4. COVID-19 and food systems in Indonesia

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4.1 Abstract

This assessment examines the emerging impact of the COVID-19 pandemic on food security and rural livelihoods in Indonesia. Focusing on five key production contexts across this highly diverse archipelago, the assessment finds that COVID-19 is having profound, variable and highly dynamic impacts on rural livelihoods. The impacts differ across geographical areas and production systems, depending upon how the effects of the pandemic articulate with local food systems, social relations and the livelihood strategies of individual households. While the Government of Indonesia has rolled out social protection and other programs to soften the impact, the fragmentation of value chains, falling producer prices, the contraction of the informal sector and the loss of jobs have dealt a blow to diversified livelihoods, severely affecting the welfare of rural households in many places. In response, smallholders are taking up localised survival strategies and turning back to agriculture. There is evidence of a fall in access to high-quality food as households move to higher energy carbohydrates, suggesting that the pandemic will have detrimental effects on nutrition.

The crisis has revealed vulnerabilities in Indonesia's complex food systems. This provides an opportunity for designing research and policy strategies to address key problems. Short-term interventions can understand and respond to the nutritional and livelihood impacts of this shock. Research can analyse how the pandemic has led to the disruption of value chains and the emergence of e-commerce and support measures to address these issues. Over the medium term, research can map and analyse existing household coping strategies, learn from the history of livelihood projects, and support measures to enhance diverse livelihoods, heterogeneity in agroforestry systems and crop diversification. Over the longer term, interventions can support the integration of nutrition and health issues into agrifood policy, provide for regional responses that build on local institutions and knowledges, design social protection strategies that directly address vulnerabilities found in regional contexts, and enhance farmer learning and their capacity to adapt to climate change.

4.2 COVID-19 in Indonesia

4.2.1 Country overview (July 2020)

Land use

Land area: 1.9 million km^2

31.5% agricultural land

9.7% GDP from agriculture and fish (2018)

Population

273 million people

45% rural

Adjusted income per capita US$2,990

COVID-19 and health

First recorded case: 2 March 2020

At 31 July 2020: 106,336 acknowledged cases; 5,058 recorded deaths*

Present in 34 provinces: hotspots in Jakarta, East Java, South Sulawesi, North Sumatra

Local response to COVID-19

Semi-lockdown; ban on large gatherings

National government stabilising prices, providing social assistance and training

Provincial governments implemented movement restrictions; later eased for food products

Programs for ongoing access to agri-inputs and credit

Agriculture and fisheries

Top staples: rice, fish, livestock, poultry, bananas

Highly diverse food and social systems

Agriculture is the lead sector in 20 of 34 provinces

One of the largest exporters of tree crops globally

Fish critical for employment and food; many fisheries overexploited

Key risk multipliers

Agricultural pests and diseases

Climate risks, including changing rainfall patterns

Issues of nutrition insecurity and food access in many communities

* The assessment reports 34,316 acknowledged cases and 1,959 recorded deaths at 11 June 2020, reflecting the situation at the time of core aspects of the research.

4.2.2 Development context

An overview of Indonesia's agricultural, fisheries and nutrition context is shown in Table 4.1. The diversity of food systems and the impacts to be studied here are highly variable and this presents particular challenges for this rapid assessment. As this study is finalised in early July 2020, Indonesia emerges as the epicentre of COVID-19 in South-East Asia, and the COVID-19 crisis is having profound impacts on livelihoods, but these effects are evolving and highly dynamic.

Indonesia is the largest archipelago in the world, stretching over 34 provinces with 270 million people. The total land area is around 190 Mha, and about 29% (some 55 Mha) is classified as agricultural land. Agriculture remains the leading sector in 20 provinces (Pradana et al 2019). The major food crops in terms of area harvested are rice, corn, cassava, soybeans and peanuts. Indonesia also is one of the largest global producers and exporters of tree crops, including rubber, copra, palm kernels, palm oil, coffee, cocoa and spices. Indonesia's gross domestic product has almost quadrupled over the past decade, even while the contribution of the agriculture sector to gross domestic product has shrunk to 12.81% by 2018 (Global Economy 2018, Statista 2020). Yet, in 2020, 30.26% of the workforce are active in the agriculture sector (falling from 55.1% in 1990), and agriculture is still the second-largest employer. A Bank of Indonesia official recently argued that the structural problem is that the productivity of Indonesia's agriculture has slowed amid fast-surging demand, pushing up food prices (Ribka 2017). An alternative argument is that import restrictions under Indonesia's food self-sufficiency policies have pushed up domestic rice prices, along with other food prices (Amanta & Wibisono 2020).

Indonesia's poverty rate has fallen by over half during the last two decades. In 2019, just under 10% of the population was considered to be living below the national poverty line. This is measured by the Indonesian statistics agency at around 425,250 Indonesian rupiah (Rp) per month or US$0.76 per day. Income poverty remains high among smallholder farmers with almost one-fifth of household families practising farming living below the national poverty line (FAO 2018). Stunting rates have also fallen gradually, and the Government of Indonesia has prioritised nutrition programs in 100 districts where stunting is most severe. Nevertheless, stunting rates remain high, with around 31% of children under five considered stunted (TNP2K 2017). This means that large numbers of children were already undernourished prior to COVID-19, and research suggests that undernourishment is a risk factor when facing a pandemic of this kind.

4.2.3 Status of COVID-19 in Indonesia

While Indonesia is well connected to China, with large numbers of tourists visiting Bali and other parts of Indonesia, the first case of COVID-19 was not officially reported until 2 March 2020. By 11 June 2020, the country had reported 34,316 cases, and 1,959 deaths. In early June 2020, the number of cases was still increasing, with Indonesia recording up to 1,241 new cases a day, the highest number recorded to date (JHU 2020). A month later, Indonesia was reporting 2,657 cases a day, with an infection rate of more than 20% among those tested. This made Indonesia the hardest-hit country in Asia after India (Massola & Rosa 2020). By late July 2020, Indonesian authorities reported that positive COVID-19 cases had passed 100,000 (Jakarta Post 2020a).

Table 4.1 Agricultural, fisheries and nutrition context of Indonesia

Indicators		Unit	Value
Surface area[a]		'000 km^2	1,913
Agricultural land[b]		percentage of land area	31.5
Age of population[a]	0–19 years	percentage of total population	35.3
	20–39 years	percentage of total population	31.4
	40–59 years	percentage of total population	24.0
	over 59 years	percentage of total population	9.1
Stunting rate[c]	under 5 years	percentage of age group	36.4
Wasting rate[c]	under 5 years	percentage of age group	13.5
Overweight[c]	under 5 years	percentage of age group	11.5
	male	percentage of total population	25
	female	percentage of total population	31
Obesity[c]	male	percentage of total population	5
	female	percentage of total population	9
Prevalence of undernourishment[c]		percentage of total population	8.3
Population distribution[a]	rural	percentage of total population	45
	urban	percentage of total population	55
Gross domestic product per capita[a]		US$	3,893.6
Adjusted net national income per capita (2018)[a]		US$	2,990
Agriculture and fisheries, value added[a]		percentage of gross domestic product (2018)	9.7
Government expenditure on agriculture[c]		percentage of total outlays	1.1
Top staples (ranked most to least)[c]		rice, fish, livestock, poultry, banana, coconut/copra, corn, sugarcane, mango, pineapple, cassava	
UNDP Human Index ranking[d]		out of 189	111
2017 World Risk Index (mean value calculation 2012–2016)[e]		out of 171	33

a World Bank (2020)
b FAO (2020)
c Global Nutrition Report (2020)
d UNDP (2020)
e Bündnis Entwicklung Hilft (2017)

Data collated on 10 July 2020 by Alex van der Meer Simo.

The actual number of infected people is likely to be higher, due to limited testing. The death toll is also underestimated, due to problems with attribution of the cause of death. COVID-19 has now spread across 34 provinces.

While the Government of Indonesia is increasing testing, Indonesia has a comparatively low testing rate. In early June 2020, it was reported that around 10,000 people were being tested a day (Ritchie et al 2020). By 11 June 2020,

laboratories had tested 287,478 people from a total population of 270 million, amounting to 1.08 tests per thousand people, one of the lowest rates in South-East Asia. Testing occurs in major hospitals, initially in Jakarta, and gradually extending to cities in outlying provinces. Rural areas lack testing capacities and many districts are unable to test and/or can only test small numbers. They need to send swabs to hospitals in the major cities where labs are equipped to do polymerase chain reaction testing. Reporting of laboratory-confirmed results can take up to a week from the time of testing (WHO 2020a).

The impact of COVID-19 across Indonesia is highly varied, with epicentres in Jakarta, East Java, South Sulawesi and North Sumatra. Informants in the cities are highly concerned, while respondents in outlying provinces and rural areas note that the virus is less prevalent. Some village informants noted that migrants had brought the virus back to their villages, even while village administrations were quarantining returnees.

Indonesia has a complex and shifting tapestry of COVID-19 related policies. Central and provincial authorities have implemented different policies over time, with different areas moving into and out of large-scale social restrictions known as PSBB (a semi-lockdown/ban on large gatherings). During the early stage, large numbers of migrants from the cities and from overseas sought to return, even as the state gradually tightened policies to restrict movement back to villages, particularly during the run-up to the annual Ramadan migration (*Mudik*). During this period, most areas went through a tighter PSBB period. This greatly disrupted trade networks and employment and had deleterious impacts on logistics and the movement of food supplies. Interviews and news articles from this initial period suggest that restrictions on movement had a highly detrimental impact on supply and value chains, or markets and livelihoods, affecting both the movement of staples around the country and food stocks. This policy was loosened, with a focus on restricting movement of people but not essential items, including food. Different provinces and cities intermittently continue to restrict the movement of people, with village authorities requiring returning migrants to quarantine and provinces requiring letters to move between islands or between provinces. In June 2020, Jakarta started moving to a 'new normal', loosening restrictions, much to the concern of epidemiologists who argued that the pandemic had not yet peaked and that restrictions should not be relaxed (Fachriansyah & Sapiie 2020).

The government response has been focused on social protection. Government of Indonesia policies have also sought to stabilise prices, ensure free flow of agricultural products as much as possible, and provide rural credit and support to small and medium sized-enterprises whose operations have been badly affected by the PSBB policies (Antara News 2020).

4.3 Assessment approach

This assessment is based on interviews using open-ended questions with more than 20 informants, seeking to achieve a gender balance among informants, including researchers, government officials and non-government organisation workers with national and regional expertise relevant to the study, including informants with specific information about the five case studies. In addition, a review was conducted of news articles and journal articles and a short survey of rural leaders and officials as circulated via email and WhatsApp. The assessment is also based on online data collection involving

more than 100 informants distributed across Indonesia. When reading this assessment, it is important to remember that Indonesia is very diverse, the trends are irregular and context dependent, and the situation is changing rapidly.

The focus of this assessment is shaped by an analysis of Indonesia's food security mapping exercises and recent stunting maps, which provide indicators for patterns of vulnerability and undernutrition across the nation. The World Food Programme of the United Nations notes that 58 of Indonesia's 398 rural districts are highly susceptible to food insecurity and malnutrition is widespread (WFP 2019).

Across this diverse archipelago, the following key issues and areas have been identified for further analysis:

- Rice and vegetable producing areas of Java: Java is home to two-thirds of Indonesia's population and over half of the country's poor and has the highest numbers of nutritionally insecure people (Badan Ketahanan Pangan 2018, NIHRD 2018).
- Coastal, fishing communities and trading networks: Fish remain a critical source of protein and micronutrients in archipelagic South-East Asia and there is a high degree of vulnerability among artisanal fishing communities.
- Oil palm producing areas: Research on stunting suggests that large numbers of undernourished people are found in areas outside Java, where estate crops, spices and dryland agriculture are the predominant practices (TNP2K 2017).
- East Nusa Tenggara: There are deep pockets of insecurity in dryland agriculture in eastern Indonesia.
- Papua: There are high levels of poverty and stunting in some areas of Papua, which is Indonesia's least-developed province.

The World Health Organization (WHO) defines stunting as occurring when height-for-age is more than two standard deviations below the WHO Child Growth Standards median. Stunting is, of course, a complex problem with multiple causes (WHO 2020b). The term 'stunting' is used here as it gives a direct physical indicator of degrees of undernutrition across Indonesia that incorporates various factors that lead to relative deprivation (for example, access to nutrition due to socioeconomic factors, food preparation and consumption practices, education of women, age of motherhood, breastfeeding practices, sanitation, hygiene and access to health care). Patterns of inadequate access to food are clearly an underlying cause of stunting (UNICEF 2018). Stunting rates tend to be highest in Indonesia's most deprived rural areas: 55.48% in Langat and 44.7% in Asahan (North Sumatra), 59.01% in Rokan Hulu (Riau) and 55.84% in Barito Timur (Central Kalimantan). Child stunting is clearly related to food insecurity (SMERU Research Institute 2015).

This is a rapid, qualitative study that aims to provide a snapshot of issues faced by Indonesia during and after the COVID-19 pandemic. The study relies on reading available reports and a limited number of interviews. Indonesia is a very diverse country and follow-up research will be required to identify processes and impacts to provide a more precise picture of many of the complex issues discussed here.

4.4 Assessment results

4.4.1 Snapshot of key findings

Smallholders

Horticulture, cash crops, informal workers, returning migrants, fishers and women highly vulnerable

Households with diversified livelihoods are less vulnerable than those with specialised livelihoods

Farmers unable to sell perishable products at market

Limited availability of agri-inputs

Coping strategies include village networks, traditional agriculture and selling assets

Supply chains

Low producer margins and high consumer prices from fragmented chains

Reduced demand for estate crops and fish products

Small and medium-sized enterprises (SMEs) lack access to finances and reserves

Advantages for e-platforms and some traders

Governance

Rice prices and supply stabilised in most areas

National social protection system already established

Supplementary programs established for local needs

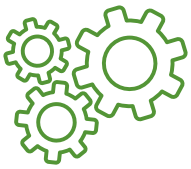
Input subsidies, rural credit program and support for markets

Community

Households losing on-farm and off-farm incomes

Impacts on women's workload, income and mobility

Changes in food consumption; cheaper, less nutritious foods



Employment

Informal and formal job losses

Distribution and agri-processing SMEs are vulnerable

Reduced remittances from overseas and urban workers

4.4.2 Exposure and vulnerabilities

Susceptibility of rice supply

Indonesians have a cultural preference for rice. Indonesian diets are highly reliant on rice, with low levels of consumption of meat and fats (Hirschmann 2020). This exposes Indonesia to particular risks, given that Indonesia imports significant amounts of rice and other key staples such as soybeans, sugar and meat. Shocks that disrupt logistics and distribution, especially to rice imports, present significant challenges.

Anticipating this problem, Indonesian policies have focused on promoting self-sufficiency in food production in order to achieve food security. The 2012 Food Law emphasises that importing food products should be avoided unless local production is insufficient to meet Indonesian consumption needs (Limenta & Sianti 2017). The Indonesian parliament and government are currently deliberating over changing articles in Food Law regarding imports to bring them in line with World Trade Organization rules through Rancangan Undang-undang Cipta Kerja (Draft of Employment Creation Law/ Omnibus Law). As rice imports have been restricted and rice production in Indonesia is comparatively expensive, rice prices in Indonesia have been above world prices[1]. For instance, prices for rice and sugar, as well as fruit and vegetables, are well above those found in global markets. Studies have suggested that raising rice prices to subsidise its production has increased poverty. As the poor spend an estimated 26% of their expenditure on rice and 65% on all foods, high food prices detrimentally impact the livelihoods of the poor (Booth et al 2019).

The COVID-19 pandemic has also led to a global rise in food prices for rice. The Thai rice market is used as a gauge for the global rice economy, and the price of rice hit a seven-year high in April. India, Vietnam and China have restricted their exports in order to ensure supplies for their own consumers. The difference between rice production and consumption fluctuates each year. In 2018, this difference was about 2.85 Mt (Booth et al 2019). There is some concern that Indonesia may face a threat of shortages late in the year, when, according to one estimate, there may be a gap of around 700,000 t/month (Novika 2020).

Exposure to climate change

Climate change exacerbates the risk of floods, droughts, storms, landslides and forest fires. Changing precipitation patterns are lengthening the dry season and leading to more intense rainy seasons, prolonged drought in the dry season, and more intense flooding in the wet season. Precipitation patterns are changing, increasing the number of dry days and reducing the number of wet days, and increasing the unpredictability of rain intensity, augmenting uncertainty and uncommon risks for farmers. The impacts of El Niño events include reduced average rainfall, which affects water storage and exposes extensive areas to drought and fire, and rising temperatures, which increase the incidence and range of pests.

Shifts in rainfall, evaporation, run-off water and soil moisture change combine with other risks that negatively impact smallholders. Reduced water availability will lower groundwater tables and empty wells, leading to a lack of drinking and irrigation water for farming. This, together with temperature increases, shorter growing seasons, unpredictable rainfall and saltwater intrusion, negatively affect production patterns and outputs and decrease food security. For instance, it is estimated that a 30-day delay in the onset of the wet season decreases rice yields by 6.5–11%, prolonging

1 In 2019, El Niño was blamed for higher food prices, which accelerated to 5.4% year-on-year in the third quarter of 2019 compared to 3.8% growth in the previous quarter (Bappenas 2020).

the 'hunger season'. This can increase the risks of harvest failures in the second planting season and delay the consecutive rice crop. Some estimates suggest that, as general crop productivity falls, food deficits of up to 90 Mt of husked rice will be generated by 2050 (GFDRR 2011, Ministry of Foreign Affairs of the Netherlands 2018). The high dependence on the production of rice renders the country particularly vulnerable.

Water deficits linked to climate change have already been reported for Bali and East Nusa Tenggara, while food deficits resulting from climate change have been reported in the provinces of South Sumatra and Lampung, East Kalimantan, East Nusa Tenggara and Papua (Ministry of Foreign Affairs of the Netherlands 2018). Poor rural smallholders are among the most vulnerable to these impacts, due to the dependence of their livelihoods on land and water, their limited income (110–140 million people live on less than US$2 per day), their poor adaptive capacity, and their limited ability to access improved technologies, inputs and alternative livelihood options.

Reports link harvest variability, particularly of rice, to exposure to climate change. Rice production is trending downwards with a 13% fall in harvests compared with the previous year, even though harvests were still sufficient for a 6.4 Mt surplus (WFP 2020). During the 2019/20 wet season, a prolonged dryness was linked to the Indian Ocean Dipole (Lerner 2020). East Nusa Tenggara, the driest province in Indonesia, has experienced severe drought. In other areas, rainfall and rice harvests were much delayed.

Indonesia's Meteorology, Climatology and Geophysics Agency has projected that more than 30% of the country's regions, including parts of Bali, Java, Sumatra and Sulawesi, might face an unusually harsh dry season this year. Regions hit by the worse-than-normal dry season include staple food production centres (Jakarta Post 2020a). Other sources note that only 30% of areas are expected to have a long dry season, affecting the second rice harvest. This will lead to a deeper production deficit than normal, beginning from August (Novika 2020). Lower rainfall is also expected to impact other crops such as corn (Agenparl 2020). However, in some areas of Java, a wetter dry season is expected, which will be good for rice production. The Australian Bureau of Meteorology has also observed that some models predict an increased chance of a La Niña event in the Australian spring (September–November) (Bureau of Meteorology 2020).

Fragmented value chains

Many commodities in rural Indonesia involve elongated, fragmented and geographically dispersed value chains (in the supply of inputs, production and marketing) where agrifood products pass through multiple processing and marketing stages that are managed by different actors (Gereffi & Lee 2009). The elongated nature of these chains means that they are not subject to market standards (for example, food quality and traceability) and are not well coordinated, so they are easily disrupted by market shocks such as that represented by COVID-19.

Fragmented value chains and poor logistics deliver additional costs (time and money) and lead to spoilage. This can mean inflate prices for consumers, as well as lower returns to producers who face higher costs for transporting to markets. For instance, research has pointed out that the high cost of basic staples in remote areas such as eastern Indonesia compounds poverty and nutrition issues (Sandee et al 2014).

Exposure to fluctuations in agricultural commodity prices

Agricultural producers have become increasingly commercially oriented. Studies suggest that, in many cases,

farmers have transformed the land around their dwellings, previously used for food production, by planting commercial crops for sale. This is especially the case in the estate crop sector, where monocultures are pronounced. Households who purchase most of their food are vulnerable when the price of the commodities they grow drop by large margins (Abdoellah et al 2020).

Land ownership in Indonesia is also increasingly concentrated. Smallholders on average have less than half a hectare, or about an acre. Functionally landless farmers have much less capacity for providing their own food (McCarthy & Robinson 2016). Landless non-food-producing households may be poorer and more vulnerable to fluctuations in labour demand (Rosalina et al 2007, McCarthy 2019). While household food production can be an effective strategy for rural households to meet their food requirements, developing food crops needs time and requires access to suitable land.

Other studies suggest that communities still value the consumption of local staples, even as they have increasingly become net food purchasers. In some parts of Indonesia, the provision of rice for the poor has become a key factor shaping a change in consumption away from local staples towards rice (Utami et al 2018). Rural households consume more plant-sourced protein than animal-sourced protein.

While fish is the main animal-source food in diets in many parts of Indonesia, poor families often have insufficient incomes to access fish (Gibson et al 2020). Chicken (meat and eggs) is also one of the most-consumed forms of animal protein and micronutrients. The chicken value chain, which stretches from corn production, feed mill production, fodder consumption for chicken and chicken meat to demand for eggs, is critical to food security outcomes (Diansari & Nanseki 2015). Patterns of chicken and fish consumption indicate shifting access to protein and bioavailable nutrients in diets.

Exposure to contracting labour market

In rural Indonesia, households are increasingly diversified. On-farm activities contribute only 49% of farming income on average, with activities off farm and in other sectors contributing the remainder (FAO 2018). Income diversification strategies therefore provide a critical means to secure household livelihoods. However, incomes in rural communities remain low, and one in five farming household are below the national poverty line (FAO 2018). Diversified households who have modest livelihoods are vulnerable to reductions in farming income or income from off-farm work.

Rural communities have also embraced migration. Large numbers of people move overseas or into the cities, either as long-term migrants or as circular, seasonal labourers. The remittances they send home increase food expenditure, contributing to their family's food security, and potentially offering a buffer against vulnerability to food price shocks. However, it also makes the family's nutritional intake highly vulnerable to shocks that cause migrant family members to lose their jobs and return home (Hasanah et al 2017).

Rural people in many areas of Indonesia are net food buyers. In fact, two out of three farmers in the country are classified as net consumers, and the population in 34 provinces spend, on average, more than 50% of their incomes on food. According to Kompas (2020), the 10 provinces with the highest percentage expenditure of income on food per capita can be ranked from East Nusa Tenggara (57.21%) to Aceh, Papua, North Sumatra, West Sulawesi, West East Nusa Tenggara, Jambi, West Sumatra, Lampung and finally South Sumatra (52.04%). These are in outer island Indonesia, and include areas where dryland agricultural, rubber and oil palm cultivation

predominate (Pancawati 2020). Among poor citizens, food accounts for more than 60% of the monthly expenses (Kompas 2020). In fact, the World Bank (2019) estimated that 68% of Indonesia's population is vulnerable to an economic shock. Sustained drops in commodity prices or demand for labour will lead to problems accessing nutritious food. Smallholders lack access to finance and falling incomes impact on their ability to afford inputs.

Exposure of women to reduced agricultural prices and shrinking labour markets

Women play a vital role in the agriculture sector. For instance, women are highly involved in the choice of seeds and the marketing of crops, and also take responsibility for family food practices (Rosalina et al 2007). Estimates suggest that women make up 37% of workers in the agriculture sector. Despite this, women tend to have limited control over land assets, and limited access to the financial resources, knowledge and technology required to increase crop yields and improve their livelihoods. While women often manage household finances in Indonesia, and have a degree of control over decision-making, they cannot access finances without their husband. In areas where large-scale rural-to-urban migration occurs, women take up work typically done by men. Female-headed households are more vulnerable to poverty due to their lower incomes, and estimates suggest that 20% of rural households are headed by women. Due to gender inequalities and income distribution, access to credit, and control over land and natural resources, rural women are more vulnerable to poverty. Further, previous studies have shown that women are vulnerable to gender-based violence during and after disasters (FAO 2019).

Nutritional security is also gendered. For instance, the age of lactating mothers significantly effects average calorie intake at the household level because older mothers better understand food quality and family requirements (Srinita 2018). Moreover, women suffer from much higher rates of anaemia. Policies that increase women's access to and control over resources and participation in decision-making in agriculture management are important to reducing vulnerability (Rosalina et al 2007). These factors suggest that many women working in the informal and agricultural sectors are particularly exposed to the COVID-19 shock. The price and health shock that COVID-19 represents will adversely impact women's access to paid labour or agricultural income and is likely to impact household nutrition.

Agricultural pests and diseases

Pest and disease infestations raise risks of crop damage and even failure. Avian influenza continues to circulate and African swine fever is increasingly affecting areas of eastern Indonesia. Crop damage in rice-producing areas continues, due to both the increase in humidity and incidence of drought, and also the persistent, excessive and injudicious use of pesticides. These pesticides increase the fecundity of brown planthopper (the most devastating pest in rice), kill pest predators, damage rice in one planting season and lead to outbreaks of viruses in the following planting season. Fungi such as rice blast also significantly reduce yields with increased humidity (Fox & Winarto 2016). The fall armyworm is impacting corn yields in some areas, and is expected to decrease corn production in some areas by 30–50% (Detik News 2020).

Nutrition issues

The triple burden of undernutrition (underweight, stunting and wasting) remains a significant challenge. When shocks to the food system occur, it is a threat multiplier. If not well handled with respect to prices (for example, diversification,

marketing, regulation), these shocks worsen the problem. Indonesian diets and food expenditure patterns are changing (for example, high use of instant foods and snacks with poor nutritional quality). A senior health ministry official interviewed during this research noted that Indonesian children were caught in a vicious circle of malnutrition and anaemia that increased their vulnerability to the COVID-19. Previous crises have suggested these trends can have detrimental impacts on stunting, obesity and micronutrient deficiencies. At the same time malnourished children are more susceptible to the virus. The ageing of the farming population is also an issue. Most farmers in Indonesia are around 56 years old, and are therefore vulnerable to the COVID-19 pandemic (Ridhoi 2020).

Public investments in agriculture

The Government of Indonesia makes extensive public investments in input and credit subsidies, trade restrictions, state enterprises food market interventions, and storage. As a World Bank report notes, a large proportion of public funding is spent subsidising fertiliser and other inputs, while there has been a long-term underinvestment in public goods that are vital for agricultural productivity and competitiveness (World Bank Indonesia 2016). As the Food and Agriculture Organization (FAO) (2018) notes, smallholders often farm without the benefit of modern tools and improved seed varieties. With the COVID-19 shock leading to reductions in research and development and public investment, budgets to modernise production systems and value chains will be limited.

Longer-term challenges are:

- how to produce more with less inputs
- how to develop more sustainable and resilient food systems in the face of climate change
- how to guarantee access to nutritious food with increasing demand and increasing water and energy scarcities.

Durability of Indonesia's social protection system

Indonesia has developed a social protection system since the 1998 east Asian economic crisis. This system places Indonesia in a better situation than other neighbouring countries, who are yet to develop social assistance policies. A recent World Bank (2019) report estimated that around 115 million Indonesians were vulnerable to falling back into absolute poverty if there were a shock to the economic system. Faced with the COVID-19 pandemic, the state is rolling out a series of social protection programs aimed at helping various cohorts of people. Nonetheless, this system will experience enormous challenges in identifying and transferring assistance to its poorest citizens, and a crisis such as this will undoubtedly test Indonesia's system (Antara News 2020).

4.4.3 Impacts of COVID-19

The way COVID-19-related dynamics intersect with these underlying vulnerabilities varies across production systems, landscapes, sectors, periods of time and locations. In this section, we examine the five contexts identified earlier to discuss how this works, before summing up the major impacts in the following section.

Rice and vegetable production in Java

The value chains connecting producers to supermarkets, inter-island, inter-city markets or local consumption are very diverse. The short value chains tend to be still functioning, while the most elongated chains (for export) have not functioned for some time. There are transportation problems and wet markets are intermittently closed in some areas, leading to delays or bottlenecks

in getting products to markets. Perishable products that need to be marketed quickly, particularly vegetables, are especially vulnerable to value-chain disruptions. Vegetables may not be sold into some value chains, or only sold intermittently. In many cases, as they are being used for livestock or local consumption, this has led to a decline in farmer income. Product prices, especially for perishable products such as fruits and vegetables, have dropped. Some small-scale distributors (*lapak*) have totally closed their businesses, as they cannot sell their products or buy from farmers. Women are highly involved in some of these value chains, for instance, as sellers in vegetable markets, and apparently are highly impacted. The price of cattle has fallen by 50% in some areas, and some households who need cash urgently have sold their cows at half price, indicating a significant level of desperation in some households (Woodward 2020).

In Java, e-commerce and social media (for example, WhatsApp) have emerged to keep value chains working to some extent. This is a fast-growing phenomenon. Some reports note that e-commerce platforms have experienced a fivefold increase in patronage. In many areas, this is a new way of governing value chains. While the amount may be still limited and only done by certain actors, this phenomenon can be considered as a new response. However, as food (retail consumer) prices have risen while product (farm-gate) prices have dropped, marketing margins may have increased greatly for those actors able to successfully work across these disrupted value chains.

The COVID-19 pandemic has not significantly affected rice production. However, climate variability (a prolonged dry season due to El Niño in 2018–19 and the Indian Ocean Dipole during 2019–early 2020) led to a late start of the planting season and a short wet season, impacting rice production. This combines with outbreaks of pests and diseases due to the overuse of chemical pesticides and fertilisers. In some parts of Java, there are significant water availability problems for farmers dependent on rainfed agriculture, or those who have limited streams or irrigated water supply.

Rice farmers in East Java and Central Java (Jogjakarta) keep some of their yields for self-consumption and hold off selling some of their rice in the latter period to meet cash needs. Rice farmers in West Java used to sell their yields immediately due to the need for cash (as capital for the second planting), to pay debts and to cover daily household expenses. To meet those expenses, farmers had to sell their unhusked rice at lower prices than usual, because big traders from outside the village failed to arrive to buy the unhusked rice. There are reports that, due to a fear of shortages later on, or following practices of keeping rice for self-consumption, villagers are retaining rice stocks. This has possible impacts on markets and the attempts of the state logistics agency, BULOG (Badan Urusan Logistik), to purchase rice.

Farmers need capital to start planting for the second rice production season. Disturbances to rice value chains, lower grain prices at the point of sale and delays in payments to farmers from mills and middle-agents have reduced their capital. This has delayed planting or led to reduced use of inputs, especially because of the unavailability of particular fertilisers in the market. Despite the central government's policy to release farmers from their financial burdens, banks still require monthly payments from traders and farmers who have accessed agricultural credit.

While some fertilisers are missing from the market or are in short supply, the main chemical fertilisers and seeds remain available. Vegetable growers in Pangalengan, West Java, are late applying

Perishable products that need to be marketed quickly, particularly vegetables, are especially vulnerable to value-chain disruptions.

Photo: Lisa Robins

fertiliser or are applying 'fake' fertilisers, leading to late and poor growth of plants and affecting yields. Yield reductions could be up to 20–30%.

Village leaders in some areas have imposed localised lockdowns, discouraging outsiders from entering villages. Restrictions on the use of labour due to social/physical distancing restrictions imposed by local leaders have led farmers to rotate labourers, leading to additional costs for labour. Returning migrants who have lost jobs in the cities and towns remain unemployed and often cannot find work in the farming sectors. Those badly affected include those finding casual work on construction sites, driving pedicabs (*becak*) or working in the informal sector. Households have lost remittance income, which used to be shared with families, and also face the extra burden of more mouths to feed.

Women who earn secondary income from the sale of homemade products (for example, snacks, bamboo handicrafts) are experiencing drastic impacts in survey areas (Indramayu, Sumedang and Pangalengan in West Java; Trenggalek in East Java; Bantul, Sleman and Gunung Kidul in Jogjakarta; and Klaten, Magelang and Purworejo in Central Java). A fall in demand from outside villages and kiosks, the lack of traffic and the closure of some stalls along the main road have led to declining income. Women continue to produce snacks only for local markets. The price of eggs, flour and sugar has increased, adversely affecting household budgets and also reducing the margins earned by women selling food in the informal sector. For the most part, the prices of staples have remained quite stable. The price of tofu, a major source of protein in Java, is increasing due to the rising price of imported soy. One tofu trader noted that the price of soy has risen from Rp600 per piece to Rp700 per piece in rural areas (Murdaningsih 2020).

The official list of recipients for social assistance has a high rate of inclusion and exclusion errors. This may be due to local leaders incorporating their own relatives or failing to exclude influential villagers. There are also issues with the updating process. Many local governments have claimed that they have received outdated beneficiary lists from the central government. For its part, the central government pointed out that many local governments have failed to regularly update their unitary social welfare (Data Terpadu Kesejahteraan Sosial) (DTKS) database, which contains a registry of the poorest 40% of the population. However, this database is clearly unable to capture poverty dynamics prior to and during the COVID-19 pandemic. Significant numbers of people are not receiving benefits to which they are entitled. New programs, such as the unconditional cash transfers (Bantuan Langsung Tunai) program, now provide new cash assistance (Rp600,000 per month). The dispersal of these funds depends upon the diligence of the village authorities in reaching out to cover newly poor residents who do not receive other assistance.

When the economy moves towards a 'new normal', informants expect the return of distribution and transportation. This may support the return of income generation from horticultural and homemade products, as well as off-farm services related to local trading, food distribution and tourism. However, if COVID-19 impacts increase, this return may be delayed, and the detrimental effects discussed above may become even deeper.

The most vulnerable include horticultural farmers, returning migrants, women and informal workers. Landless labourers may have lost work in the informal sector work (such as sand mining and rock quarrying) (Woodward 2020). Income from agriculture has become more important, and many can still find work in rice and horticultural

production as long as cultivation practices continue, earning wages as usual. Where labourers from other areas have left, villagers can find new work opportunities. In contrast, farmers employing workers experience the extra burdens of the shock. Rice growers will continue with their second planting season. However, vegetable farmers must weigh up whether to keep growing vegetables for market. Given the uncertainty, farmers need to gamble on what the future might bring. Failure could mean loss of working capital and a downward livelihood trajectory.

The impact of the COVID-19 crisis on farmers is differentiated. Wealthier farmer who engage in the commercial production of chicken and vegetables have difficulty selling their produce and are badly hit. However, small farmers who produce very little, tend to be less affected as they continue to produce to meet household needs. In general, secondary income generation from off-farm and homemade products has dried up. Villagers must wait for the end of the pandemic and the recovery of value chains, markets and distribution networks. In the meantime, they are planting all available land with vegetables. In general, household expenditure has dropped dramatically. In the short term, impacts on household food consumption will be ameliorated as long as rice, government social support and local food resources remain available. However, falling food consumption is likely to deepen as the crisis continues.

Estate crops in Sumatra and Kalimantan

In 2018, there were approximately 14.3 Mha of oil palm plantation land in Indonesia (Kompas 2018). It is estimated that around 2.67 million smallholders manage around 40% of this land, extending to approximately 5.8 Mha (Jong 2020). According to one calculation, there are 10.5 million workers within the oil palm sector, of whom 70% are casual day labourers (Sinaga 2013).

With the onset of the COVID-19 pandemic, global demand for estate crops fell. This led to congestion in storage facilities. Mobility restrictions meant the transportation of oil palm slowed, while demand for biodiesel dropped. This led to the closure of some independent mills (Info Sawit 2020). As company mills prefer to process fresh fruit bunches from their own estates, or from farmers who have partnership contracts with palm oil companies, the demand for fresh fruit bunches produced by independent smallholders has fallen dramatically.

In May 2020, the price for fresh fruit bunches had dropped by around 40% in many villages in North Sumatra, affecting the income of farming households. Rubber farmers were hurt even more, with already-low prices dropping by as much as 40%. Some responded by converting their rubber gardens into oil palm, using income from the sale of the timber to pay for replanting. Sharecropping rubber tappers were the most vulnerable, as they provide half their harvested rubber to the landowner.

While oil palm farmers continue their farming activities as before, they have the same operational expenses, even though the prices for fresh fruit bunches has fallen. Larger farmers, who continue to produce, retain their purchasing power. However, given the fall in fresh fruit bunches prices, those who borrowed from banks experience difficulties meeting repayments. With the relaxation of the loan repayment requirements from banks, households avoid repaying loans and some use their savings to make up the income lost from falling oil prices. Given the fall in labour demand and falling income due to declining demand for oil palm, marginal farmers with low oil palm production and a dependence on casual paid labour are acutely affected.

These include those with three hectares or less of inadequately maintained oil palms, typically trees that are from low-quality planting stock, over age or poorly maintained.

Many labourers continue to work as normal for the oil palm companies and receive the same salary. With the temporary closure of mill operations, demand for casual workers (*buruh harian lepas*) falls and workers face wages cut and the livelihood of casual workers becomes more precarious (Darto 2020). If there are confirmed cases (COVID-19 positive), workers face dismissal. In some locations, casual work opportunities for labourers on smallholder plots have disappeared, as farming households can no longer afford to pay them and instead turn to family labour. Where many palm oil mills have closed, outsourced workers, especially casual workers, such as those harvesting, loading and transporting fresh fruit bunches, face unemployment. Opportunities to work as drivers in public transport or on building sites have disappeared. Unemployed casual labourers lose their capability to purchase food.

Women living close to oil palm estates form a large part of the informal workforce, with many working to harvest loose fruit. This group has been identified as vulnerable and at risk, given their precarious employment, lack of social security and poor access to healthcare, insurance or fair wages (Zein 2018). Women who work casually in the oil palm sector are particularly exposed because they are more likely to lose their jobs.

The price of fertilisers has increased and there is difficulty accessing it, due to mobility restrictions. In some villages, fuel, fertiliser and other inputs remain available. However, they are not easily found in other oil palm villages, particularly in the more remote areas due to transport difficulties, or because subsidised fertilisers have been allocated to rice farming. Poorer households face difficulties buying fertiliser and instead divert their resources to buying food.

While in the past farmers used to practice dryland rice cultivation (*padi ladang*), in Sumatra this tradition disappeared after farmers converted their land to oil palm. Very few households grow vegetables and other food crops in their compounds. Farmers rely on sales of fresh fruit bunches to meet their daily needs, including food, and they are vulnerable to food insecurity if their income falls. For many households, there are limited work or farming opportunities outside the oil palm industry. These areas are especially vulnerable to food insecurity, and stunting rates tend to be high, especially among casual labourers and marginal smallholders. Field surveys suggest that daily wage labourers and marginal oil palm farmers have poor-quality diets and cut back on their protein. This is especially true during periods of low labour demand and low production, such as the dry season, which is known as a scarcity period (*paceklik*) (Sitorus & McCarthy 2019). Villages in remote areas closed their gates and forbade entry to non-residents, including traders who sell food. With the onset of panic buying, those with cash stocked up, which raised food prices. Small businesses that sold food experienced a sudden drop in sales and shops were instructed to close for periods of time. When stocks were low and prices high, shops lacked buyers.

While some migrants retain their work in the city or overseas and avoid returning, many others have lost their jobs overseas or in urban centres and no longer send remittances. In one study village, 130 'children of the village' have returned home. As migrants return, there are more mouths to feed, and a higher risk of spreading COVID-19. Returning migrants face the prospect of being unemployed, with more

people chasing the limited casual work available, adding burdens to household budgets. Some people also have to send assistance to unemployed relatives in affected urban areas. These landless casual workers become the most vulnerable group due to their poverty and the reduction of work opportunities, especially in remote villages. This problem is especially acute while they wait for social assistance to be distributed.

Informal social protection from neighbours, local social organisations and local companies help. However, they cannot cover all villagers and are often unable to reach remote areas. There are several social protection programs, principally:

- Bansos (food supplies purchased from community production by local governments for distribution as food assistance)
- Bantuan Langsung Tunai (unconditional cash transfer)
- conditional cash transfer program
- staples card (*kartu sembako*)
- Bantuan Kemensos (social affairs assistance).

Each program involves a different set of recipients and provides different amounts or forms of assistance. Provincial governments are rolling out social assistance (for example, the North Sumatra provincial government provides assistance of Rp225,000 per family). Villagers believe that, since COVID-19 can infect anyone irrespective of their wealth, the distribution of assistance should be equal. Therefore, district government assistance is divided equally, with recipients receiving 2.5 kg rice and 15 eggs from each allocation. However, the central government, through the Social Affairs Ministry, distributes Rp600,000 to a limited number of casual day labourer beneficiaries. The conditional cash transfer program and the staples card continue to be distributed using centralised data lists. In remote villages, the benefits from national, province and district safety nets arrive late. At the time of writing, the social safety nets have not yet effectively addressed vulnerabilities in remote areas. In some cases, there are protests from community members who fail to receive cash transfers in time or who deem themselves to be treated unfairly.

Vulnerable households respond by decreasing the consumption of high-quality foods and the variety of foods consumed, turning to cheap carbohydrates, and selling productive assets such as jewellery, and even their houses and land. In oil palm villages, the seasonal scarcity begins in the dry season when, with falling oil palm production and less work available, marginal famers and landless labourers tend to cut back on protein. Village governments are encouraging households to open home vegetable gardens. While social assistance will help households to some extent, careful management will be required over the dry season.

In the past, farmers traditionally valued diversity. With the enclosure of such large areas of land for plantations during the oil palm boom, many find themselves working small areas of land and are overly dependent on a single crop. In the future, farmers growing estate crops need to find ways to grow food crops, with strategic support for growing multi-crops or the reallocation of village, social forestry, housing compounds or plantation land for rice, corn and vegetable cultivation. As the shock most adversely affects casual labourers, social assistance needs to target this group. Palm oil price insurance could be explored to maintain stable prices of fresh fruit bunches. Program support could be extended to develop community-based, self or participatory targeting for food assistance; combine social protection

with supporting productive farming among most affected households; provide financial support for multi-cropping; and rejuvenation of old trees.

Papuan provinces

Indonesian Papua is divided into the two provincial administrations of Papua and West Papua (the Papuan provinces). By early June 2020, Papua had the third-highest proportion of individuals in its population infected with COVID-19, and West Papua was the fifth (Sucahyo 2020). Both provinces have low capacity for polymerase chain reaction testing, lack health facilities and have limited health workers. They also have high malnutrition rates among children under five years old and high levels of infectious diseases such as tuberculosis, HIV/AIDS and malaria. The populations of the Papuan provinces are considered high risk (Ramadhan 2020).

Due to their vast size, lack of medical facilities and health workers, and security issues, handling COVID-19 in the Papua provinces is challenging. Many health workers have tested positive (34 as at 26 May 2020). The supply and distribution of medicine relies on air transportation and faces shortages. Distributing medicine and developing testing capacity will take time. Given these constraints, regional governments have made extra efforts to try to reduce the mobility of people across the region. Papua Province was the first to close its border, shutting its airport and ports on 24 March 2020, especially links to and from Sulawesi, another COVID-19 hotspot.

Over recent decades, the population of both Papua provinces have changed their food consumption patterns and this has generated a high dependence on imports. Large numbers of migrants, especially Javanese, have moved into the Papua provinces and are primarily rice consumers. These groups are vulnerable to fluctuations in rice prices and availability.

Conditions in some areas of the Papua provinces are broadly similar to other parts of the region. While remote areas have limited access to food markets and rely on their own production, in some areas, factors such as climate conditions, land suitability, drought and flood lead to seasonal deficits in food supplies (Ichi & Tamimi 2020). Areas of the Papua provinces have significant potential to grow local foods such as sago, banana and sweetpotato. However, Indigenous Papuans have also changed their consumption patterns (Elisabeth 2020ab). While Papuans traditionally relied on local food, the introduction of the Raskin (Rice for the Poor) program gave them ready access to cheap rice. They prefer to buy inexpensive rice than grow their own food. Only 25% are fully self-sufficient food producers who do not primarily consume rice. These are Indigenous Papuans (*Orang Asli Papua*) who still have home gardens (Sumule 2020). The Indonesian Food Security Index 2019 notes that approximately 90% of districts in Papua rely on food supplies from outside their area.

In 2019, Papua produced 133,684 t of rice, 91% of this in Marauke. However, this only met 10.7% of the total needs (Papua Province 2020). West Papua can only produce 10.8% (9,045 t) of its total needs (Sumule 2020). With unstable climate patterns, last year's harvest in Marauke failed to meet its target, and average rainfall fell in February 2020. Furthermore, the provinces lack the capacity to speed up post-harvest management of rice (Wiyanto 2020). Consequently, it is estimated that 51% of people in Papua and 75% of people in West Papua depend upon imported rice supplies. The government has predicted that drought this year will affect rice production (Amanda 2020). During the COVID-19 pandemic, local governments are encouraging communities to produce more local food.

As in other areas of Indonesia, large-scale changes in land uses over recent years have affected prospects for food production. Forty-seven new permits were issued providing for 6.1–7.3 Mha of oil palm concessions since 2014 (Costa 2020b). In West Papua, oil palm permits have been allocated over 436,955 ha of land (Costa 2020b). Land conversion is reducing the land available for growing sago gardens or foraging from forests as areas are transformed into estates that produce non-food commodities, such as oil palm, increasing the dependence on rice imports.

Communities are returning to indigenous land practices during the COVID-19 crisis. In Asmat, Indigenous people are leaving villages and returning to their forest lands because they are afraid of COVID-19 and they can access food in forest areas (Costa 2020a). However, following deforestation, this option is no longer available for some. Deforestation increased threefold in Papua, moving from 60,300 to 189,300 ha per year from 2009 to 2017 (Elisabeth 2020b).

As most food is imported from elsewhere, food prices in the Papua provinces have always been higher than in other areas of Indonesia, especially close to festivals. According to official data (Tinal 2020), the prices of food staples increased after the onset of the COVID-19 pandemic. Food prices also vary significantly between the capital city of Jayapura and highland districts, such as Paniai, or isolated districts, such as Asmat. The 2018 Food Security and Vulnerability Atlas gave Papua and West Papua the lowest food security score. This atlas uses indicators such as the prevalence of stunting for children under five, the education level of women 15 years old and above, food consumption per food production, access to water and sanitation, and household spending on food. While specific areas of the Papuan provinces are known for high malnutrition among children, according to the 2018 Basic Health Research, the stunting rate for Papua is 32.8%, which is close to the national average, and the atlas suggests that food security is acute in all areas.

However, some areas are more vulnerable. The two Papua provinces have the highest number of vulnerable districts, with 17 out of 29 districts in Papua and six out of 13 districts in West Papua listed as 'priority one'. In neighbouring Papua New Guinea, one of the main causes of stunting among children under five is a lack of protein intake (Schmidt 2019). In Indonesia, the national average consumption of protein is 57 g per capita per day, but in Papua it is 46.03 g and in West Papua it is 53.02 g. These are the lowest below the national average. A measles and malnutrition crisis occurred in Asmat in February 2018 (BBC 2018), which caused 72 people (mostly children) to die. In February 2020, just before the pandemic, Jaya Wijaya district in Papua reported malnutrition cases in 40 subdistricts (KabarPapua 2020).

Cultural changes in food consumption may contribute to this issue. Indigenous people in Asmat used to spend months in the forest cultivating sago and finding enough food to live. However, large-scale cultural changes began in the 1950s with the arrival of Christian missionaries. This, together with the influence of migrants from other part of Indonesia, dramatically changed the diet of the Indigenous people in Asmat (BBC 2018).

With the outbreak of the pandemic, movement restriction led to problems in the distribution of food. In April 2020, the government closed ports in Papua Province (Costa 2020a). This disrupted distribution and increased the price of food commodities imported from Java and Sulawesi. Informants in the Asmat government noted that passenger ships bringing supplies from Marauke to Asmat only came twice per month after the onset

of the COVID-19 pandemic (from the end of March to June). Similarly, the road to the Meepago highlands closed from the end of March 2020, stopping the movement for goods and people, and generating shortages and price spikes in the Paniai traditional market in mid-May (Yogi 2020). The cost of chicken increased by 30% due to shortages. Despite these disruptions, the impact is minimal for communities who rely on community gardens to produce vegetables and sweetpotato while fishing in the lake.

The impact is greater on migrants who rely on cash work or produce cash crops for sale in the local cities, as well as those whose jobs have been affected by the economic slowdown. In May 2020, reports suggested that people were afraid of going back to the market or had less cash to spend, and therefore the incomes of the market sellers had dropped. However, in early June 2020, markets in Jayapura started to reopen and people returned. Farmers groups have also complained that their sales have decreased since COVID-19.

Some reports suggested that, without actions to minimise risks, 1.75–2 million people in Papua face the risk of hunger (*kelaparan berat*) due to the impact of the COVID-19 crisis, especially because of the disturbances in logistics from outside the regions, especially for rice (Sumule 2020). The main concern is that, if rice supplies in Java run short later in the year, the Papuan provinces will be most affected. However, both provincial governments moved quickly to assure people that their food stocks are secured. In early June 2020, BULOG noted that the stock of rice in storage for the next 3–4 months was more than 1.4 Mt.

To date, policies have focused on three key actions. First, state policies quickly focused on the smooth distribution of goods (including food) imported from other regions. During May 2020, the government agencies moved to fix logistics and ensure the movement of food supplies. Government initiatives to stabilise the food prices are focused in the major cities, such as Jayapura, but there are no reports regarding how provincial governments or BULOG are helping to stabilise food price in more isolated districts such as the highlands or Asmat. The BULOG initiative to stabilise the price of sugar in Jayapura may have succeeded: the market price of sugar is around Rp18,000–20,000, higher than the maximum price set by government. BULOG sugar is sold at Rp12,500.

Second, the government is encouraging citizens to grow their own food for food security purposes. Regional governments have focused on increasing local production of sweetpotato, cassava, taro, talas, banana, pumpkin and other crops that can replace rice. Local government and civil society movements are calling for people to return to local food and for communities to cultivate their food gardens (Triharyanto 2020). Local governments argue that people cannot always rely on state social assistance and imported food from Java. To stimulate demand and reduce dependence on imports, local governments are buying food supplies from community production for distribution as food assistance. For example, on 5 May 2020, the Governor of Papua purchased 5 t of sweetpotato and distributed it to vulnerable groups (Sucahyo 2020).

Third, Papua's provincial and district governments are rolling out social assistance programs, allocating Rp325 billion. The provincial government's plan for social assistance aims to complement national government programs, targeting communities who are opening land for farming and also fishers, small businesses and cash-for-work programs. The ability of local governments to implement and distribute social

assistance and reach vulnerable groups will determine whether these programs are effective in addressing food security in the region.

Future research could focus on whether the central government's Raskin (Rice for the Poor) program creates disincentives for communities to grow their own traditional food. Future research can look at how to increase the productivity of local food in Papua regions. Research can also study initiatives to increase Papua's ability to produce food and how policy can uphold the Indigenous people's rights to access land for food production.

Fisheries

While Indonesia's fishing grounds extend over 5.8 million km^2, many fisheries are overexploited. One estimate suggests that 72.44% of fish resources of Indonesia, comprising 92 of 127 fish species and groups of species, are fully exploited or subject to overfishing (Adhuri et al 2015, BPS 2016). About 97% of Indonesian fishers are artisanal, with boats below 10 gross ton. This means that many fishers access coastal waters that are already overexploited and often do not fully cover their production costs (fisheries researcher, pers. comms, June 2020). While there are approximately 2.7 million fishers, they constitute around 25% of those below the poverty line. These communities are especially vulnerable to the shocks caused by COVID-19 (DPP KNTI 2020).

Movement restrictions and implementation of the physical distancing policy led to transport restrictions and bottlenecks, reduced access to export markets and the closure of restaurants. Fish markets (*tempat pelelangan ikan*) became quiet. This affected fish processing and distribution systems, and the cost of logistics reportedly increased by 40%. As consumers lost purchasing power, the demand for capture and aquaculture fish fell. Fish collectors limited their purchase of fish from fishers and aquaculture farmers (DPP KNTI 2020, Samudranesia 2020). Fish stocks piled up and fish were even thrown away. Fishpond varieties, such as milkfish, were harvested in large quantities and sold at very cheap prices to prevent greater losses.

Since the onset of the COVID-19 pandemic, fish prices dropped dramatically, from 50% to as much as 75%. Prices for low-grade small fish (*ikan kering* or *ikan teri*), popular with poorer people, have also fallen from a normal price of Rp5,000–8,000 per kg to Rp1,500–3,000 per kg (CNN Indonesia 2020). One report noted that fishers' incomes from each time at sea fell from Rp3.5 million to Rp1–1.5 million (Samudranesia 2020). A fisher in North Sumatra reported that his daily income had fallen from Rp350,000 per trip to only Rp30,000–50,000, enough for the most basic needs (CNN Indonesia 2020).

Fishers are caught between rising operational costs and falling incomes. Operational costs, including the price of fuel, remain high and supplies are scarce in some areas. For aquaculture, the price of feed and medicines, especially those containing imported materials, has increased. The prices of some staple foods have increased, while households have to meet additional costs such as buying disinfectants.

Fish workers, particularly women who work in the trading networks, post-harvest sector and in informal stalls, face the biggest challenges with loss of income, lower wages and the risk of contagion (Orlowski 2020).

As most artisanal fishers lack collateral, they do not have access to formal credit, and remain dependent on fisher collectors and intermediate traders (*tengkulak*) for loans. While some *tengkulak* were badly impacted, others emerged even stronger. As fish auction locations (*tempat pelelangan ikan*) are considered risky, they are quieter. Fishers are unable to sell much of their fish

in the open market. They are forced to sell cheaply to *tengkulak*. Some intermediate traders have manipulated the situation to extract greater profits and control more of the high-quality value chains. The pandemic increases the fishers' dependence on *tengkulak* for working capital. Fishers who receive loans take risks. If they lose due to fluctuating prices or lack of market access, they must repay loans, even while the profits are with the *tengkulak*. One report noted that the government should be alert to the emergence of a 'mafia' in regions, who stack and lift the price of supplies and then resell for their own benefit (Sibuea 2020).

Poor access to cold chain infrastructure has particularly affected small-scale fishers, especially in remoter cities and fishing villages. This has degraded fish quality and has led to fish catches being wasted (CNN Indonesia 2020). However, new value chains are emerging: according to one account, online retail marketing jumped fivefold (Grahadyarini 2020). However, many areas are not yet connected, and these new value chains are still limited.

While fishers can attempt to adjust to ecological or climate factors by changing fishing grounds, practices and gear, the COVID-19 crisis presents a completely new set of dilemmas. Fishers cope by using savings, borrowing, selling and pawning assets. Some also barter with farmers, exchanging fish for rice. Fishing households change to cheap foods, and try shifting to work in agriculture as casual day labourers to generate some cash income. As fishers' livelihoods are not diversified and they need to buy rice, they are more vulnerable, especially to loss of working assets and capital. Reports note the emergence of self-help organisations, and assistance from religious organisations, neighbourhoods and relatives. However, if their livelihood crisis is deep, and if the pandemic continues, it will have a significant impact and the recovery process will be slow.

If the economic hardship continues, there is some discussion of whether this will lead to significant industry consolidation. Meanwhile, there have been calls for government agencies to step in to buy stock, offer minimum prices, assist with logistics and provide special cash-for-work programs for fishers.

Fishing activities have fallen quickly from April to June 2020 (Ambari 2020). While many fishers continue to go to sea to feed their families, in some areas they choose not to, as they lack working capital. In East Nusa Tenggara, one estimate suggested that fish production would decline by 50% in 2020, from 157,691 t to 78,845 t (Amnifu 2020).

An estimated 65% of Indonesia's population lives in coastal and marine areas (BPS 2016), and in many parts of the archipelago fish is the main source of protein. The large drop in demand suggests that the poor are consuming much less fish protein (CNN Indonesia 2020).

In conclusion, the crisis has severely affected the marine and fisheries sector, impacting an estimated 8 million fishers, fish farmers, those working in the supply chain and their families. The problem is a contraction in demand leading to oversupply, as well as reduced market access due to disrupted value chains, possibly generating a vicious cycle of dropping fishing effort, falling incomes and declining nutrition.

East Nusa Tenggara

East Nusa Tenggara is the driest province of Indonesia and has the highest stunting rate among underage children in Indonesia (43.6% in 2020). Most farmers grow food crops such as corn, beans and tubers that require little water. As well as the pandemic, farmers have faced a long dry season and extensive harvest failures, making 2020 a very difficult year. Although few cases of COVID-19 were reported in East Nusa Tenggara, from March to June villages shut

markets and banned outsiders from visiting (de Rosary 2020).

In Kupang, the lack of rainfall in April 2020 caused crop failures for the forthcoming harvests in some coastal areas (Pos Kupang 2020). At the start of May 2020, farmers began to anticipate water shortages as the dry season approached and were advised to shift to crops that require little water (Okenews 2020).

On the island of Lembata, while corn harvests were sufficient, as usual they had a rice deficit. Farmers could no longer sell cattle, usually used as a form of savings that can be sold for income during difficult periods (EkoraNTT 2020). In Timor, the livestock agency (Dinas Peternakan) noted in April 2020 that households had lost 7,000 head of pigs due to an infestation of African swine fever, losing a source of income used to support household economic needs during periods of scarcity (Detik.com 2020).

In East Sumba, rice harvests had fallen by half, with pest infestations compounding the impacts of droughts. Sudden unseasonal downpours in May 2020 affected some rice crops still in the field. Villagers usually consume meat during ceremonial events, but these events were cancelled and the pig market collapsed as travelling traders could not buy pigs from local markets. Similarly, the market for chicken folded as people conserved their resources to buy food staples rather than the luxury of meat. Mobile fish traders, who feared spreading the virus, ceased trading for some time. To make do during periods of crisis, people sell their jewellery to pawnshops (Vel & Makambombu 2020).

Reports estimate 1.1 million farmers in East Nusa Tenggara have experienced a reduction in farming incomes during the pandemic. One survey across 17 districts found that the majority had experienced a fall in yields compared to the previous year, with declines of up to 50% in some areas. The main factors included late rains during the planting season at the end of 2019, pest infestations, declines in prices of up to 50% and difficulties accessing markets. The drop in demand and distribution bottlenecks made farmers vulnerable. All the farmers interviewed were uncertain about whether or not they would be able to sell their products for cash in order to buy food (de Rosary 2020).

The media discussed how harvest surpluses might be moved to deficit areas to protect prices and avoid farmers wasting perishable food products. Local governments were also buying a proportion of harvests at half price and promising to pay the remainder once products were sold. The government planned to continue programs to assist households to grow crops on available land (*Kawasan Ramah Pangan Lestari*) and develop village food barns (*lumbung pangan*). Regional governments also supported efforts to develop food sources that are suitable for the area, including local cereals, such as sorghum, barley, tubers, sago (*sago gewang*) and palm sugar, along with local legumes and vegetables (de Rosary 2020). District governments received social assistance funds from Jakarta to support farmers, particularly horticultural farmers affected by the crisis. Meanwhile the provincial government is arranging the delivery of cheap rice through the Bantuan Sosial Beras Sejahtera (Bansos Rastra) (replacing the Raskin (Rice for the Poor) program) and the provision of cash transfers under the Bantuan Sosial Tunai program. As in other areas of East Nusa Tenggara, farmers are highly diversified. Exchanges between extended kinship networks stretch across rural and urban areas and between areas with different harvesting periods, spreading the risk and helping people to get by (Vel & Makambombu 2020).

In summary, climate change has already disturbed the precarious balance of farming livelihoods in East Nusa Tenggara. Yields have declined as farmers find it difficult to predict the right time to plant, and their crops are infested by pests (such as the brown planthopper, rice ear bug (*walang sangit*) and fall armyworm). Alongside extended droughts, farmers face periods of high rainfall intensity and catastrophic floods. Now the COVID-19 pandemic has affected markets for crops and livestock, afflicting households with a threefold burden (climate change, pandemic and economic shock). This is a crisis in both production and exchange entitlements. If the crisis persists for too long, local forms of resilience and state social assistance will become overstretched.

Summary of impacts

As noted earlier, before the crisis, significant issues of food access existed in many communities, along with the burdens of nutrition insecurity and obesity. An increasingly changeable climate is affecting production, and there are pest and disease infestations across some areas. Now a pandemic and a severe supply and demand shock has upset the delicate balance that existed prior to the crisis.

Informants recognised two main drivers of disruption. First, the partial shutdown and requirements for social distancing restricted movement of labour, disrupting transportation and logistics and closing wet markets, negatively affecting the storage and distribution of fresh food products. This has led to an increasing gap, with farmers and fishers obtaining low prices for their produce while consumers continue to pay high prices. Second, according to one estimate more than 6 million Indonesians lost their formal jobs by April 2020, with large numbers of people working in the informal sector also losing income. By mid-April 2020, one-quarter of Indonesians surveyed said that 'they could no longer fulfil their basic needs without borrowing money' (Economist 2020).

Economic scenarios for this contraction vary. One scenario suggests a 3.5% contraction in gross domestic product will increase the poverty rate from the previous rate of around 9% to 16%. However, a 5% contraction would drive poverty rates up to 18%. More modest predictions suggest zero growth in gross domestic product, pushing poverty rates up to 14%. The trajectory very much depends on how the pandemic works out (Dr A Suryahadi, interview, June 2020).

The most significant impact has occurred in value chains. In much of rural Indonesia, there are several vertical layers sequentially linking production to distribution to consumption. As each layer extracts a margin, these fragmented value chains are often seen to be playing a part in low farm-gate prices and low margins earned by rural producers. Following the implementation of the partial shutdown and falling demand, these value chains were disrupted. While the situation varies across commodities and locations, the impacts have been profound. Many farmers struggled to get their products (especially horticultural products and fish) to market before they spoiled. Rice farmers in Java faced delays in being paid and had less access to the capital they needed for the next planting season. Disruptions to logistics due to late imports and disrupted supply chains led to short-term food shortages and price spikes in some parts of the country. The same dynamics disturbed the distribution of inputs (for example, chemical fertilisers and imported inputs) which slowed, became more costly or in some cases were no longer available.

Farmer incomes also dropped, as producers had difficulty selling their products. With falling demand, there were reports of producer prices for some commodities

falling precipitously, creating welfare crises in food-producing communities. For example, fish, rubber and coffee prices all fell by up to 50% and oil palm fell by up to 40%. In many cases, at least in the short term, vegetables and fish that had previously sold into long-distance value chains or for export could only be sold locally. Local oversupply meant that, initially, products were cheaper. As poultry producers released cheap stock, producers faced losses and reduced production. As fishers and cash crop–producing small farmers faced falling prices and difficulties selling their products, the incentives for going to sea or planting vegetables for sale were reduced, with some informants envisaging that this will impact on supply and prices over the medium term.

Indonesia has quite a strong agriprocessing sector for local consumption and export involving small and medium-sized enterprises. This part of the food system is vulnerable to COVID-19 impacts with falling access to produce for processing, labour issues, workers having COVID-19, the closing of facilities during the pandemic, and resultant upstream impacts on farmers and agents.

At the same time, well-positioned traders or those able to move to e-platforms are highly advantaged. There were reports that the use of specialised online platforms grew fivefold, even while producers and traders excluded from these platforms attempted to use WhatsApp and Facebook groups to coordinate sales to their clients. Some intermediate traders were able to extract higher margins, transferring the risk to producers. In the medium term, this may lead to shorter value chains as consolidation takes place. However, powerful actors may be able to squeeze less well positioned producers who are forced to sell at low prices unless protections are put in place.

The impacts of the crisis are highly differentiated. Vulnerabilities and risks are often specific to production contexts, so the impacts of the crisis vary across geographical and production contexts, manifesting in different ways. The impact very much depends upon how the crisis articulates with existing production systems and social relations. Households who are specialised or whose livelihoods are overly dependent on a single commodity, those dependent on precarious wage labour, those without land and with low subsistence capacities, and those integrated into value chains on less positive terms tend to be more vulnerable. Farmers suffered significant losses. The terms of trade (the ratio of farmers' incomes to their household expenses) fell 0.85% in May 2020 to 99.47 (a value below 100 means that expenses are higher than incomes). Farmers producing estate crops experienced the highest drop (down by 2.3%) while horticultural farmers faced a drop of 0.58%, with the agriculture sector already contracting in the first quarter of 2020 (BPS 2020). This represents a substantial welfare shock for marginal smallholders. With markets shut or with shorter trading hours, and much less interest in food and other products sold from roadside kiosks, women who work, who sell homemade food products, or who are members of cooperatives marketing agricultural products, faced significant falls in income. Migrants with precarious work in the city returned to their villages to avoid the threat of destitution and to access the safety net provided by their families and villages of origin.

Farming households producing vegetables and rice on a small scale and for their own use were hardly affected. However, relying on their own production is only possible for some. While the impact on households who have diversified livelihoods may be less than those with specialised livelihoods, many face the simultaneous loss of farming

income and off-farm incomes. While some landless labourers in rice landscapes may be less severely affected, in oil palm estates, West Nusa Tenggara and elsewhere, casual workers are badly impacted.

The loss of income led households to embrace a range of strategies. With less available income and restrictions on movement, at first the price of protein (chicken and fish) fell and stocks were still available. In many places, the last harvest had been enough, and households still had savings and could access these commodities. The Government of Indonesia's social packages, such as cash and staples, will help households with low incomes to survive. However, over time, households who have lost remittances, have less income and have more mouths to feed may gradually face a build-up of nutrition impacts. As previous research into consumption shocks has shown, families may protect the caloric intake of children but the falling consumption of high-quality foods (such as fruit and vegetables) leads to maternal wasting and micronutrient deficiencies in mothers and children. This crisis is also likely to affect the balance of diets. The quality of food declines as households cut back on protein, vegetables or even the number of meals consumed or move to instant foods and higher energy carbohydrates. This suggests that the triple burden of undernutrition may increase over the medium term.

COVID-19 is particularly impacting women, increasing the burden of childcare, decreasing mobility and access to information, closing access to markets and leading to loss of incomes. Women who face declining nutrition and decreased immunity may also face increased exposure to the virus if they leave the house to buy food. Women also face increased risk of gender-based domestic violence.

Vegetable farmers, unsure about the future, found it difficult to plan. There were reports of farmers hesitating over when to plant their next crop. In the medium term, as the crisis continues, changing consumption patterns will continue to affect nutritional quality, reinforcing the transition to unhealthy foods and accentuating micronutrient deficiencies and stunting. The most vulnerable include children under five years of age and pregnant women. The impact on poor families will persist long after this crisis, because of the effects on human capital development and the potential of the next generation. For some households, the crisis clearly affects the sustainability of their livelihoods. By June 2020, there were reports of those most badly affected selling liquid assets (such as cattle) at low prices as a coping strategy. This indicates that, even with state assistance for some households, the crisis was already very difficult.

Climate change plays into these supply and demand shocks. However, for the most part, the issue is not one of supply. The problem lies in reduced access to nutritious food among poor and newly poor households. According to informants, the prospects for later in 2020 is 'not too bright'. The predictions are for the dry season to peak in August, and a more arid dry season in areas of Sumatra, Kalimantan and Java, with a delayed harvest and a hunger season (*paceklik*) persisting up to February 2021 (BMKG 2020). This places pressure on the rice supply. Some reports suggest the possibility of problems of rice availability during the last quarter of this year. Indonesia usually fills this gap with imports from the Mekong region. International rice prices have been spiking, and there are reports of limitations of availability in the international rice market. Dealing with this problem will require care. While BULOG has stabilised prices and supplies in many areas (such as Java), there were reports

from remoter villages in Central Kalimantan that prices have gone up 30% for basic needs due to restrictions on movements. Informants from eastern Indonesia, where many households depend on the supply of rice from the west of Indonesia, are concerned that they will face shortages later in the year if rice stocks in Java run low.

4.4.4 Recovery and resilience

Coping strategies and social protection

This section begins by considering coping strategies. Rural communities are tightly knit, and there are many reports of neighbourhood and village-level responses, including various forms of mutual assistance, such as bartering between fishers and rice producers, and the growing of traditional crops and substitute foods. Many of these strategies work in the short term but they have limitations in the medium to long term. For instance, producers taking on debt from *tengkulak* can be subject to exploitative trade arrangements.

Village institutions and networks work as sources of resilience. Villagers rely on family and neighbourhood networks in times of need, and village governments try to funnel help to those who fall through the cracks in state social protection systems. However, there are limits to these processes. Networks of mutual assistance are not necessarily available to the extremely poor, who have little capacity to reciprocate or rarely participate in village affairs. Moreover, the poor can only borrow for a limited period before their credit runs out. Those with higher degrees of capacity to rely on subsistence practices will be more resilient, while those with more specialised livelihoods or who are dependent on selling products or labour may well be more susceptible, especially if they lack productive assets such as land.

As the crisis deepens and savings are depleted, we are likely to see a gradual shift by more vulnerable households into strategies that are detrimental to sustainable livelihoods over the long term, such as selling productive assets at low prices. There is already evidence of this happening. These problems are exacerbated by the structural problem of urban labourers returning to their villages. A long period of jobless growth and low demand for rural labour will present a critical challenge for rural policy.

The balance of diet will change as the proportion of meals derived from the market decreases and households turn to self-production and traditional 'crisis' foods more often. In the past, many rural households moved out of poverty but kept agriculture as a component of their diversified livelihood portfolios. However, as the cash-producing aspects of these portfolios contract and farm incomes are curtailed, many rural households may well fall into deeper income poverty, leading to poorer diets. For these newly poor households, there may be no rapid recovery until their diversified incomes are reinstated.

Ongoing pest and disease infestations, and the impacts of climate change, will affect both the resilience of smallholders and their capacity to recover. In some cases, the persistent overuse of chemical inputs (pesticides and fertilisers) is exacerbating vulnerabilities and undermining community coping capacities. Research and assistance for farmers is critically important in order to improve their literacy on weather and climate issues so they can better understand the impacts of rainfall patterns on their fields' ecosystem, have access to climate scenarios over longer periods, and become able to better manage their fields' ecosystems to avoid pest infestations and diseases.

Value chains

The crisis has revealed vulnerabilities in the way complex value chains are organised. Disruptions affect smallholders and lead to falling producer prices in key commodities. The problem of improving the governance of value chains during this crisis must be addressed to support recovery. In response, In response to broken value chains, e-platforms have emerged, leading to a rapid uptake of e-commerce. In addition to these sophisticated e-platforms, WhatsApp and Facebook groups have also been set up to inform and organise people and link them to markets in areas where there are no specialised e-platforms. This represents a potential transformation of food systems and raises a series of issues.

Shorter value chains could provide opportunities for smallholders by reducing the margins extracted across fragmented value chains. Encouraging digitisation of fisheries value chains, both downstream and upstream, could secure or even expand market access of fishery products to national or international markets (assuming a shorter chain will be less detrimental to fish farmers). Policy could aim to find ways to support the development of cold storage and help manage supply and demand fluctuations in the market and preserve fish products until the market improves, increasing frozen and tinned products. Policy could also help strengthen logistics to ensure that the supply of goods needed for fishing runs smoothly. Research may be needed to help identify ways to support the inclusion of marginal smallholders on positive terms, modernise value chains and facilitate investments in cold storage to ensure greater value is added to fishery products.

Small and medium-sized agribusinesses play an important role in agricultural value chains, but they are often vulnerable, lack access to finances and have a low skills base. Small and medium-sized agribusinesses have been hard hit due to decreased mobility, cuts in supply chains, limited savings and their poor internal resources to allow them to withstand long periods without incomes.

Those small and medium-sized enterprises and intermediate traders who are able to adjust may earn significant margins. However, many enterprises are badly affected and are unable to move effectively into e-commerce. Producers living in telecommunication shadows are also disadvantaged. There are discussions about whether these changes are long-term and if they will lead to industry integration and consolidation. Informants also discussed the digital divide that is emerging between those who are able to adjust and those who are excluded, or included on less positive terms. While enterprises may be considered inefficient in economic terms, they play important distributional functions and provide extensive employment.

These long-term impacts may be profound. Although patron–client relations are often exploitative, they are shaped by moral economies and provide safety nets for the poor. In contrast, online market relations might be governed by purely economic logics and replace value chains based on patron–client relations. The danger is that, unless carefully managed, these changes could marginalise smaller traders and potentially exclude women who work in food processing and distribution systems.

Migrants with precarious work in the city returned to their villages to avoid the threat of destitution and to access the safety net provided by their families and villages of origin.

Photo: ACIAR

Return to agriculture

In many parts of Indonesia, there has been a movement back to agriculture. Villagers have returned to older subsistence practices to ameliorate shortages. In rural areas of Java and Bali, workers have been forced to return from the cities. Unfortunately, in Java, not all of these workers are ready to work in the agriculture sector, especially the younger generation who have no farming experience. The unemployment rate in rural areas will increase unless programs are created to provide off-farm work opportunities for these badly affected people.

In remoter areas of Kalimantan and Papua, informants noted that farmers were staying longer in their swidden fields (*ladang*), aiming where possible to produce their own vegetables and forage, hunt for meat or fish in forest areas, and avoid the pandemic. Articles in regional newspapers support this return to old subsistence practices with discussions of the virtues of traditions of dryland rice production (*padi ladang*), which has been neglected with the emphasis on wet rice cultivation (*sawah*). However, there are limitations to this shift. The majority of rural households are net consumers and need to buy food in the market. They have to earn cash income from casual labour, seasonal migration or off-farm work. These coping strategies are no longer possible in landscapes that have been transformed into estate crops such as oil palm or in areas with high degrees of landlessness. In forested areas of Kalimantan, traditional *padi ladang* practices that involve the use of fire are now illegal. In these landscapes, the limited ability of Indigenous Dayak communities to buy rice, their reduced ability to forage in degraded forest, and rising prices, poses critical questions for their livelihoods. It also has potential impacts for conservation and forest policy. At the time of writing, it was unclear to what extent social assistance programs were functioning in remote areas of the country, to what extent they can protect people in these remote landscapes from becoming more vulnerable or how increasing vulnerability may play out during the forthcoming fire season. In July 2020, the Central **Kalimantan** provincial administration had already declared a state of emergency, with over 700 hotspots and wildfires reported across the province (Muthiariny 2020).

State intervention

State interventions are critical to both recovery and resilience. Regional government policies encourage household food production, building on previous initiatives. Some programs encourage people to grow vegetables in polybags. The Sustainable Home-Yard Food Garden program supported women's farming groups to grow vegetables. In this case, the crisis has provided new opportunities to develop more-resilient food crop systems and diversify diets and cropping systems away from rice, helping to deal with the broader problems that loom over the future of Indonesia's food security. Initiatives in this area could also help farmers find alternative inputs if supply chains are disrupted. The crisis could provide important learning opportunities for policymakers searching for new approaches for sustaining food security. However, to ensure that new approaches are suitable for many diverse economic, social and cultural contexts, they must build on the most viable local practices and avoid top-down, one-size-fits-all approaches.

The Government of Indonesia's processes seem to have ameliorated the threat of food shortages in major staples for the most part. State institutions have functioned well and were able to forestall a major food crisis. Anticipating deeper scarcity due to a more arid dry season and possible import problems, the Government

of Indonesia moved rapidly to loosen import restrictions, increase production and fix prices by releasing reserve stocks and supporting inputs. Efforts to make sure that logistics effectively moved food around the country stabilised prices of key food staples. This seems to be working in all but remote locations. According to informants, since the disruptions in the first weeks of the large-scale social restrictions, prices and availability of rice and other key staples have been stabilised in key areas. There is confidence that there will not be food shortages of key commodities for several months.

The Ministry of Agriculture has prioritised policies to support the availability of food staples (principally rice and corn) to accelerate the export of strategic export commodities, support the development of farmers markets and roll out work labour intensive programs (*kegiatan padat karya*) and other social assistance for the farming sector (Ministry of Agriculture Republic of Indonesia 2020ab). New policies are being rolled out to increase the terms of trade for grain growers, building buffer stocks for 11 key food commodities, and maintaining price stability at the farm level (Warta Ekonomi 2020).

In response to the structural problem of rice deficits, the Government of Indonesia has returned to the idea of converting marginal wetlands in Kalimantan or intensifying rice production in other underutilised landscapes. In the past, such policies have proved costly, have not reduced the rice deficit substantially and have involved significant environmental costs (McCarthy & Obidzinski 2017). It remains to be seen whether developing more intensive rice agriculture in marginal Kalimantan and Sumatran wetlands can address Indonesia's structural rice deficit. The long-term challenge remains that of how to produce more higher-quality food with less inputs and in more sustainable ways in existing production systems while building resilience to external shocks like climate change.

In view of the impacts of curtailed income and employment on the ability of rural communities to access working capital for next season, the state is rolling out subsidised inputs and credit programs. The central government has developed policies for the relaxation of debt repayments and is providing access to financing, including credit and microfinance programs with low interest rates, flexible loan repayments and options for restructuring loans to small-scale fishers and aquaculture enterprises. However, the problem lies in implementation at the local level. Until these policies are working effectively, the burdens on local villagers may continue. The ability of these programs to address these issues remains to be seen.

Social protection policies provide the main means of responding to the crisis. Fortunately, since the last major shock in 1998, Indonesia has invested significantly in building its social safety nets and is in a much better position to assist the poor. As at 16 June 2020, Indonesia's total COVID-19 response budget was A$69 billion, of which A$20.3 billion is to be spent on 'social safety nets' (Ministry of Finance Republic of Indonesia 2020).

Significant amounts of the state budget have also been diverted from other budgetary areas to support social protection. Indonesia has at least seven social protection measures. The core programs remain the narrowly targeted conditional cash transfer program and the staples card, which provides monthly cash assistance for basic family consumption. The cash transfer program aims to help the poorest pregnant women and women with young children, as well as the elderly and people with disabilities, by protecting their buying capacity. This makes a significant

contribution to nutrition. However, the new poor are largely found outside this category, or the category of people covered by the staples card, many were not considered poor before the crisis.

In order to cover the 'new poor' and those who are not in the bottom 20–25% of the social welfare DTKS database, the government also introduced temporary programs, including a temporary unconditional cash transfer. These programs use the existing DTKS database. Many people have pointed out that this database has not been updated and contains many exclusion and inclusion errors. As this mechanism uses a proxy means test and ranking to determine who the poor are, it is unable to capture recent shocks.

Provincial, district and village governments have developed programs to support those not covered by the two flagship programs and those left out because they are not registered in the DTKS database. The Village Fund (*Dana Desa*) is being reallocated to provide cash transfers to those left out of the flagship programs. It uses community-based targeting that let villages play a key role in selecting beneficiaries. While village governments can use their own discretion to decide who is entitled to receive social assistance from the Village Fund, they need to avoid any overlap with the other programs. However, some villages have already used this fund this year. In addition, President Joko Widodo has set out to ensure that 3.8 million farmers and fishers receive social assistance. The Ministry of Agriculture is also providing social assistance to 2.7 million poor famers of Rp600,000 for three months. This is made up of Rp300,000 cash transfers and fertiliser, seeds and other production resources worth Rp300,000.

It remains to be seen if these different mechanisms will provide an effective response. Unreliable data has been a common issue in Indonesia's social assistance programs well before the COVID-19 crisis. Many studies have discussed the large exclusion and inclusion errors found in Indonesia's social protection policies (McCarthy & Sumarto 2018, Booth 2019). There are reports of difficulties around including the new poor in these policies. On 18 May 2020, President Joko Widodo acknowledged that 'just a quarter of urbanites whose livelihoods have been damaged by the crisis have received social aid' (Economist 2020). Anecdotal accounts tell of a similar phenomenon in villages. While many people who missed out on these schemes felt entitled to assistance, attempts to avoid overlap between schemes has the potential to delay the roll out of social assistance. The capacity of local government to implement these programs remains critical.

Further research is needed to understand how these programs help the poor and vulnerable and to what extent they deal with the food security problems posed by the COVID-19 crisis. How will food-for-work programs (*Program Padat Karya*) provide for fishing communities? Will social assistance compensate for temporary or permanent loss of fishing income for the estimated 8 million households who depend on fishing for a livelihood? Can these complicated programs be implemented effectively and on time? What are the nutritional impacts on pregnant mothers and children? Are men more likely to be able to access these benefits? Are women being marginalised? Cross-sectoral approaches (involving the health sector) are needed to understand the issues and ensure that social assistance is used to purchase nutritious food.

Further mistargeting remains a longstanding problem, with the complex proxy means testing methodology and the social welfare DTKS database continuing to omit significant numbers of poor people. The COVID-19 period could offer an opportunity to develop and trial simple and more robust targeting methodologies.

In addition to questions of how well the social protection system works, there are questions of whether it can be sustained over the longer term. The unconditional cash transfers payments will be dropped from Rp600,000 to Rp300,000 after three months (from July to December). Further broad-based allocations of social assistance programs limit the amounts that can be distributed. Dr Asep Suryahadi from the Research Institute SMERU has calculated that the poor require Rp2 million a month if they have no salary at all. Although cash transfers offer some help, they only cover an estimated 30% of the needs of those who have totally lost their livelihoods. The crisis offers opportunities for experimenting with new approaches and possibly transforming Indonesia's somewhat cumbersome and weakly targeted system of social protection.

State agencies have reallocated budgets. For instance, the fisheries ministry reduced its budget by Rp1.8 trillion (US$119 million), or more than one-quarter, to provide funding to tackle the COVID-19 outbreak in the country. Provincial budgets are similarly affected. East Nusa Tenggara reallocated Rp957 billion from of the Rp3 trillion village funds to help low-income citizens affected by COVID-19 (Jakarta Post 2020b). Research and development budgets have been slashed to support the emergency response, raising the question of whether donors will be able to support strategic policy interventions and research during and after the crisis. Research and development programs are required to address Indonesia's pressing food systems problems.

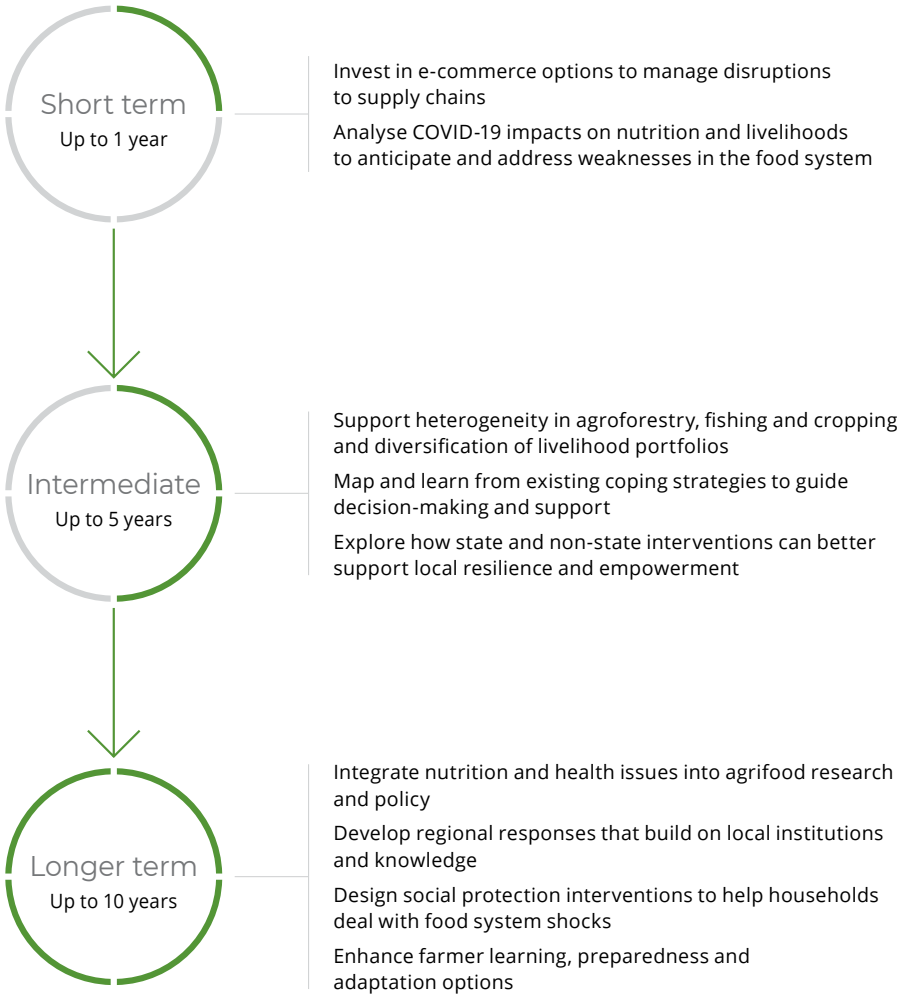
The socioeconomic situation and level of education in households has also been linked to their food security status. Households with access to safe water and better sanitation facilities tend to be more food secure. This points to the socially differentiated nature of food security, with better-off households more able to afford a nutritious diet (Srinita 2018).

Due to falling incomes, disrupted supply chains and limited social protection allocations, people use their income to buy carbohydrates, reducing consumption of fresh vegetables and fruit. It is likely that children, pregnant women and female-headed households from low-income groups (as well as the other most affected groups discussed above) will be most affected, due to their limited access to nutritious food. Women in locations where food consumption practices are gendered may also be badly affected. This will have long-term impacts on their health and the human capital of future generations. The decline in the quality of food in these groups requires policy and research attention if Indonesia is to avoid increasing the triple burden of malnutrition.

When considering resilience and the prospects for recovery, sources of resilience and adaptive capacity that provide households with the ability to absorb shock and to innovate are clearly co-emergent and not easily disentangled. Further research into these issues is required to identify particular points of intervention and also to consider how differently situated households fare over time.

4.5 Opportunities for action

4.5.1 Snapshot of potential investment options



4.5.2 Short term (up to 1 year)

Invest in e-commerce options to manage disruptions to supply chains

Vulnerability in food systems existed before COVID-19, with fluctuations in yields, price variations and involvement of middle-agents. Studies are needed to understand how the situation is changing, what the underlying vulnerabilities in value chains are, and what makes these value chains function better. Marginal smallholders were already price-takers and are often relatively powerless. It is important to understand how changes in value chains during the pandemic make these vulnerabilities more acute. For instance, the impacts seem to be highest with estate crops, followed by vegetables and, least of all, grains. Understanding how value-chain vulnerabilities play out is crucial to designing effective tactical interventions to ameliorate these problems.

The current rapid uptake in e-commerce points to the need for research into repairing broken supply chains. Indonesia needs a policy map for managing fragmented value chains and understanding the obstacles and opportunities for reform. This research must consider the political economy, social and economic aspects of marketing systems in order to anticipate the challenges of supply-chain reforms. As e-commerce becomes institutionalised, policy-relevant research needs to ensure the inclusion of marginal smallholders and women on positive terms, mapping how the e-commerce revolution is shaping who is included/excluded and why, and anticipating what policies will be needed to support inclusion. For example:

- price controls
- nutritional and safety standards
- affordability of nutritional food for the poor
- food safety standards and food traceability to support nutritional outcomes.

Other critical topics include:

- developing the technology to support supply-chain logistics
- interventions to make agricultural inputs more available
- developing cold storage and improve processing facilities to minimise waste and provide more stable markets for producers
- interventions that best support affected small and medium-sized agribusinesses.

There is also a special need for research into marketing chains in the fishing sector to consider how digitalisation might work best for marginal fishing communities.

Analyse COVID-19 impacts on nutrition and livelihoods to anticipate and address weaknesses in the food system

Based on previous studies of the impact of shocks on food security and considering the emerging evidence discussed above, it is clear that the COVID-19 crisis has serious implications for dietary practices and nutritional outcomes, including stunting. It is important to precisely analyse the effects on vulnerable people. Using community-based vulnerability and capacity assessment methods, research can analyse how rural households face these shocks. This can support the design of tactical interventions. It can deepen understandings of the weaknesses in Indonesia's food system and help policymakers anticipate the impacts of future problems. Finally, research can provide the basis for designing measures to support the coping strategies used by vulnerable people before future crises.

4.5.3 Intermediate term (up to 5 years)

Support heterogeneity in agroforestry, fishing and cropping and diversification of livelihood portfolios

The discussion above suggests that households with diverse livelihood portfolios, more heterogenous food systems and greater control over local resources, including more secure land tenure, are better able to withstand risks. In contrast, those dependent on monocultures or single commodities, and those who have lost their land during land enclosures (where small landholdings are replaced by plantations and access to land becomes restricted as formerly common land is privatised) are more vulnerable. Researchers need to help map out pathways back to more heterogenous food systems and landscapes, enhancing local control over the resources vital to rural livelihoods, including the on-farm and off-farm components. Rural smallholder livelihoods who have more diverse livelihood strategies are more resilient if one component of a household's income stream falls over, as they have other choices.

Access to forest resources and the development of agroforestry can enhance resilience, avoiding reliance on single commodities, and making the livelihoods of rural households more robust.

Increasing tree coverage and finding ways of integrating crops into social forestry schemes can reduce temperatures and evaporation rates and help with humidity. Access to forest resources or annual trees, and the development of agroforestry, can provide resilience in the future, and reduce overdependencies on rice. However, agronomic strategies and institutional development is required to achieve this.

For example:

- how to provide windbreaks to reduce air convention
- how to combine vegetables and annual trees with forestry, providing protection from infestations of pests and disease
- how to improve soil texture to avoid evaporation
- how to improve water-holding capacity and soil humidity.

To address food security needs, forests, social forestry and agroforestry (or silviculture) can play a key role. Access to food, cash crops and small livestock (for example, small-scale poultry, goats, bees, rabbits and guinea pigs) may be integrated with social forestry schemes. Monocultures and reliance on single commodities create vulnerability, so interventions are required to support the heterogeneity of cropping patterns and the diversity of on-farm and off-farm livelihoods. When a shock leads to a failure in one livelihood strategy, it will not jeopardise the farmer's entire suite of entitlements.

Strategic research is needed for revitalising crops diversification to include the intercropping of food crops within the areas of monoculture-estate crops. This will bring back not only food crops, which have disappeared in many rural areas due to transformation to cash crops such as palm oil, but also the sustainability of diverse cropping patterns. Future research could focus on the identification of potential food diversification strategies in oil palm areas, considering suitable strategies for promoting mixed crops within oil palm landscapes to avoid monoculture. This could be done revitalising and/or returning the traditional *tembawang*—the Dayak tradition of multiple cropping patterns.

Map and learn from existing coping strategies to guide decision-making and support

In rural contexts, yields, prices and ecosystems are fluctuating. The impacts of the pandemic point to deeper questions: how may smallholders be helped to be better able withstand challenges; and how to alleviate their vulnerability and improve the sustainability of the ecosystems they depend upon so that they may face risks in a more resilient way?

Research could enhance our understanding of the local trees, plants and local foods that rural people turn to, and how local food systems might be supported to make rural communities more resilient to climate change and other future shocks.

Research could map how local communities use local resources to face food security challenges, in order to understand how these can be enhanced. The research could help us better understand scarcity seasons, when and why they occur, who is affected and how households deal with shortages. For instance, in eastern Indonesia (West Nusa Tenggara and Papua), households replace rice with corn, cassava, banana, mungbean, taro and tubers, yet it is unclear how research and policy have supported the resilience of these practices.

Vulnerability and capacity assessments can facilitate better decision-making and support household adaptation strategies. Research and policy development over the intermediate term can support the design of interventions to enhance community capacity to resist, absorb and recover from the effects of both climate variability and other shocks such as those triggered by the pandemic.

Explore how state and non-state interventions can better support local resilience and empowerment

Researchers could analyse existing government strategies and programs that aim to support local resilience (for example, *lumbung pagan*, food gardens and other programs), to determine how well they work and how they might be improved or better adapted for the varied contexts of rural Indonesia. The aim could be to improve interventions that build the adaptive capacity of local farmers and vulnerable people and reduce exposure and sensitivity.

Research could also analyse existing diverse empowerment and facilitation programs carried out by non-state agencies who have helped local people to sustain and/or diversify their livelihood strategies. The objective would be to understand what supports local resilience and builds social and institutional capacity.

Research could also consider opportunities for marginal groups (such as artisanal fishers and farmers) to work collectively to articulate their interests and develop policy initiatives that incorporate their knowledge, understandings and aspirations. Collective action to pursue sustainable fisheries and agriculture needs to accommodate civil society experiences and the creativity of local communities. Over the intermediate term, this could lead to new interventions to support smallholder and fishing households.

4.5.4 Longer term (up to 10 years)

Integrate nutrition and health issues into agrifood research and policy

Rural Indonesia is undergoing a nutritional transition. Diets increasingly include higher amounts of fast foods, ultra-processed foods and sweets, including *jajan* snack and instant noodles. Poverty and the cost of food, dietary habits, health factors

and time and food availability also drive these food choices, generating a range of health problems (UNICEF 2018). Research to support the development of better food choices might consider how to:

- help people improve their diets
- put together existing food elements in rural landscapes to create nutritious diets if rice access and cash incomes fall
- address cultural issues where local foods are not accorded the respect they deserve.

This could build on understanding of what types of crops or livestock smallholders can use to hedge against shocks, and how households can improve food preparation to make traditional foods more attractive. This research would aim to support interventions to enhance farmer resilience in facing external shocks and the role of government in empowering them to be more resilient. As an alternative to top-down diversification strategies, food systems research could look for diversification strategies that emerge from within communities.

If rural people are to have access to diverse food resources and support bottom-up diversification strategies, they need to understand the nutritional impacts of poor diet on health and wellbeing, especially for mothers and women. This will help address stunting, but if value chains are disrupted, and communities cannot rely on the outside, they may also be able to make use of local food production.

Develop regional responses that build on local institutions and knowledge

One of the questions posed by several informants is how can more robust regional food systems be developed to support resilience at the regional level? Provinces and districts need to improve their capacity to identify areas in need and move food from areas with surplus production to deficit areas during crisis. Food systems need to be less dependent on imports from Java, so that local foods are available and less expensive, and local food economies are stabilised.

Technologies need to be 'fit for use'. For example, technology should support increased water efficiency in East Nusa Tenggara and better management of local crops, including production and marketing. To support self-sufficiency at the regional level, districts and provinces could analyse how food produced and distributed between local communities within the same region could support subsistence needs.

As this assessment suggests, vulnerability is differentiated and contextual, and a regionally nuanced approach is needed to address it. In other words, research that understands the social and gendered mechanisms that create vulnerability in particular contexts can help regional policymakers determine how these vulnerabilities might be addressed.

For example, interventions could build on existing social institutions and make them more efficient, accommodating locally available knowledge and social institutions to improve resilience and strengthening the capacity of local institutions to manage shocks. For example, village institutions are highly engaged in managing responses both to COVID-19 and the food shock. What shapes how this works? What might be done to sustain such capacities in the future?

Research may need to identify existing gaps in the capacity of regional government agencies to develop approaches to addressing vulnerabilities specific to their regional contexts. Agriculture-related local government agencies need to integrate capacity and vulnerability assessments in order to enhance their decision-making and provide better services to the most vulnerable farmers and agriculture stakeholders and build their resilience.

Analysis of contextual vulnerability might help regional governments develop approaches to addressing vulnerabilities that are specific to their regional contexts. For instance, rural households dependent on day labour (*buruh harian lepas*) may need assistance during periods of the agricultural calendar when there is very little demand for work. During such periods, social assistance such as food-for-work programs could be rolled out. Social protection programs could also be more integrated, or target directly seasonal aspects of vulnerability. For example, rural households could be helped during scarcity seasons at specific times of the year (typically before the harvest). There is also a need to support or make use of existing research and develop outreach to assist smallholders facing pest and/or disease infestations that are increasingly linked to climate change and that arise from farmers' use of chemical inputs. Improving farmers' sustainable cultivation strategies could increase production as much as or more than opening new paddy rice (*sawah*) in marginal landscapes.

Design social protection interventions to help households deal with food system shocks

COVID-19 is severely testing the social assistance system and highlighting the longstanding problem that the existing targeting methodology does not reaching all vulnerable households. While village-based community practices of mutual assistance and non-government systems are stepping in to assist (Wilson 2020), the COVID-19 crisis provides an opportunity to experiment with ways to move towards simpler and more robust methods for assisting the poor.

Social protection is usually seen as separate from agricultural questions. However, livelihood research could contribute to the design of social protection interventions that help households deal with food system shocks, including local climate or pest-linked crop failures. For example, social assistance could be designed for scarcity periods, social assistance could be provided from locally purchased food, and village budgets could be used to support food security outcomes rather than focus on infrastructure.

Enhance farmer learning, preparedness and adaptation options

Informants noted that, before difficult seasons, farmers need to be well-prepared. Farmers who have improved their agro-meteorological knowledge can better anticipate the probable seasonal scenarios based on their regular understanding of the impacts of rainfall patterns on their own fields and food production, and their access to seasonal climate scenarios. While on-time provision of seasonal, three-month climate scenarios is crucial, further work is required to support farmers to gain the literacy to anticipate climate conditions and manage uncertainties and risks. This involves enhancing the technical skills and education of farmers and fishers, and supporting knowledge gains among farmers and youth to improve climate their climate-change literacy and understanding of virus-related risks. Research is required to further understand farmer learning and how it can be enhanced. Research could also support adaptation in fishing communities, looking at how fishers may deal with emergent forms of vulnerability in fishing communities facing climate change.

As women have differential vulnerabilities, coping mechanisms and adaptation capacities, these studies need to apply a gender-sensitive approach. This will help ensure these programs achieve gender equity and social inclusion. Studies could also look at gender-based consumption of food and whether women and girls have been more affected. Research could also explore what strategies would enhance

resilience without detrimentally increasing women's labour.

Several of these recommendations align with the principles of conservation agriculture. According to the FAO, conservation agriculture emphasises the maintenance of permanent soil cover, minimum soil disturbance and the diversification of plant species, while enhancing biodiversity and natural biological processes to support increased water and nutrient use efficiency to promote and sustain crop production (FAO 2018). Indonesia's new law regarding sustainable agriculture systems holds that agriculture needs to follow an agroecosystem approach based on the principles of conservation agriculture to improve and sustain agricultural productivity.

Potential research questions

- How is COVID-19 impacting livelihoods and nutrition?
- How do smallholders face food shocks and vulnerabilities and how can these strategies be enhanced?
- Which existing state and non-government organisation interventions work well and how can they be improved?
- How well do empowerment and facilitation processes work and what can be done to enhance them?
- How can the technical skills and climate literacy of smallholders be enhanced in order to support their resilience?
- How might research respond to the needs of marginal smallholders and fishers and help develop policy initiatives that build on their understandings and needs?
- How can agroforestry or social forestry initiatives that support diversity and enhance community food security outcomes be developed?
- How might crop diversification strategies assist smallholders and landless labourers in oil palm landscapes?
- How can better food choices among the rural poor be supported?
- How can locally appropriate social protection systems be designed to better address entitlement failures among smallholder communities?
- How can more robust regional food systems be developed to support resilience at the regional level?
- How can regional governments be helped build the capacity to develop approaches for addressing vulnerabilities specific to their regional contexts?
- What is causing vulnerabilities in value chains during the COVID-19 pandemic?
- How can fragmented value chains be restructured to build more robust and inclusive value chains for the future?
- How can smallholders benefit from improvements in these chains (including a gender-sensitive approach to ensure women and girls are not further marginalised)?

4.6 Conclusions

In the early days of the crisis, it was thought that the COVID-19 pandemic would have little impact on agriculture. However, the impacts of COVID-19 are both significant and highly differentiated. They vary between upland and lowland areas, between different production systems and along lines of class, gender and age.

The crisis has undermined elements of diversified livelihoods. Those pursuing diversified livelihoods still retain elements of their diversified portfolios to fall back on, even if their incomes have fallen. In rice-growing landscapes, production has continued much as before, and rice farmers and those who work for them have experienced relatively less impact. Although income from vegetable production may have fallen, they have harvested rice or there may be new labour opportunities where migrant labourers have been displaced. However, many of those depending on a cash crop or a commodity or a single income-earning strategy are facing a more intensive welfare crisis.

Over time, the problem of hidden hunger is likely to become deeper due to this crisis. For a while, households may make do with savings, borrowing or selling assets, or finding small cash-earning activities. However, prolonged hits to income are likely to generate considerable impacts on nutrition over the medium term, particularly among those moving back to their villages without effective livelihoods.

The state response has been considerable, and state agencies have stabilised prices of key commodities. However, budgets are limited, and these responses need to be maintained for an unknown period. Moreover, the structural rice deficit remains a challenge that requires careful management.

Agricultural research necessarily focuses on increasing production. However, the problems discussed in this assessment involve issues beyond production questions. The crisis poses problems about how to improve value chains, logistics and storage, as well as questions of ecological sustainability, land-use change, nutrition, health and social protection. This will require an integrated approach. UNICEF (2018) noted that policies related to food and nutrition security need to 'take a multi-sectoral approach to improving nutrition and ensuring that nutrition-specific interventions that tackle the immediate causes of malnutrition are in place, as well as nutrition-sensitive programmes that address the underlying causes' (UNICEF 2018:9). To avoid increasing perils from multiple sources of risk that face the food system, policy strategies need to address several sources of risk simultaneously (OECD 2015). This suggests that research to support Indonesia as it faces food and nutrition security dilemmas should be sharply focused but also broad enough to lead to cross-sectoral approaches to the problem of food and nutrition security. Research and policy also need to consider issues of scale, ensuring that policies address food and nutrition security issues at national, regional and household levels. The current shock offers the opportunity to address policy learning that can support Indonesian rural communities before they face systemic crises linked to climate change.

Finally, the crisis has revealed the varied, multiple and intersecting vulnerabilities that Indonesia's smallholders face. The proposed opportunities for action support efforts to find new ways of sustaining rural livelihoods, enhancing existing coping strategies and promoting local control over the rural resources that are vital to livelihoods. Suggested actions for research and development investments

also support building policy on established local institutions and knowledges while avoiding one-size-fits-all approaches, supporting heterogeneity in agroforestry systems and crop diversification, providing for new and fairer ways of organising value chains, and finding better forms of social protection to address entitlement failures more directly. Such actions can support non-incremental transformations towards improved nutritional outcomes. However, further research is needed to identify more clearly the active processes of vulnerability production, single out more sharply how they might be amenable to policy redress and identify other transformational reforms that more clearly focus on the systemic causes of these vulnerabilities.

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