## INTERVENTIONS

The following interventions can potentially address direct disruptions in the food system. Changing input and output prices and losing ready markets can reduce income and productivity and even put farmers out of business (Schmidhuber et al., 2020; Swinnen & Mcdermott, 2020). For farmers not constrained by labour shortages, **subsidising inputs** can stimulate the use of fertiliser, improved seeds, pesticides, fuel and machinery. Since shortages of workers could become a recurring problem, additional labour supply interventions such as "green corridors" for migrant workers (European Commission, 2020) or, in the long term, increases in **mechanisation** (Swinnen & Mcdermott, 2020) may become necessary. Especially during a crisis, spreading accurate information through defined extension services is crucial to adapt farming systems quickly to unavailable inputs or new food safety requirements (Kosec & Ragasa, 2020).

Due to labour shortages, market closures and changes in downstream processing and retail, entire harvests may perish before reaching the consumer, implying food and income losses, price fluctuations and food safety issues, especially in fresh produce. Post-harvest, **storage and processing** interventions can minimise such losses in terms of both quality and quantity. Temperature-controlled supply chain technologies can significantly increase the shelf life of vegetables (S. Kumar et al., 2004), or make dairy supply chains more resilient, as recently demonstrated in Uganda (Trotter & Mugisha, 2020). Conservation techniques can preserve energy density and nutritive value of crops when adequate storage and cold chains are lacking (Augustin et al., 2016; Mensah & Tomkins, 2003).

The Covid-19 crisis reinforces pre-existing challenges in the food system. Investment in transportation infrastructure, power, irrigation and storage networks is needed to sustain its functioning. Financial and technical support for small and medium-sized enterprises (SMEs), including the development of e-commerce, is particularly important to sustain (low-income) consumers' food and nutrition security (FAO, 2020a). Such investments will require public–private partnerships (IFPRI, 2018) or blending, i.e. the use of development finance to catalyse private money (Nordhagen et al., 2019). Supporting SMEs, the functioning of value chains, and interventions and training to develop adequate and safe wet-market infrastructure are needed to keep wet markets open and operational (Safety & Businesses, 2020).

Given the pandemic's devastating impacts on (informal) labour markets (ILO, 2020), expanding and improving **social safety nets and transfers** through innovative delivery mechanisms is crucial. Related to this, replacing suspended **school feeding programmes** by take-home rations or cash transfers and promoting and maintaining food fortification schemes is vital to ensuring access to nutritious foods and improving the health of many (Fore et al., 2020; WFP, 2020b). Furthermore, in the long run, **home garden interventions** promoting nutritious traditional or biofortified crops and **urban agriculture** hold the promise of increasing food availability in urban centres particularly affected by food supply chain disruptions (Lal, 2020; Pulighe & Lupia, 2020).

## EFFECTS ON FOOD AND NUTRITION SECURITY

The traditional concept of food security comprises four dimensions: availability, access, utilisation and stability. Nutrition security is closely linked to food security but is also determined by food quality, health and care (Gross et al., 2000). Based on this framework, we highlight those interventions where rigorous effects have been demonstrated.

As shown in systematic reviews, both information interventions and input subsidies increase the adoption of productivity-enhancing technologies, yields and farmer income (Takahashi, Muraoka and Otsuka, 2019; Hemming et al., 2018), and can thereby increase food availability during Covid-19-related disruptions. However, evidence for direct positive effects on food security and nutrition is mixed (Pace et al. 2018; Harou, 2018; Walls et al., 2018). Poorer households benefit disproportionately in terms of production increases from combining input subsidies with other social transfers, as shown in Malawi (Pace et al. 2018). However, the long-term effectiveness of input subsidies depends on the prevention of crowding-

out of demand in commercial markets (Jayne et al., 2018).

As indicated in a rigorous review, nutrition-sensitive agricultural interventions can improve various nutrition outcomes in mothers and children, especially when they include nutrition and health education, water, sanitation and hygiene (WASH) components and fortified products, and when they empower women (Ruel et al., 2018). For instance, both communicating the importance of nutritious diets in extension services while providing biofortified seeds (Ogutu et al., 2020) or promoting food fortification programmes (Osendarp et al., 2018) increase utilization as well as overall nutritional status. Rigorous reviews found that home gardening and, with less evidence, urban gardening interventions positively affect the availability of nutritious foods and dietary diversity (Galhena et al., 2013; Poulsen et al., 2015). So far, households relying on self-cultivated foods have not experienced significant dietary changes due to the pandemic, as shown in China (Ahmed et al., 2017).

While diversity of production is generally associated with better diets, this relationship differs significantly according to context and is more pronounced in remote areas with suboptimal market infrastructures. Where production diversity is low, access to markets is a key factor in increasing dietary diversity (Ruel et al., 2018). Investment in infrastructure can strengthen supply chains, reduce transportation costs and increase market access, thereby increasing food availability, access and stability. According to a comprehensive review, infrastructure investments might lead to even larger decreases in poverty than input subsidies (Jayne et al., 2018).

Improved post-harvest handling, storage and processing technologies reduce food losses and strengthen food security through an increase in food availability and stability, another comprehensive literature review finds (Kumar & Kalita, 2017). While individual assessments find that programmes financially and technically supporting SMEs in retail and food service improve businesses' food safety protocols, access to finance and the ability to provide nutritious foods (USAID & GAIN, 2017), rigorous evidence is still lacking.

School meals provided as take-home rations or in-kind food transfers can increase the availability of and access to food for schoolchildren and their families (Ruel et al., 2013). If this includes the provision of nutritious and diverse foods, nutrition education and WASH measures, further improvements in utilisation and nutrition can be expected. A scoping review found that the provision of free school meals leads to reductions in anaemia and improvements in dietary intake but also to variable effects on nutritional status (Downs & Demmler, 2020).

In-kind food transfers were shown to increase recipient households' calorific intake. Cash transfers increase both calorific intake and, to some degree, dietary diversity (Durao et al., 2020; Gentilini, 2016; Hidrobo et al., 2018), directly by improving food access and indirectly through better nutrition decisions (Burchi et al., 2018). In the long term, cash transfers and vouchers are more efficient (Gentilini, 2016). To address child malnutrition, these interventions are best accompanied by nutrition and health messaging as "soft" conditionalities (Burchi et al., 2018; Lelijveld et al., 2020).

## CONTEXT-SPECIFIC CONSIDERATIONS

Interventions involving cash transfers or vouchers require functioning input and output markets (Laborde et al., 2020). In regions where markets cannot satisfy demand or where prices are volatile during crises, nutritious and safe in-kind distribution becomes even more important.

For interventions aimed at directly increasing food access, it is important to reach out to vulnerable groups such as women and children, youth, the elderly, migrants and poor informal-sector workers, as these groups are most affected by Covid-19 (Mesa Vieira et al., 2020). Geographical targeting could support the roll-out of programmes in suitable areas or clusters (Jayne et al., 2018) where the most vulnerable groups live. Decentralised targeting strategies that rely on communal knowledge can be another approach to better incorporate knowledge about recent income shocks

(Alatas et al., 2012). Targeting women in transfer or subsidy programmes can improve intra-household distribution, but needs to anticipate the traditional bargaining structure (Doss, 2013) to result in positive effects on child nutrition and overall poverty reduction (Bassett, 2008; Mason et al., 2020).

## NECESSARY ADAPTATION TO COVID-19

Respecting sanitation and hygiene standards is key for the effective implementation of any intervention to prevent the spread of Covid-19. National and subnational governments need to be supported to ensure that appropriate standards are met. This includes the health of workers and agents operating in the food system and the functioning of key infrastructure, such as wet markets. To reduce physical contact, input subsidies, transfers and vouchers should be provided electronically or via contactless digital payment schemes (FAO, 2020b). Spreading key information on healthy diets to vulnerable populations and refuting misinformation about virus transmission through food or misleading health claims is of major importance. To avoid contagion, the use of information and communication technologies (ICT) or decentralised approaches via lead farmers, mobile teams or clinics is recommended (IFAD, 2020). Besides information distribution via SMS, the use of radio has shown positive effects on knowledge and adoption of agricultural techniques (Tambo et al., 2019). Furthermore, authorising multiple household members to make transactions in existing social protection programmes could ensure that important nutrition-sensitive and Covid-19-related information reaches both men and women equally (Hidrobo et al., 2020).

## SPILLOVER EFFECTS

Overall, interventions that support agricultural production can generate multiplier effects and employment opportunities for rural youth (Tirivayi et al., 2013). Integrating environmentally sustainable approaches in agricultural practices can further reduce environmental impacts and enhance animal welfare (Garnett et al., 2013). Furthermore, effectively targeted interventions can empower women (Bassett, 2008), keep girls in school and delay pregnancies (Manley & Slavchevska, 2019).

Improved transport infrastructure can improve access to healthcare, especially for older people (Cooper et al., 2019). Besides nutrition, (on-site) school meals also improve children's participation, attainment and school performance (Alderman et al., 2010; Ruel et al., 2013; Wang & Fawzi, 2020). Cash transfers improve economic decision-making, increase productive investments and agricultural productivity, and encourage the utilisation of health services (Burchi et al., 2018; Tirivayi et al., 2013), and are often associated with a reduction in child labour (Tirivayi et al., 2013). However, input subsidies and other transfers can elevate the potential for corruption (Holden, 2019; Jayne et al., 2018), and therefore require effective monitoring.

## FURTHER RESEARCH

Evidence-based interventions in the food system are urgently needed to build resilience and prevent further disruption due to the Covid-19 crisis. While it is too early to see impact assessments on specific Covid-19 interventions taken to date, a considerable amount of research underpins the suggested interventions and can help to inform policies. Nonetheless, more robust evidence will be needed to understand the potential role of mechanisation, different processing and storing interventions, especially cold chains, the role and needs of SMEs along the supply chain and the potential for e-commerce in food retail, and urban gardening interventions, and their impact on food and nutrition security. Since the impacts of Covid-19 differ significantly between food supply chains, and within countries and even local communities (Dev, 2020), adequate subnational and target-group disaggregated real-time data on different aspects of food systems will be needed to inform policy decisions assuring their continued functioning.

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The thematic team on „Rigorous Impact Evaluation“ is contributing to a more systematic integration of rigorous impact evaluations and the use of their results in German Development Cooperation. Evidence-based policy and program design is crucial to increasing the effectiveness of German Development Cooperation and thus to promoting sustainable development. To this end, the thematic team brings together experts from BMZ, evaluation, academia and governmental as well as civil society implementing organizations.

Short explanatory video on the subject of "rigorous impact evaluations" (in German):
https://youtu.be/2iVqBhooeA8