created for clearing land for extensive agricultural production, particularly in areas with poor environmental and land governance and enforcement capacity. This could disproportionately encroach on land rich in biodiversity and carbon stocks, and existing land users with relative high levels of tenure insecurity.

Where environmental governance is more robust, facilitating the use of such land through relaxing existing environmental regulations is unlikely to have significant impacts on production in the short term and will potentially lose the environmental benefits built up from protecting such land (Glauber and Laborde, 2022).

[4] Raw manure can introduce pathogens into fresh food.

In the short and medium term, policymakers could adopt a series of responses focused on:

1. **Strengthening real-time monitoring of land use change**, combined with data on food and fertilizer prices in different countries, focused particularly on environmental hotspots. Existing monitoring systems could be put on high alert and linked up more strongly with global institutions with the mandate to monitor food security, such as the FAO, to combine information. The Committee on World Food Security (CFS) could be used as a platform to flag emerging land use change linked to agricultural extensification in environmentally sensitive areas.
2. **Increasing the scrutiny of proposed agricultural investment projects and respect for existing land use rights** through heightened monitoring of land-based agricultural investment projects and expanded support for agricultural investment agencies. This can be accompanied with bursts of intensive activity to improve the quality of real-time information available and enable governments to act on it.

Transforming *what* food is produced and consumed

Diversifying food production

A long-standing body of literature points to the benefits of diversifying food production. Crop diversification at the household level has widely been shown to increase resilience, improve food security (and dietary diversity), suppress crop disease and increase incomes (Mango et al., 2018; Adjimoti and Kwadzo, 2018; Lin, 2011; Vernooy, 2022). At a national and global level, diversifying food sources is key to strengthening food security by providing alternatives to staple foods if there is a shock or crisis (Benton, 2022).

Seven broad diversification strategies tend to be used: agroforestry, associated plant species, cultivar mixture, intercropping, landscape heterogeneity and crop rotation (Vernooy, 2022). Exploring alternative crops for commercial production as a substitute for imported grains can reduce reliance on volatile imports while strengthening local food systems.

Elements of these measures can be adopted in the short term as a way of alleviating food availability. Governments and the international community can **accelerate and adapt programmes to support the diversification of production in the next planting season**. This can include horticultural products, legumes and indigenous staples.

Ideally, short-term responses need to avoid supporting the production of a narrow range of staples, such as wheat and maize, which could crowd out farm-level investments in resilience and lock in production practices (such as monocropping) that, over time, can themselves threaten food security.

Healthy and sustainable diets

Changing food consumption patterns could reduce the overall level of inputs needed to produce enough food while remaining within planetary boundaries, improving the chance of reaching targets set out in the Paris Agreement (Willett et al., 2019).

However, there are several challenges to achieving more environmentally sustainable consumption patterns. This includes the affordability[5] and availability of healthier foodstuffs, both of which vary significantly at the local level. Environmental impacts can also vary. Even with measures to address structural constraints to the affordability and availability of

[5] In high-income countries over the last 30 years, the cost of healthy items in the diet has risen by more than that of less healthy options, a trend now being mirrored in emerging economies (Wiggins, 2015).

healthier foods, it is notoriously hard to change consumption preferences, which are governed not just by affordability but by sociodemographic, psychological and other factors.

This implies that demand-side responses to the food crisis need to focus more on medium- and long-term measures that: reduce the costs of healthy diets; adapt and test proposed dietary guidelines for different countries; increase availability of healthy foodstuffs through better urban planning; support the production, storage and logistics of fish and fresh fruits and vegetables; and understand and address the constraints to changing consumer preferences.

However, in the short term, there are some actions that can be taken, including:

1. **Scaling up nutrition-sensitive social assistance programmes**, incorporating nutrition-sensitive social protection interventions into national and regional humanitarian responses.
2. **Producing tailored messaging for different consumer groups** about moving to more nutritionally balanced diets to improve personal and planetary health, and food security (mirroring the messaging on energy security and reducing dependence on Russia).

In the short term, responses to the food crisis would ideally avoid broad-based subsidies to energy-dense, but nutritionally poor and narrowly based, foods.

Improving how food is *used* and *stored*

Minimizing post-harvest crop loss and food waste is key to increasing the availability of food from a given set of inputs while improving environmental sustainability. Around one-third of all food produced for human consumption is wasted, costing $1 trillion annually (FAO, n.d.) and generating GHG emissions from production and waste products (FAO, 2013). Furthermore, nearly 60% of grains in 2020/21 were used for animal feed rather than direct human consumption (FAO, 2022a).

Reducing post-harvest food loss and waste

National governments and international funders could increase resources to existing programmes to reduce post-harvest crop losses and encourage consumers and food companies to minimize food waste through communications campaigns.

Stocks

Food reserves can be an important way of smoothing out fluctuations in supply and demand to reduce food price volatility and increase food security (Laio et al., 2016; Drechsler, 2021). However, it can be expensive to maintain stocks over long periods over time, particularly when they may only need to be used infrequently (Wiggins et al., 2013; World Bank, 2021; Fathallah and Robertson, 2021).

Using grains for animal feed and biofuels

An alternative to holding large food reserves is to switch grain use from animal feed to human consumption and relax biofuel mandates in order to release more maize from ethanol production and oilseeds from biodiesel production. In 2020/21, only 15% of coarse grains (including maize, wheat, barley and sorghum) produced globally was used for food; 59% was used for feed and 26% for other uses (FAO, 2022a). The feasibility of this in different

countries depends on economics, international trade conditions and technical specifications of grain.

The large volumes of maize used for biofuels in the United States make it more promising for lowering international grain prices. However, relaxing ethanol mandates is unlikely to encourage such a switch if the relative prices of maize and oil make it profitable to continue producing ethanol.

Short-term actions include:

1. **Monitor closely short-term changes in the consumption of animal products** to see if demand for animal feed falls as incomes are squeezed, freeing up production into markets where feed specifications make human consumption possible.
2. Through global cooperation platforms, **encourage discussions of alternative animal feed sources and longer-term, planned switches of grain** normally destined for animal feed in countries that affect global grain prices.

Governments would ideally avoid creating incentives to increase meat consumption or targeting livestock producers with cost-reducing efforts in countries with a high per capita consumption of meat.

Longer-term options could focus on reducing the need for industrial feed for livestock; promoting alternatives, including grass-based feed; and adopting more circular farming models in countries with large industrial production.

Next steps for delivery

Ensuring that short-term food crisis response helps to address, rather than entrench climate and environmental threats will need further work at technical, political and diplomacy levels. Suggested **immediate steps** include:

- Accelerate and scale up implementation of existing programmes that already address climate and environmental issues in food production while addressing food security.
- Integrate measures with positive climate and environmental impacts into other existing programmes designed to boost food availability and access, such as social assistance programmes.

Over the **longer term**, more structural changes are needed in food system dynamics, including:

- Repurposing public support to food and agriculture to reform policies that incentivize harmful and/or inefficient use of land, water and chemicals, and redirect resources to climate-resilient and sustainable production.
- Supporting behavioural change in food consumption and food waste.

Introduction

Against a backdrop of extreme weather events and a narrowing diversity of global food production, the war in Ukraine has pushed up food prices around the world. The accompanying rises in fuel and fertilizer prices have reduced farmer margins in some key producing countries and lowered incentives to increase production. The price hikes risk forcing millions more people into severe hunger and moving the world even further away from the goal of ending hunger, food insecurity and malnutrition by 2030.

Previous food crises have taught us valuable lessons about which policy responses can flatten price spikes and protect the most vulnerable. They have also highlighted the role of climate change in making food crises more likely and exposing the underlying fragility in our food systems. Yet there has been little scrutiny of the climate and environmental impacts of previous policy responses.

Short-term actions to address the immediate need to support those most affected by food price rises and boost production need to avoid exacerbating the climate and environmental drivers of such crises and making the world more vulnerable to repeated and more frequent emergencies in the future.

Context: The war in Ukraine highlights the fragility of the global food system

In 2021, up to 828 million people suffered from chronic hunger (FAO et al., 2022). This exceeds levels in 2015, when the world set itself the goal of eliminating hunger, food insecurity and malnutrition by 2030. Since then, severe food insecurity increased in every region of the world, most particularly in Central and Western Africa and in South Asia (ibid.).

This situation looks set to become worse in the future as the major drivers of food insecurity and malnutrition – "conflict, climate extremes and economic shocks, combined with growing inequalities" (FAO et al., 2022) – intensify. These underlying drivers have been accentuated by the war in Ukraine, a key exporter of wheat and edible oil. In mid-July 2022, the World Bank's Agricultural Price Index was 19% above levels in January 2021; maize and wheat prices were 15% and 24% higher, respectively (World Bank, 2022). Between April 2020 and March 2022, energy prices rose at rates not seen since the 1973 oil price spike (World Bank, 2022), and food and fertilizer price increases were the greatest outside of 1973 and the food price crisis of 2008.

This raises the spectre of severe hunger affecting millions more people. If the war in Ukraine results in a prolonged reduction of exports of wheat, maize and edible oils from Ukraine and the Russian Federation, the number of undernourished people globally could increase by between 8 and 13 million in 2022/23 (FAO, 2022b). The most pronounced increases would take place in Asia-Pacific, followed by sub-Saharan Africa and then the Near East and North Africa (ibid.).

Countries highly dependent on imports of wheat and maize, such as Somalia, Egypt and Lebanon, are particularly vulnerable, as are those whose consumers have narrow diets focused on wheat and maize without easily available alternatives (Benton, 2022; Wiggins, 2022a). Food price spikes, such as the one in 2007/08, can worsen malnutrition, particularly for children in poor households that do not produce for home consumption. This can potentially lead to lifelong disadvantages (Yamauchi and Larson, 2018).

A crisis of access

2022 was characterized by a **crisis of access** (Torero, 2022): food prices were high but global stocks of rice, wheat and maize – the world's three major staples – remained reasonably healthy and high relative to levels during the 2007/08 food crisis (Pangestu, 2022).[6] Estimates suggest that about three-quarters of Russian and Ukrainian wheat exports for 2022 had already been delivered before the war started (ibid.), avoiding the destruction of crops and the blockade of grain exports.

[6] However, global wheat stocks have been falling since 2017, which has contributed to the rise in food prices.

Moving to a crisis of availability

Despite the healthy global stocks of rice, wheat and maize, 2023 may become a **crisis of availability** (Torero, 2022) as farmers react to fertilizer price increases by reducing planted area or switching to less fertilizer-intensive crops, such as soya (USDA FAS, 2022b). In some areas, high commodity prices may spur producers to expand the amount of land under cultivation, but there is uncertainty about yields given high fertilizer prices and unpredictable weather (ibid.). This is likely to be compounded by a squeeze on Ukraine's production and exports: Ukraine's 2022/23 harvest could come in almost 40% lower than in 2021/22 due to disruptions directly related to the war as well as limited available supplies of fuel and inputs. And unless Russia's blockade of Ukraine's Black Sea ports is lifted over a sustained period, the country's grain exports could fall to 18 million tons. This is just one-third of the 54 million tons exported in the 2021/22 marketing year (Brower, 2022).

Lessons from previous crises

What can previous crises teach us about how best to respond to the short-term needs and underlying drivers of the current food crisis? The food price spike of 2007/08 and the COVID-19 pandemic are two key reference points and have yielded insights into how best to respond – and what to avoid. However, analyses of these events have focused on price impacts and the short-term efforts to smooth these. There has been little analysis of the climate and environmental impacts of policy responses to previous crises, although some of these can be inferred.

Lesson 1: Keep trade going rather than take refuge behind national trade restrictions. When large food-producing countries restricted exports during the 2007/08 food price hike, in an effort to conserve their domestic food supply, they exacerbated price increases (Pangestu, 2022). During the 2007/08 food price spike, nearly three-quarters of emerging markets and developing economies took action to insulate their economies (World Bank, 2019). These measures were judged to be "ineffective in stabilizing domestic prices, on average, while increasing further world prices" (Amaglobeli et al., 2022). In the long run, bans on food exports by net food exporters can dampen production incentives, causing food output and producer incomes to shrink, and reduce domestic supply by encouraging smuggling to countries with higher prices (ibid.; Laborde and Mamun, 2022). In addition, such measures can crowd out productive spending, particularly where fiscal space is already constrained (Amaglobeli et al., 2022).

The COVID-19 pandemic showed another, more cooperative path which helped to reduce disruptions to global food supply. In this instance, countries maintained food trade flows despite lockdowns which restricted logistics and labour mobility (Pangestu, 2022).

Lesson 2: Ensure systems are in place for targeted cash transfers to support consumers and vulnerable households in both urban and rural areas. The 2007/08 food price spike laid bare that few low-income countries had safety nets in place that could be scaled up when prices rose; countries where half or more of the population were vulnerable simply did not have the resources to provide protection (Wiggins and Keats, 2013). As Wiggins (2013) states: "a clear lesson from the spike is that if safety nets are not in place, they cannot be created quickly enough to make a difference." Since 2008, countries have taken huge steps to set up systems to get cash transfers to consumers (Wiggins, 2022b). The COVID-19 pandemic has provided further insights. First, in the very short term, governments can only pay out to people already on social programme registers because they are already classified as low income. Second, governments may not have the fiscal ability to give people anything approximating adequate compensation: the average payment to people under COVID-19 was $5 per person in low-income countries; in middle-income countries, it was about $49 per person (ibid.).

In addition, governments and donors will need to recognize the full spectrum of those needing support and the differentiated approaches required. Responses in the 2007/08 crisis were biased towards urban areas; in general, there was no appreciation that poor rural households might be equally vulnerable (Wiggins and Keats, 2013).

Support to consumers can be provided in different ways: price controls, vouchers for food, ration books or direct cash transfers. All of these require identifying those in most need in enough detail to plan responses (Wiggins, 2022a). Of these options, direct cash transfers

have proved to be the least costly and be less demanding administratively. However, what can be done in the short term depends on the administrative capacity and experience of national agencies (ibid.).

Support for farmers – to cushion the blow of increased input prices, for example – also best takes the form of direct cash transfers. This is facilitated by increasing cellular phone usage among farmers (ibid.). For the many smallholders who use little or no mineral fertilizer, higher fertilizer prices will not have a significant impact. However, high prices are more likely to affect farmers with irrigated fields and in high-potential zones, particularly for high-value cash crops, such as cotton and vegetables, which may be fertilized, especially when they are irrigated (ibid.). These farmers could benefit from schemes to reduce input costs.

Lesson 3: Adopt a measured response. Countries should avoid panic buying and hoarding, as this will only serve to push prices up further in the short term (Glauber and Laborde, 2022). Countries also need to avoid early judgments. These may prove wrong as more is understood of the crisis, and responses need to be adapted as understanding of the crisis changes (Wiggins, 2022a).

As with any response, policies will need to acknowledge the diversity of impacts and policy interventions for different regions and households: whether a country or household is a net buyer or seller of food, whether general economic growth offsets price rises and the capacity of the government to provide public goods and services, and social protection (Wiggins and Keats, 2013). Ex-post analysis of the impact of the 2007/08 crisis showed increased self-reported food insecurity in urban Africa, but improved food security, on average, in rural Africa (Verpoorten et al., 2012). In India, higher prices resulted over the longer term in greater welfare of rural households, as higher agricultural prices prompted more use of labour on farms and additional investments, raising rural wages (Wiggins and Keats, 2013).

Emerging policy responses

Given the nature of the current crisis, there are risks that short-term measures focused mainly on boosting production of a narrow range of staple foodstuffs will reproduce and entrench structural fragilities in the food system and not address the underlying drivers of the current and future crises. While immediate food security needs are the priority, there is the opportunity to transform the current food system away from one with a narrow focus on a few food crops and that is often reliant on cropping patterns and input use that degrade the environment and hasten global warming. There is also an opportunity to move away from unsustainable and unhealthy food consumption patterns related to (often unequal) income growth, the high cost of a healthy diet and the way that food is provided. Cooperation at local, national and global levels is vital will be key to ensuring that different policy responses steer the food system away from this direction (Committee on Food Security, 2022).

Emerging national policy responses

Despite the lessons from previous crises, many national policy responses seem to be replicating some previous patterns and missing the opportunity to shift the food system onto a new trajectory. These actions typically revolve around placing restrictions on exports of foods or fertilizers to reduce pressure on domestic prices (Laborde, 2022).

Trade restrictions

- 23 countries currently have imposed bans, licensing arrangements or taxes on exports of foodstuffs, principally grains and oilseeds. This is up from seven countries at the end of February 2022, when Russia began its invasion of Ukraine.
- Two of the world's largest producers and exporters of fertilizer – Russia and China – had already imposed export restrictions (bans and/or licensing) before the invasion of Ukraine (USDA FAS, 2022b).

Fertilizer subsidies

A few countries, such as India, have responded to rising fertilizer prices by increasing fertilizer subsidies (Reuters, 2022).

Consumer transfers and subsidies

Relatively few countries so far have taken steps to protect domestic consumers from rising food prices (Allianz SE, 2022) through transfers and subsidies.

Land use regulations

The European Commission has granted an "exceptional and temporary derogation to allow the production of crops on land set aside within the European Union, while maintaining full greening payments for farmers" (European Commission, 2022).

Emerging International Financial Institution (IFI) responses

The IFI Action Plan to Address Food Insecurity (African Development Bank et al., 2022) classifies international responses into six goals:

1. Supporting vulnerable people with targeted help to meet their immediate needs, including through social safety nets and cash transfers.
2. Promoting open trade, mainly through increased finance, information and improved storage/grain reserves.
3. Mitigating fertilizer shortages by reducing trade restrictions, increasing finance, improving the efficiency of fertilizer use and reducing dependency on chemical fertilizers.
4. Supporting food production in the short term, principally through finance for food value chains.
5. Investing in climate-resilient agriculture for the future.
6. Coordinating responses and programming for maximum impact.

Of these interventions, those directed at fertilizer, food production and longer-term climate resilience several are most relevant for climate and environmental considerations.

Mitigating fertilizer shortages

Most planned responses focus on reducing restrictions on fertilizer trade, facilitating imports and providing finance for access to and storage of fertilizers. In 2022, the African Development Bank approved a $1.5 billion African Emergency Food Production Facility, an "unprecedented comprehensive initiative to support smallholder farmers in filling the food shortfall."[7] Part of this approach relies on making fertilizers (and seeds) more readily accessible to farmers. However, some IFIs[8] also have programmes to increase the efficiency of fertilizer use, reduce dependency on chemical fertilizers and decarbonize fertilizer production.

Support food production now

While most programmes strive to improve fertilizer availability and affordability as the main way of supporting food production in the short term, broader interventions also include increasing liquidity to expand supplies of seeds and fertilizer, boosting access to inputs and technology, and providing more training to farmers. These aim to raise productivity for the upcoming planting season and offset food supply shortages in 2023.

The African Emergency Food Production Plan aims to increase the production of wheat, maize, rice, soybean, poultry and aquaculture across Africa over the next four crop production seasons. This is expected to lead to the production of 11 million tons of wheat, 18 million tons of maize, 6 million tons of rice and 2.5 million tons of soybeans (African Development Bank, 2022).

The World Bank is supporting food emergency responses using the International Development Association (IDA) Crisis Response Window's Emergency Response Financing. This may be used in conjunction with IDA country allocation resources to support production in four African countries, and Inter-American Development Bank Trust Fund resources for Afghanistan.

The Inter-American Development Bank will continue promoting the implementation of income support interventions, such as vouchers for the purchase of fertilizers and other critical inputs and technologies.

[7] https://www.afdb.org/en/topics-and-sectors/initiatives-partnerships/african-emergency-food-production-facility
[8] The European Bank for Reconstruction and Development, the Asian Development Bank, the International Fund for Agricultural Development and the Inter-American Development Bank.

Investment in climate-resilient agriculture for the future

Beyond the immediate actions to tackle food insecurity, the IFI Action Plan states that IFIs "must increase green investments in agricultural capacity, adaptation, smallholder farmers, food systems and climate-smart technologies to boost client/partner countries' food production and resilience in the longer-term".

Actions coalesce around three areas, with different emphasis across the IFIs:

1. **Climate-smart agriculture** principles and practices for adaptation and mitigation: increasing efficiency of natural resource use, reducing GHG emissions per unit of output, limiting the use of chemical inputs and protecting biodiversity.
2. **Diversification of production and consumption** with the aim of supporting alternative crops, particularly through horticulture, to reduce dependency on imported grains and provide a more balanced diet.
3. **Provision of public goods**, notably agricultural and climate information, improving tenure security and investing in agricultural research and innovation.

Only one IFI Action Plan mentions actions to reduce crop loss and food waste through improved pest and disease control, storage and logistics.

From a climate and environmental standpoint, there are several challenges and missed opportunities with IFI responses:

1. The approach to food production focuses on mitigating fertilizer shortages with scattered references to increasing efficiency of fertilizer use (the Asian Development Bank includes an aim to adapt their Greater Mekong Subregion Sustainable Agriculture and Food Security Program) and reducing dependency on chemical fertilizers (the International Fund for Agricultural Development refers to biofertilizer and biofortified legume varieties).
2. The crisis does not seem to have sparked a sense of urgency in transforming structural fragilities in the food system. Investments in climate-resilient agriculture refer to existing or already-planned programmes rather than the introduction of new ones. Even with existing programmes, there is little to no discussion of accelerating, expanding or otherwise adjusting programmes to build climate-resilient food systems to respond to the current crisis.
3. While there is one reference to the United Nations Food Systems approach[9] (from the World Bank Group), there is little consideration of changing dietary patterns and food waste/loss, both of which could offset some of the need to expand grain production.
4. Despite listing coordination as one the six goals of the IFI Action Plan, this appears to refer mainly to existing coordination. This misses the opportunity for assessing the collective impact of short-term responses on building resilience to future crises or helping to build genuinely global responses to issues such as fertilizer shortages.

[9] With the aim of changing Food Systems to achieve healthier, more sustainable and equitable food systems (https://www.un.org/sites/un2.un.org/files/2020/12/food_systems_paper-draft_oct-25.pdf).

Climate and environment considerations

"If it weren't for the backdrop of extreme weather combined with spiralling oil and gas prices, and supply chain issues, today's food crisis might be manageable. But the global food system has both relied on the stability of good weather while undermining climate stability by creating greenhouse gas emissions at an alarming rate – some 30% of all emissions are related to the food system."
(Benton, 2022)

While there is increasing focus on extreme weather arising from climate change as a driver of current and future food crises, there is a danger that GHG emissions from food systems will be exacerbated rather than abated by short-term responses to the current food crisis. This, in turn, is making food systems less equipped to cope with economic and political shocks. Changes in temperature and rainfall, shifting pests and diseases, and increasingly frequent extreme weather events are already impacting production. With climate change already taking place, adaptation and longer-term resilience building will be key to food security.

Agriculture and food systems already cause a third of GHG emissions and are the major driver of biodiversity loss. Agricultural irrigation accounts for 70% of water use worldwide and over 40% in many OECD countries, and is a major source of water pollution (Gruère and Shigemitsu, 2021). "Business-as-usual" production, processing and logistics will double GHG emissions from agriculture by 2040 and increase biodiversity loss and watershed depletion, both directly and through land use change. The impacts of this further heighten the risks to future food security.

Policy options for crisis response: dos, don’ts and long-term linkages to sustainability

In the short term, immediate actions are needed to protect vulnerable households from the sharp increases in prices of wheat, maize and edible oils. This means taking globally coordinated action between governments to smooth out price rises by facilitating trade flows from net exporting countries to net importers. It also means targeting poor households which are net buyers of food in both urban and rural areas with cash transfers to improve access to food.

However, decision makers will soon need to take steps to increase food availability to stave off impending reductions in planted area and yields. There are three ways this could be done: increasing production through improving yields or increasing planted areas; switching grain out of other uses, such as animal feed; and changing diets to reduce the land, water and other inputs needed to produce food.

These approaches can have widely differing impacts on whether the agricultural sector accelerates or slows global warming, protects or erodes biodiversity and strengthens or weakens the long-term resilience of the food system. To take these impacts into account, policy responses need to address four areas:

1. Changing *how* food is produced;
2. Monitoring/controlling *where* food is produced;
3. Transforming *what* food is produced and consumed; and
4. Improving how food is *used*, *transported* and *stored*.

The following sections identify and discuss possible actions across these four areas in a matrix of policy dos and don’ts, assessed from the point of climate and environmental outcomes.

Changing *how* food is produced

Many of the responses needed align with long-standing recommendations in agricultural development on how to strengthen resilience in farming and reduce negative climate and environmental impacts. These focus on *how* to farm: improving soil and water use and management to reduce and reverse degradation; making input use more efficient to avoid water pollution and damage to biodiversity; changing the type of inputs to those that contribute to a more circular economy; and changing production techniques to increase soil quality to boost yields, soil biodiversity and carbon retention. Policymakers will need to assess short- and long-term responses against these objectives and redouble efforts to tackle the political, economic and social barriers to producing food in a more sustainable way.

In the short term, policymakers and donors could use existing measures to amplify environmental benefits, as discussed in the follow sections and summarized in Table 1.

Social assistance/protection

Cash, food and voucher assistance in *humanitarian* contexts tend not to integrate environmental considerations like pollution, soil health or emissions. They aim principally to mitigate the damage caused by crises and meet immediate needs rather than increase production or address long-term issues.

However, in *development* contexts, there are examples where conditional cash transfers or other social assistance programmes have been effective at improving environmental outcomes, improving land and water use.

Initiatives attempting to straddle the humanitarian/development divide have also been developed. These combine short-term, cyclical social protection needs with longer-term livelihoods interventions that focus (at least in part) on ecosystem restoration and climate mitigation –particularly public works programmes. There is growing interest has in the potential of such schemes to address the twin challenges of climate change and biodiversity loss, as well as a resurgent interest in nature-based solutions for flood mitigation, pollution control, water storage/conservation and carbon sequestration (Calow, 2021). Available evidence suggests such programmes can offer multiple benefits in terms of improving local ecosystems and natural capital, carbon sequestration and local biodiversity conservation (Norton et al., 2020) while addressing cyclical short-term social and economic needs.

Various international and local organizations have promoted food or cash-transfer programmes linked to public works and asset-building programmes. Such schemes could be scaled up to expand coverage and increase support during shocks, such as spiking food prices, while improving environmental outcomes and building longer-term resilience. Some already have vast coverage and a roster of eligible households – or participatory selection processes – which could be used and expanded.

See Box 1 for three programmes that serve as examples.

Box 1: Social assistance/protection programme examples

World Food Programme (WFP)'s Food Assistance for Assets (FFA) programmes

Under these programmes, people identified as being in the poorest or "hanging-in" category of households (Dorward, 2009) receive cash or food-based transfers to address their immediate food needs, while building assets for longer-term resilience with soil conservation and fertility measures, water harvesting and flood control. In WFP's FFA programme for watershed management in Malawi, activities include rehabilitating degraded land, digging trenches, supporting tree regeneration, and constructing check dams and similar structures at community and household levels (Calow, 2021). Although more evidence is needed on the relevance of food security and resilience interventions in conflict and protracted crises, results from WFP's FFA programme in Malawi from 2014 to 2019 were positive. These included increased yields of major crops; additional production and income from irrigation (solar irrigation supported in downstream areas); reduced problems with flooding (attributed to the construction of trenches, check dams and gully plugs); and positive trajectories for consumption, coping and dietary metrics (WFP, 2021).

Box 1: Social assistance/protection programme examples *(continued)*

India's Mahatma Gandhi National Rural Employment Guarantee Scheme

The world's largest works-based social protection scheme, the Mahatma Gandhi National Rural Employment Guarantee Act, has covered all of India since 2006. It aims to enhance livelihood security in rural areas by providing at least 100 days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work at any time each year (Porras and Kaur, 2018; Calow, 2021). The programme includes 120 million active workers and generated more than 2.5 billion person days of work in 2018 (Norton et al., 2020). This public employment programme directs 65% of its funds towards water and broader natural resources management, building resilience to droughts, floods and cyclones.

The social impacts of the guarantee scheme have been positive: increased incomes reflected in raised consumption expenditure, mainly on food, clothing, education and health; expanded cultivation of land and increased food security; and greater resilience to economic shocks and inflation (Porras and Kaur, 2018). The programme also yielded environmental benefits and improvements which had positive impacts on agriculture, such as increased crop and livestock production, better groundwater recharge, water percolation, more water storage in tanks, increased soil fertility, reclamation of degraded lands and carbon sequestration (ibid.).

Ethiopia's Productive Safety Nets Programme (PSNP)

Ethiopia's PSNP was developed in 2005 as an alternative to the repeated, ad hoc emergency public works interventions which had characterized the humanitarian response to cyclical food insecurity in Ethiopia over several decades (McCord, 2012; Norton et al., 2020). The programme aims to provide a planned multi-year response to cyclical vulnerability, providing predictable social protection for food-insecure households in food deficit areas. This prevents the loss of household assets and enables the creation of community assets, promoting the 'graduation' of households from poverty (ibid.). The programme provides employment on public works projects to able-bodied adults in food-insecure households, and supports households without able-bodied adults with transfers that do not require a household member to work.

The PSNP is estimated to create roughly 40,000 community-level assets annually (Calow, 2021; Norton et al., 2020). Community-level projects and asset development are selected on the basis of six criteria, including a watershed approach. Many of the projects under the PSNP have also supported land restoration, replenished soil fertility, improved water management and expanded irrigation (ibid.).

Fertilizer use and availability

Around 50% of the world's population relies on fertilizer-fed crops to provide their food. By 2050, worldwide use of synthetic nitrogen fertilizers is expected to increase by 50% from 2012 levels (FAO, 2018).

Concerns about the climate and nature impacts of manufacturing and using fertilizer have risen as their impacts have become better documented: fertilizer manufacture accounts for approximately 1% of global GHG emissions. If associated nitrous oxide emissions from fertilizer (over-) use are taken into account as well, the total increases to 2.5% of the global GHG emissions (Farm Carbon Toolkit, 2023). In 2018, emissions along the production chain, from manufacturing to transport to application and run-off of fertilizer into waterways,

amounted to the equivalent of 1.25 billion tons of carbon dioxide – more than a fifth of the total estimated direct emissions from agriculture worldwide (Menegat et al., 2022).

There are also concerns about the efficiency of fertilizer use. Only around 20–30% of the synthetic nitrogen fertilizers applied to fields are converted to food; the remainder runs off into water bodies polluting water (ibid.). This not only has negative consequences for downstream users and fish stocks, but releases GHG into the atmosphere.

Across-the-board cuts in fertilizer application are neither feasible nor efficient and fertilizers have a role to play in bolstering food security. Certain countries and regions, particularly in sub-Saharan Africa, need to use more fertilizer to reduce deforestation and degradation caused by agricultural expansion (Ritchie et al., 2022).

However, there are significant trade-offs to consider when taking short-term measures that entrench dependency on the limited number of fertilizer producers, do not incentivize fertilizer use efficiency or lock in inefficient production technologies and infrastructure. Such measures include increasing broad-based fertilizer subsidies and financing new fertilizer plants that rely on conventional technology.

Measures that could help in the short and medium term to achieve both social and environmental objectives include:

1. **Providing targeted help to poorer farmers who currently use mineral fertilizers** and who are likely to cut back their fertilizer use, even when they know the returns of doing so outweigh the costs. This would preferably be done through offering them support, such as cash transfers, rather than via broad-based fertilizer subsidies (Wiggins, 2022a).
2. **Strengthening global cooperation on fertilizer use efficiency – particularly nitrogen use efficiency – and environmental standards**. There is a huge opportunity to reduce the over-application of fertilizers in certain countries without depressing crop yields (Ritchie et al., 2022). If polluting countries increased their nitrogen use efficiency, nitrogen pollution could be reduced by around 35%, while increasing yield gaps[10] by only 1% (Wuepper, 2020; Ritchie et al., 2022). As emissions from synthetic nitrogen fertilizers and pollution are highly concentrated in certain geographic areas (Menegat et al., 2022),[11] attention could be focused on these countries backed by financial support from the global community, as well as using existing international guidelines on effective fertilizer use, such as the International Code of Conduct for the Sustainable Use and Management of Fertilizers (FAO, 2019).
3. **Accelerating projects to decarbonize the fertilizer supply chain**. Currently, the fertilizer production process generates at least three tons of carbon dioxide per ton of fertilizer due to its dependency on fossil fuels to provide energy and feedstock (Ouikhalfan et al., 2022). Nitrous oxide, another GHG, is also emitted during the production process (Næss-Schmidt, 2015). Several approaches to decarbonizing

[10] The amount that yields could be increased with better management of nutrients.

[11] In terms of total volumes, the biggest emitters are China, India, North America and Europe. On a per capita basis, the biggest emitters are the major agricultural export countries of North America (United States and Canada), South America (Argentina, Brazil, Paraguay and Uruguay), Europe (Denmark, France, Ireland and Ukraine) and Australia and New Zealand (Menegat et al., 2022). The largest polluter are China, Brazil, Mexico, Colombia and Thailand. These are also the countries that are overapplying nitrogen the most; China causes 170% more nitrogen pollution than is necessary to achieve its level of crop yields (Ritchie et al., 2022).

fertilizer production are being considered (Batool and Wetzels, 2019; Ouikhalfan et al., 2022):

   a. **Technological improvements** through the use of a different production feedstock, such as: substituting natural gas for hydrogen; improving energy efficiency in production plants; using carbon capture and storage to syphon off carbon dioxide emissions; and abating nitrous oxide emissions during the production process.
   b. Taking a **circular economy approach** by increasing the use of by-products of fertilizer production, such as waste heat and carbon dioxide for agricultural greenhouses, or biogas from fermented manure as a feedstock.

4. **Scaling up initiatives to increase access to, and use of, organic fertilizers, combined with a circular economy approach between livestock and crop production.** One option is to adopt a circular economy approach, using locally produced composted or fermented (Gillbard, 2021) animal manure[12] to apply on fields instead of – or to complement – synthetic fertilizer. This could tackle the twin challenge of reducing dependency on synthetic fertilizers and lowering emissions and pollution from livestock manure. The feasibility of such initiatives depends on farm size, distance between livestock farms and crop fields, efficiency of fertilizer application and the safety of consuming foods produced with animal manure (Kamilaris and Prenafata-Boldú, 2021).
5. **Changing production practices** using legumes, either singly or intercropped, to fix nitrogen in the soil (Ritchie et al., 2022). Intercropping could help achieve triple wins for climate, nature and people: it is associated with "positive effects on agricultural productivity, incomes and potentially health… [and] positive impacts on carbon sequestration, resilience and biodiversity" (FCDO, 2022).

Box 2: China's experience with increasing fertilizer use efficiency

China's experience demonstrates that fertilizer use can be reduced without compromising yields. Between 2005 and 2015, researchers developed enhanced management practices for rice, wheat and maize, tailored to different agro-ecological zones in China, using an integrated soil-crop system programme. Researchers trained extension staff and agribusiness personnel to work participatively with farmers through field trials and created a national programme to transmit and monitor recommended practices. This provided high quality inputs and strengthening the technical and organizational capacity of farmers.

Nearly 21 million farmers adopted enhanced management practices between 2005 and 2015, reducing nitrogen application during that period by 14.7–18.1% and nitrogen losses by nearly 35%. Over the same period, average yields rose by 10.8–11.5%, and grain output expanded by 33 million tonnes. The combination of increased production and reduced nitrogen needs generated additional farmer income of $12.2 billion, compared to direct programme costs of $454 million.

GHG emissions from nitrogen use, manufacture and transport, and diesel use in farming operations fell by up to 13.2%. This figure was even higher when scaled by the yield (GHG emission per kilogram of grain).

Source: (Ritchie et al., 2022; Cui et al., 2018)

[12] Raw manure can introduce pathogens into fresh food.

Challenges and trade-offs

There are several challenges that need to be addressed to successfully change fertilizer production and use:

1. A range of measures will need to be in place to promote changes in fertilizer use, including relative price changes, production techniques, crop varieties and availability of alternatives to current mineral fertilizers.
2. Policymakers cannot underestimate the time needed for such changes to take place, given the knowledge needed, the slow pace of individual behavioural change and supply chain characteristics.
3. Related to this, any transition will need to be carefully managed. The case of Sri Lanka is a cautionary tale in transitioning away from synthetic fertilizers too quickly. An abrupt government ban on synthetic fertilizers in April 2021 was rolled back after just six months owing to farmer protests. By this point, however, the ban had already impacted production, with rice paddy production dropping by almost 40% in 2022 .[13]

[13] https://www.spglobal.com/commodityinsights/en/market-insights/blogs/agriculture/081022-sri-lanka-crisis-food-organic-farming

Table 1: Building climate and nature considerations into *how* food is produced

Specific instrument/area	Short-term response (Dos)	Concrete examples	Short-term response (Don'ts)	Linking to long-term sustainability
Cash transfers/social protection	Scale up targeted, shock-responsive social assistance through, for example, cash transfers to support vulnerable producers affected by higher fuel and fertilizer prices, thereby avoiding short-term harmful environmental impacts, such as increased deforestation. Maximize green impact of social assistance/protection by linking cash and voucher assistance to green public works programmes. Scale up existing programmes with combined social and environmental benefits.	WFP's Food Assistance for Assets programme in Malawi aimed at watershed management. Ethiopia's Productive Safety Nets Programme. India's Mahatma Gandhi National Rural Employment Guarantee Scheme.	Provide non-specific, non-targeted income support that will further constrain fiscal capacity to support strategies that build longer-term climate-resilient production.	Use basis created by employment-based social assistance programmes to spin out broader payments for ecosystem services programmes and expand coverage beyond poorest households.
Fertilizer	Provide continued access to fertilizers through trade facilitation measures. Provide targeted support to farmers producing food crops, for example, through vouchers or cash transfers to purchase fertilizer, especially in areas where there is under-use of fertilizer (such as sub-Saharan Africa). Encourage global cooperation on fertilizer use efficiency and environmental standards, with immediate measures to reduce over-application of fertilizer in countries where overuse is prevalent to lessen fertilizer supply constraints. Accelerate projects to decarbonize the fertilizer supply chain. Promote practices to reduce dependence on chemical fertilizer and encourage the complementarity of chemical and organic fertilizers in next planting season by, for example, linking local livestock producers with crop growers, or providing vouchers to purchase organic fertilizers. Provide training and access to grain legumes for intercropping for the next season planting.	China: action to increase fertilizer use efficiency. Lessons from changes in energy security strategy in response to the Russian invasion of Ukraine. International Code of Conduct for the Sustainable Use and Management of Fertilizers. European Bank for Reconstruction and Development project to finance green ammonia plant in Egypt. A global meta-analysis found intercropping boosts agricultural production by 22% (Beillouin et al. 2021).	Introduce general fertilizer subsidies which can be regressive, inefficient and difficult to dismantle. Build new production facilities with traditional production methods. Encourage monocropping and production practices that deplete the soil and water.	Repurpose subsidies and other fiscal measures to incentivize and support more efficient, less harmful chemical use, and improve soil and water management through climate-smart agricultural practices. Decarbonize fertilizer value chains through alternative green fertilizer production, and fund research and development to reduce the vulnerability to volatility of natural gas prices through reduced investment and operational costs. Encourage and monitor global implementation of the International Code of Conduct for the Sustainable Use and Management of Fertilizers. Address economic, social and technological barriers to scaling up intercropping to improve soil quality and soil carbon sequestration.

Monitoring *where* food is produced

The combination of rising food and fertilizer prices heightens the risk that incentives are created for clearing land to expand agricultural production, particularly in areas with poor environmental and land governance and enforcement capacity. This could disproportionately encroach on land rich in biodiversity and carbon stocks, and affect existing land users with relatively high levels of tenure insecurity.

Where environmental governance is more robust, facilitating the use of such land through relaxing existing environmental regulations is unlikely to have significant impacts on production in the short term and will potentially lose the environmental benefits built up from protecting such land (Glauber and Laborde, 2022).

In the short and medium term, policymakers could adopt a series of responses focused on *where* to farm (see Table 2) by:

1. **Strengthening real-time monitoring of land use change**, combined with data on food and fertilizer prices in different countries, focused particularly on environmental hotspots. Over the last three decades, more in-depth and wide-ranging research and monitoring of global and regional land use and land cover changes have been enabled by advances in earth observation and monitoring methods, including remote sensing and geographic information systems (Chaikaew, 2019; Potapov et al., 2022). Of particular interest are tools that focus on monitoring environmental change, including deforestation, along supply chains and deforestation. Existing monitoring systems could be put on high alert and linked up more strongly with global institutions with the mandate to monitor food security, such as FAO. In this way they could combine information and use platforms, such as the CFS, to flag emerging land use change linked to agricultural extensification in environmentally sensitive areas.
2. **Increasing scrutiny of proposed agricultural investment projects and respect for existing land use rights.** The 2007/08 food price rise led to a wave of agricultural investment applications for large swathes of land in countries that were perceived to be “land rich”. This revealed the weaknesses in land allocation and investment project authorization processes across low- and middle-income countries (Deininger et al., 2011). Since then, more resources have been allocated to governments to strengthen their governance capacity in these areas. There has also been a significant shift in international action, with the publication of international guidelines on the governance of tenure and responsible agricultural investment. Civil society organizations have likewise built their capacity to monitor land tenure security, land allocation and agricultural investment, and to hold governments and the private sector to account.
   These changes have happened over the last 15 years. There is still much to do to ensure that land use rights are respected and that agricultural investment is undertaken in a responsible way. It is unlikely that seismic shifts in this area will be possible in the near future. However, in the short term, much could be done to increase the monitoring of land-based agricultural investment projects and scale up existing support to agricultural investment agencies. This can be accompanied with bursts of intensive activity to improve the quality of real-time information available and enable governments to act on it.

Table 2: Building climate and nature considerations into *where* food is produced

Specific instrument/area	Short-term response (Dos)	Concrete examples	Short-term response (Don'ts)	Linking to long-term sustainability
Land use and (indirect) land use change	Closely monitor short-term land use change to identify whether rising fertilizer prices are driving expansion of production in areas with poor environmental governance, and whether rising food prices are incentivizing land clearance. Ensure respect for existing land use rights and due diligence of new investment projects. Heighten monitoring of land-based agricultural investment projects and scale up existing support to agricultural investment agencies.	Role for FAO/World Bank Group to monitor short-term consumption patterns, using CFS as a platform for highlighting risks and identifying actions. See monitoring and risk assessment tools: Accountability Framework, 2021; Trase monitoring of agricultural supply chains; Global Land and Carbon Lab, which monitors land cover, land use and land-use change globally, plus associated carbon stocks and flows; and Landsat Analysis Ready Data. The Land Matrix monitors large-scale land acquisitions in low- and middle-income countries using regional focal points, national land observatories and crowd-sourced data.	Relax restrictions on use of land that is environmentally sensitive or rich in carbon stocks.	Support and expand ongoing efforts to implement the Voluntary Guidelines on Tenure and CFS Principles for Responsible Investment in Agriculture and Food Systems and strengthen tenure security, particularly of indigenous peoples and local communities. Strengthen community and satellite monitoring of land use change as well as integrated programmes that combine strengthened land rights with greater capacity for tackling environmental crime and alternative livelihoods for forest dwellers.

Transforming *what* food is produced and consumed

Crop diversification at the household level has been shown to increase resilience, improve food security and dietary diversity, suppress crop disease and increase incomes(Mango et al., 2018; Adjimoti and Kwadzo, 2018; Lin, 2011; Vernooy, 2022). At a national and global level, diversifying food sources is key to strengthening food security by providing alternatives if there is a shock or crisis (Benton, 2022). However, current food systems are characterized by an "inequitable power concentration and imbalance" (FAO and WHO, 2019). The current crisis has highlighted countries' dependence on a small number of exporters of staples and fertilizers.

Diversifying food production

There is a long-standing body of literature that points to the benefits of diversifying food production. This can be achieved through seven broad diversification strategies: agroforestry, associated plant species, cultivar mixture, intercropping, landscape heterogeneity and crop rotation (Vernooy, 2022). These strategies also imply the importance of exploring alternative crops for commercial production as a substitute for imported grains, thereby reduce the reliance on volatile imports while strengthening local food systems. Supporting the production of indigenous crops and the infrastructure needed to produce them (such as seed marking systems and extension services) will be crucial over the longer term.

Elements of these measures can be adopted in the short term as a way of alleviating food availability. Governments and the international community can **accelerate and adapt programmes to support the diversification of production in the next planting season**. This can include horticultural products, legumes and indigenous staples.

Ideally, short-term responses need to avoid supporting the production of a narrow range of staples, such as wheat and maize, which could crowd out farm-level investments in resilience and lock in production practices such as monocropping that, over time, can themselves threaten food security.

Healthy and sustainable diets

While focusing on improving the availability of, and access to, food in the short and medium term is important, a sustainable food system approach needs to also change demand to influence food consumption. This could reduce the overall level of inputs needed to produce enough food while remaining within planetary boundaries. The EAT-Lancet Planetary Health Diet (Willett et al., 2019) proposed a global benchmark diet to guide the shift towards healthy and sustainable dietary patterns. It calls for increased consumption of wholegrains, legumes, nuts and vegetables and reduced consumption of animal products and low-cost fast foods. Implementing such a diet worldwide could reduce overall water consumption by 12%. Moreover, without reducing emissions from global food systems, the world would not be able to limit global temperature change to the 1.5°C climate change target (Clark et al., 2020). If diets improved alongside broader changes in the food system, such as reducing waste, the chance of hitting the target would rise (ibid).

However, there are several challenges to achieving more environmentally sustainable consumption patterns, including affordability[14] and availability of healthier foodstuffs, both of which vary significantly at the local level. Environmental impacts can also vary: even if the EAT-Lancet diet cut the global water footprint by 12%, water use would increase for nearly 40% of the world's population (Tuninetti et al., 2022).

Even with measures to address structural constraints to the affordability and availability of healthier foods, it is notoriously difficult to change consumption preferences, which are governed not just by affordability but by sociodemographic, psychological and other factors. Short-term shocks can drive significant short-term change (Boyle et al., 2022), but experience from the COVID-19 lockdowns indicates that short-term changes in food purchasing behaviour is likely to revert to pre-emergency habits once the crisis is over.

This implies that demand-side responses to the food crisis need to focus more on medium- and long-term measures that: reduce the costs of healthy diets; adapt and test proposed diets for different countries and subnational regions; increase the availability of healthy foodstuffs through better urban planning; support the production, storage and logistics of fish and fresh fruits and vegetables; and understand and address the constraints to changing consumer preferences.

Various approaches can be taken to effect change: strengthen price incentives via taxes or subsidies; improve information and food marketing; invest in public health information and sustainability education; provide more detailed information about food-based dietary guidelines, tailored to different countries and target groups;[15] and invest in infrastructure such as cold chain storage (Wiggins, 2015; Willett et al., 2019).

Nevertheless, some short-term actions can be taken, including:

1. **Scaling up nutrition-sensitive social assistance programmes** by incorporating nutrition-sensitive social protection interventions into national and regional humanitarian responses (Olney et al., 2021; WFP, n.d.; Alderman, 2016). Subject to fiscal constraints, such programmes would need to set cash or in-kind transfer values that are sufficient to achieve nutrition and health-related objectives. They should also target the population most at risk of malnutrition and address preferences and behaviours to improve knowledge of proper hygiene and feeding practices (ibid.). It is likely that the target groups for such programmes differ from those targeted by public works programmes with environmentally linked activities. However, it will be important to avoid overburdening social assistance programmes with too many objectives, and to be clear about what can be achieved for different target groups.
2. **Produce tailored messaging for different consumer groups** about moving to more nutritionally balanced diets to improve food security and personal and planetary health (mirroring the messaging on energy security and reducing energy dependence on Russia). This messaging would need to take into account the drivers of individual and social differences in food consumption (d'Angelo et al., 2020). Messaging could be targeted at groups in high-income countries, middle-income countries and higher-income urban consumers in lower-income countries with a high proportion of animal products and processed foods in their diets. In urban areas, such messaging could

[14] It would have cost a global average (median) of $2.84 per day in 2011, equivalent to nearly 90% of a household's daily per capita income in low-income countries (Hirvonen et al., 2019). In high-income countries over the last 30 years, the cost of healthy items in the diet has risen by more than that of less healthy options, a trend now being mirrored in emerging economies (Wiggins, 2015).

[15] Building on the EAT-Lancet planetary health diet and FAO/WHO guidelines on sustainable and healthy diets.

be amplified through existing networks already geared up to broadcast measures on healthy and sustainable diets.[16]

In the short term, responses to the food crisis would ideally avoid broad-based subsidies to energy-dense, but nutritionally poor and narrowly based, foods.

[16] See, for example, the activities of the C40 international network of city mayors (C40, 2021).

Table 3: Building climate and nature considerations into *what* food is produced

Specific instrument/area	Short-term response (Dos)	Concrete examples	Short-term response (Don'ts)	Linking to long-term sustainability
Food production diversity	Accelerate and adapt programmes to support the diversification of production in next planting season, including horticultural products, legumes and indigenous staples.	See current IFI programmes for more detail and comment.	Support production of a narrow range of staples, crowding out farm-level investments in resilience and locking in potentially risky production practices such as monocropping.	Support crop diversification at the household level. Explore alternative crops for commercial production as a substitute for imported grains, to reduce reliance on volatile imports while strengthening local food systems.
Food consumption/ diets	Scale up targeted, nutrition-sensitive social protection programmes. Produce tailored messaging for different consumer groups about adopting more nutritionally balanced diets to improve food security and personal and planetary health. Messaging can be targeted at groups consuming a high proportion of animal products and processed foods in higher- and middle-income countries as well as higher-income urban consumers in lower-income countries.	Programa de Apoyo Alimentario in Mexico, which transferred either food baskets containing micronutrient-fortified milk and animal food products or cash to beneficiary families along with nutritional and health education sessions.	Broad-based subsidies on energy-dense foods with little nutritional value.	Take a food systems approach that uses demand-side changes to change natural resource (land and water) use. Adopt a longer-term focus on reducing the cost of healthy diets and increasing the availability of healthy foodstuffs through better urban planning, education, and support for the production, storage and logistics of fish and fresh fruits and vegetables. Adapt the EAT-Lancet Planetary Health Diet and FAO/WHO guidelines to different regions and countries to provide context-specific guidance. Participate in FAO process to review and adapt dietary guidelines (due in 2024).

Improving how food is *used* and *stored*

Minimizing post-harvest crop loss and food waste is key to increasing the availability of food from a given set of resources while improving environmental sustainability. Around one-third of all food produced for human consumption is wasted, costing $1 trillion annually (FAO, n.d.) and generating GHG emissions from production and waste products estimated at 8% of total emissions(WWF-WRAP, 2020). Globally, food waste is concentrated in high-income countries while post-harvest losses occur mainly in low-income countries. A compounding factor is how grains are used: nearly 60% of grains produced in 2020/21 were used for animal feed rather than direct human consumption (FAO, 2022).

Post-harvest crop losses

Between harvesting and consumption of food, storage and processing are the main sources of post-harvest crop loss (Claes et al., 2021) in many low-income countries. With the right training, appropriate tools or technologies, effective handling practices, sound policies and marketing-related improvements, much of this loss could be reduced (Stathers et al., 2020). While approaches are particularly context-specific, a combination of low-technology approaches and more sophisticated technology to monitor crop quality could be supported (Claes et al., 2021; Kumar and Kalita, 2017).

Food waste

In more affluent societies, food waste tends to happen as a result of consumer behaviour, such as inadequate purchase planning. Consumption preferences or quality standards that restrict the sale of products that do not conform to normal sizes or aesthetics also cause food to be wasted at the end of the food chain (FAO, 2013).

Progress has been made to reduce food waste and SDG 12.3 aims to halve food waste and reduce food loss by 2030 (WWF-WRAP, 2020). However, while there has been substantial progress in some countries, few governments are taking action to measure and track how much food is wasted.

Actions to reduce food waste focus principally on preventing waste, recycling or recovering some energy via incineration. These actions can include: regulating governments to measure and report on food waste; simplified date labelling; and giving value to converting waste into useful products, such as fuel or animal feed (ibid.).

Stocks

Food reserves can be an important way of smoothing out fluctuations in supply and demand to reduce food price volatility and increase food security (Laio et al., 2016; Drechsler, 2021). However, it can be expensive to maintain stocks over long periods over time, particularly when they may only need to be used infrequently (Wiggins et al., 2013; World Bank, 2021; Fathallah and Robertson, 2021).

There is no substantive discussion in the literature of the environmental impacts of food reserves.

Use of grains for animal feed and biofuels

An alternative to holding large food reserves is for governments to switch grain from animal feed to human consumption and to relax biofuels mandates in order to release more maize from ethanol production and oilseeds from biodiesel production. A large amount of grain is

fed to livestock and used for biofuels. In 2020/21, only 15% of coarse grains (including maize, wheat, barley and sorghum) was used for food; 59% was used for feed and 26% for other uses (FAO, 2022b). Increasing the proportion of grain used for human consumption could remove the need to hold costly physical stocks through many years of adequate supply (Wiggins et al., 2013). It could also have environmental benefits:

- A reduced water footprint: a report over 15 years old (Pimentel and Pimentel, 2003) has already flagged that grain-fed beef production uses much more water than other foods: 100,000 litres of water for every kilogram of food, compared to 2,000 litres per kilogram of soybean produced and 900 litres per kilogram of wheat.
- Likewise, feed conversion rates mean that the area of land needed to produce one kilogram of animal protein is larger than for non-animal products: 3 kilograms of feed is required to produce 1 kilogram of pork (FAO, 2009); 2–4 kilograms of grain for 1 kilogram of poultry; and 7 kilograms of feed for 1 kilogram of cattle (FAO, 2006).

Such a scheme would have the potential to cushion poor and vulnerable people in developing countries against price rises in cereals, but this is limited (Wiggins et al., 2013). It can probably work technically, depending on the technical specifications used for feed and industrial grain and consumer preferences. However, the impact of international trade and economics makes it a difficult option to implement in the case of animal feed-producing and price-taking countries. Grain diversion would only work if complementary trade management policies were deployed, which is unlikely to be accepted by individual countries.

- The large volumes of maize used for biofuels in the United States make it more promising for lowering international grain prices. However, relaxing ethanol mandates is unlikely to encourage such a switch if the relative prices of maize and oil make it profitable to continue producing ethanol.

Longer-term options could focus on reducing the need for industrial feed for livestock; promoting alternatives, including grass-based feed; and more circular farming models in countries with large industrial production. In the short term, two actions could be helpful:

1. **Monitor closely short-term changes in consumption of animal products** (for example, if demand is falling due to tightening incomes). This information can then be used to see if grain may be from animal feed (for animals with short production cycles) to human consumption, in situations where feed specifications make it possible for humans to consume the grain. While this may not affect the price of grain, it might increase its availability.
2. Through global cooperation platforms, **encourage discussions of alternative animal feed sources and longer-term, planned switches of grain** normally destined for animal feed in countries that affect global grain prices.

Governments would ideally avoid creating incentives for increasing meat consumption or targeting livestock producers with cost-reducing efforts in countries with a high per capita consumption of meat.

Table 4: Building climate and nature considerations into how food is *used* and *stored*

Specific instrument/area	Short-term response (Dos)	Concrete examples	Short-term response (Don'ts)	Linking to long-term sustainability
Stocks/ reserves	Use food reserves to dampen price spikes.	---	Hoard food stocks in particular countries, pushing up already-high food prices.	Promote effective management of stocks to reduce fiscal burden.
Use of grains for animal feed	Monitor closely short-term changes in consumption of animal products to see if grain may be released into market. Encourage planned switch of grain normally destined for animal feed in countries that affect global grain prices.	This has not yet been implemented successfully and is constrained by multiple issues. Schemes in other sectors could be explored, such as water use diversion in California.	Create incentives for increasing meat consumption or target livestock producers with cost-reducing efforts in countries with high per capita consumption of meat.	Promote alternatives to industrial feed for animals, including grass-based feed, and more circular farming models. Relaxing ethanol mandates is unlikely to have any effect on grain use for biofuels, as the elevated oil price will ensure profitability without mandates or subsidies.
Post-harvest crop losses	Increase resources to existing programmes to reduce post-harvest crop losses (such as the African Development Bank and the International Finance Corporation (IFC)).	Very specific to crop type and environmental and market conditions. Use a combination of low-technology solutions and more sophisticated approaches to monitor crop quality.	Marginalize post-harvest crop loss programmes.	Continue to review successful approaches and identify gaps in research and practice.
Food waste	Encourage consumers and food companies to minimize food waste through communications campaigns highlighting economic, social and environmental advantages to preventing food waste.	European Union Revised Waste Framework Directive, 2018.	Roll back food waste reduction programmes.	Improve measuring and tracking food waste in regions with high per capita waste. Long-term communications campaigns to change consumer behaviour. Trial and scale up more innovative food waste reduction activities.

Next steps for delivery

Food production, a stable climate and a liveable environment are inextricably linked and cannot be treated as separate, stand-alone goals. As we respond to the immediate food crisis, we must take climate and environmental impacts into account. Ensuring that short term food crisis response helps to address and not entrench climate and environmental threats will need further work at technical, political and diplomacy levels.

Immediate steps include:

- Accelerate and scale up the implementation of existing programmes that already address climate and environmental issues in food production while addressing food security.
- Integrate measures with positive climate and environmental impacts into other existing programmes designed to boost food availability and access, such as social assistance programmes.

To achieve this, policymakers, researchers and civil society organizations need to use international forums (such as the G7, G20 and United Nations climate change conferences) to raise awareness of productive and unproductive interventions to address the food crisis from a climate and environment perspective.

International financial institutions, meanwhile, need to mobilize the global institutional framework more effectively, going beyond the initial step of identifying different plans to address the food crisis to a more active and critical analysis of opportunities to change existing programmes and collaborate.

Over the **longer term**, more structural changes are needed in food system dynamics, including:

- Repurposing public support for food and agriculture to reform policies that incentivize harmful and or inefficient use of land, water and chemicals, and redirect resources to climate-resilient and sustainable production.
- Supporting behavioural change in food consumption and food waste.

To achieve this, policymakers, researchers and civil society organizations need to:

- Improve the availability of good quality data to monitor the climate and environmental impacts of food and agricultural production.
- Share best practices and lessons across countries, for example, convening policy dialogues and strengthening knowledge hubs on how public support can be repurposed and triple win approaches.

International financial institutions and global forums need to:

- Ensure that multilateral development bank commitments to environmentally sustainable production and economies are mainstreamed throughout their operations and not confined to specific projects.
- Encourage stakeholders to adhere to international principles and standards for sustainable and efficient use of inputs, and promote transparency and accountability in monitoring input use.

- Invest in the major research and development gaps to increase the use of alternative inputs and land management practices that increase resilience, conserve ecosystem health and reduce emissions.

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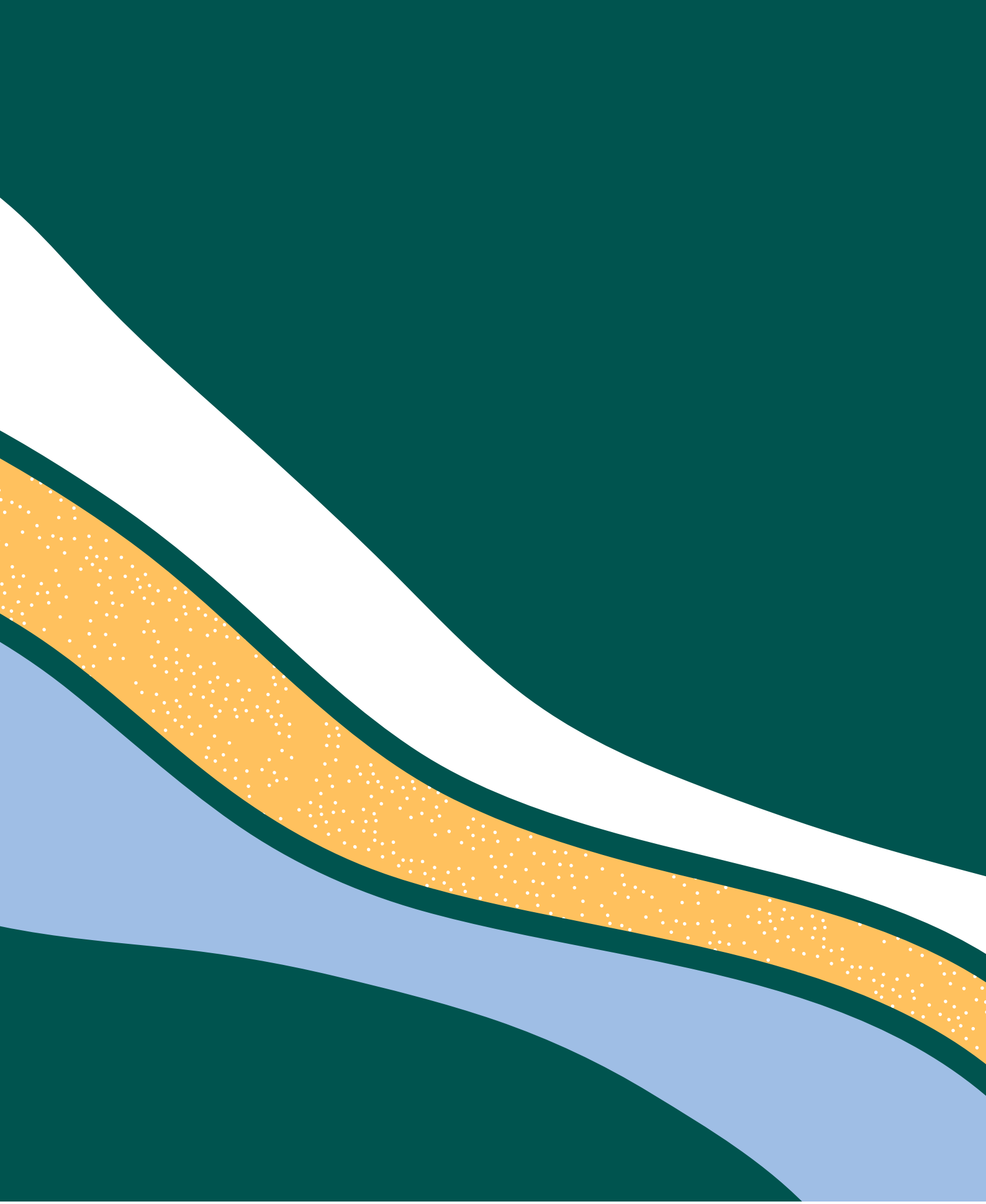
Annex 1: Dos and don’ts for short-term food security policy responses to ensure the best outcomes for climate, nature and long-term sustainability

Policy objective	Specific instrument/area	Short-term response (Dos)	Concrete examples	Short-term response (Don’ts)	Linking to long-term sustainability
Change *how* food is produced	**Cash transfers/social protection**	Scale up targeted, shock-responsive social assistance through, for example, cash transfers to support vulnerable producers affected by higher fuel and fertilizer prices, thereby avoiding short-term harmful environmental impacts, such as increased deforestation. Maximize green impact of social assistance/protection by linking cash and voucher assistance to green public works programmes. Scale up existing programmes with combined social and environmental benefits.	WFP’s Food Assistance for Assets programme in Malawi aimed at watershed management. Ethiopia’s Productive Safety Nets Programme. India’s Mahatma Gandhi National Rural Employment Guarantee Scheme.	Provide non-specific, non-targeted income support that will further constrain fiscal capacity to support strategies that build longer-term climate-resilient production.	Use basis created by employment-based social assistance programmes to spin out broader payments for ecosystem services programmes and expand coverage beyond poorest households.
	Fertilizer	Provide continued access to fertilizers through trade facilitation measures. Provide targeted support to farmers producing food crops, for example, through vouchers or cash transfers to purchase fertilizer, especially in areas where there is under-use of fertilizer (such as sub-Saharan Africa). Encourage global cooperation on fertilizer use efficiency and	China: action to increase fertilizer use efficiency. Lessons from changes in energy security strategy in response to the Russian invasion of Ukraine. International Code of Conduct for the Sustainable Use and Management of Fertilizers.	Introduce general fertilizer subsidies which can be regressive, inefficient and difficult to dismantle. Build new production facilities with traditional production methods. Encourage monocropping and production practices that deplete the soil and water.	Repurpose subsidies and other fiscal measures to incentivize and support more efficient, less harmful chemical use, and improve soil and water management through climate-smart agricultural practices. Decarbonize fertilizer value chains through alternative green fertilizer production, and fund research and development to reduce the vulnerability to volatility of natural

Policy objective	Specific instrument/area	Short-term response (Dos)	Concrete examples	Short-term response (Don'ts)	Linking to long-term sustainability
		environmental standards, with immediate measures to reduce over-application of fertilizer in countries where overuse is prevalent to lessen fertilizer supply constraints. Accelerate projects to decarbonize the fertilizer supply chain. Promote practices to reduce dependence on chemical fertilizer and encourage the complementarity of chemical and organic fertilizers in next planting season by, for example, linking local livestock producers with crop growers, or providing vouchers to purchase organic fertilizers. Provide training and access to grain legumes for intercropping for the next season planting.	European Bank for Reconstruction and Development project to finance green ammonia plant in Egypt. A global meta-analysis found intercropping boosts agricultural production by 22% (Beillouin et al. 2021).		gas prices through reduced investment and operational costs. Encourage and monitor global implementation of the International Code of Conduct for the Sustainable Use and Management of Fertilizers. Address economic, social and technological barriers to scaling up intercropping to improve soil quality and soil carbon sequestration.
Control *where* food is produced	**Land use and (indirect) land use change**	Closely monitor short-term land use change to identify whether rising fertilizer prices are driving expansion of production in areas with poor environmental governance, and whether rising food prices are incentivizing land clearance. Ensure respect for existing land use rights and due diligence of new investment projects. Heighten monitoring of land-based agricultural investment projects and scale up existing support to agricultural investment agencies.	Role for FAO/World Bank Group to monitor short-term consumption patterns, using CFS as a platform for highlighting risks and identifying actions. See monitoring and risk assessment tools: Accountability Framework, 2021; Trase monitoring of agricultural supply chains; Global Land and Carbon Lab, which monitors land cover, land use and land-use change globally, plus associated carbon stocks and flows; and Landsat Analysis Ready Data.	Relax restrictions on use of land that is environmentally sensitive or rich in carbon stocks.	Support and expand ongoing efforts to implement the Voluntary Guidelines on Tenure and CFS Principles for Responsible Investment in Agriculture and Food Systems and strengthen tenure security, particularly of indigenous peoples and local communities. Strengthen community and satellite monitoring of land use change as well as integrated programmes that combine strengthened land rights with greater capacity for tackling environmental crime and alternative livelihoods for forest dwellers.

Policy objective	Specific instrument/area	Short-term response (Dos)	Concrete examples	Short-term response (Don'ts)	Linking to long-term sustainability
			The Land Matrix monitors large-scale land acquisitions in low- and middle-income countries using regional focal points, national land observatories and crowd-sourced data.		
Change *what* food is produced and consumed	**Food production diversity**	Accelerate and adapt programmes to support the diversification of production in next planting season, including horticultural products, legumes and indigenous staples.	See current IFI programmes for more detail and comment.	Support production of a narrow range of staples, crowding out farm-level investments in resilience and locking in potentially risky production practices such as monocropping.	Support crop diversification at the household level. Explore alternative crops for commercial production as a substitute for imported grains, to reduce reliance on volatile imports while strengthening local food systems.
	Food consumption/ diets	Scale up targeted, nutrition-sensitive social protection programmes. Produce tailored messaging for different consumer groups about adopting more nutritionally balanced diets to improve food security and personal and planetary health. Messaging can be targeted at groups consuming a high proportion of animal products and processed foods in higher- and middle-income countries as well as higher-income urban consumers in lower-income countries.	Programa de Apoyo Alimentario in Mexico, which transferred either food baskets containing micronutrient-fortified milk and animal food products or cash to beneficiary families along with nutritional and health education sessions.	Broad-based subsidies on energy-dense foods with little nutritional value.	Take a food systems approach that uses demand-side changes to change natural resource (land and water) use. Adopt a longer-term focus on reducing the cost of healthy diets and increasing the availability of healthy foodstuffs through better urban planning, education, and support for the production, storage and logistics of fish and fresh fruits and vegetables. Adapt the EAT-Lancet Planetary Health Diet and FAO/WHO guidelines to different regions and countries to provide context-specific guidance. Participate in FAO process to review and adapt dietary guidelines (due in 2024).

Policy objective	Specific instrument/area	Short-term response (Dos)	Concrete examples	Short-term response (Don'ts)	Linking to long-term sustainability
	Stocks/ reserves	Use food reserves to dampen price spikes.	---	Hoard food stocks in particular countries, pushing up already-high food prices.	Promote effective management of stocks to reduce fiscal burden.
Change how food is *used* and *stored*	**Use of grains for animal feed**	Monitor closely short-term changes in consumption of animal products to see if grain may be released into market. Encourage planned switch of grain normally destined for animal feed in countries that affect global grain prices.	This has not yet been implemented successfully and is constrained by multiple issues. Schemes in other sectors could be explored, such as water use diversion in California.	Create incentives for increasing meat consumption or target livestock producers with cost-reducing efforts in countries with high per capita consumption of meat.	Promote alternatives to industrial feed for animals, including grass-based feed, and more circular farming models. Relaxing ethanol mandates is unlikely to have any effect on grain use for biofuels, as the elevated oil price will ensure profitability without mandates or subsidies.
	Post-harvest crop losses	Increase resources to existing programmes to reduce post-harvest crop losses (such as the African Development Bank and the International Finance Corporation (IFC)).	Very specific to crop type and environmental and market conditions. Use a combination of low-technology solutions and more sophisticated approaches to monitor crop quality.	Marginalize post-harvest crop loss programmes.	Continue to review successful approaches and identify gaps in research and practice.
	Food waste	Encourage consumers and food companies to minimize food waste through communications campaigns highlighting economic, social and environmental advantages to preventing food waste.	European Union Revised Waste Framework Directive, 2018.	Roll back food waste reduction programmes.	Improve measuring and tracking food waste in regions with high per capita waste. Long-term communications campaigns to change consumer behaviour. Trial and scale up more innovative food waste reduction activities.



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