



COVID-19 impacts on agriculture and food systems in Nepal: Implications for SDGs

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ABSTRACT

The objective of this study was to understand the impacts of COVID-19 crisis in agriculture and food systems in Nepal and assess the effectiveness of measures to deal with this crisis. The study draws policy implications, especially for farming systems resilience and the achievement of SDGs 1 and 2. The findings are based on (i) three panel discussions over six months with policy makers and experts working at grassroots to understand and manage the crisis, (ii) key informants' interviews, and (iii) an extensive literature review. Results revealed that the lockdown and transport restrictions have had severe consequences, raising questions on the achievement of SDGs 1 and 2, especially in the already vulnerable regions dependent on food-aid. This crisis has also exposed the strengths and limitations of both subsistence and commercial farming systems in terms of resiliency, offering important lessons for policy makers. Traditional subsistence farming appears to be somewhat resilient, with a potential to contribute to key pillars of food security, especially access and stability, though with limited contributions to food availability because of low productivity. On the other hand, commercial farming - limited to the periphery of market centres, cities, and emerging towns and in the accessible areas - was more impacted due to the lack of resilient supply networks to reach even the local market. Lower resiliency of commercial farming was also evident because of its growing dependence on inputs (mainly seeds and fertilizer) on distant markets located in foreign countries. The observation of crisis over eight months unleashed by the pandemic clearly revealed that wage labourers, indigenous people, and women from marginalized groups and regions already vulnerable in food security and malnutrition suffered more due to COVID-19 as they lost both external support and the coping mechanisms. The findings have implications for policies to improve both subsistence and commercial farming systems - in particular the former by improving the productivity through quality inputs and by diversifying, promoting and protecting the indigenous food system, while the latter through sustainable intensification by building reliant supply network linking farming with markets and guarantying the supply of inputs.

1. Introduction and methodology

The novel coronavirus (COVID-19) pandemic has revealed how the global food systems can become vulnerable and lead to increase in food insecurity, malnutrition and poverty especially among marginalized groups (World Bank, 2020a; WFP, 2020; Nguyen, 2020; Stephens et al., 2020; Fore et al., 2020). Nepal, a landlocked and least developed country located in South Asia (Fig. 1), has also been witnessing various adverse impacts of COVID-19 in terms of human casualties and physical

and mental health and on country's diverse farming systems and food security. As of 2nd November, 176,500 total cases of infection with 37,524 active cases and 984 total deaths were reported (Worldometer, 2020). Nepal imposed a lockdown to control the spread of the coronavirus since 24 March 2020 and partially opened since the first week of September 2020. The lockdown has affected the overall physical, mental, social and spiritual health of the people and posed unique challenges with vulnerable populations and limited resources to respond to the pandemic (Poudel and Subedi, 2020). It has also negatively

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impacted on education, especially for the agricultural students who should be conducting the practical fieldwork that will not be possible through online classes or videoconferencing (Thapa et al., 2020). Like in other developing countries, Nepal also faced a question as to whether the real crisis from COVID-19 would come from health or from hunger, or to what degree the crisis could setback in the achievement of the Sustainable Development Goals (SDGs) by 2030 (UN, 2015). However, Nepal's farming systems also have some resilience that helps to cope with and adapt to the crisis. For example, diversification of crops and income generating activities within the farming system in the hills and mountains was considered as adaptation to face the crisis brought by severe earthquake in 2015 (Epstein et al., 2017). Government and other actors in Nepal have also implemented new ways to deal with the disruption caused by COVID-19 in food production and food security, and some of them have helped farmers and the broader population.

The objective of this study was to assess the immediate impacts of COVID-19 on different farming and food systems as well as their consequences on SDGs 1 (no poverty) and 2 (zero hunger) in Nepal. This paper looks into: how local farming systems are being affected and which systems are likely to be resilient; how food security has been impaired; and how effective are the current measures taken by the government and the community to deal with the impact of COVID-19 on farming systems and food security. We also aim to offer some insights into appropriate responses required to deal with the crisis in Nepal. The paper is based on a series of three virtual panel discussions organized by the Nepalese Association of Agriculture, Forestry and Environment in Australia as a part of its continuous conversation on this topic. The first one was organized on 28 April 2020 and the last one on 31 October 2020, which led to an understanding on how the crisis and its impacts progressed over time and how the government's and community's responses worked. These virtual discussions were open in which authors participated as discussants and presented the information and data they collected. Two of the authors have been working at the grassroots levels in Nepal to observe the impact, provide help to people, and influence policy changes to deal with the crisis. Other authors collected data and information through secondary sources. Researchers and students (ranging from 20 to 27 in each of the virtual panel discussions) based in different countries and interested in this research theme participated in these discussions and provided comments. These discussions were supplemented by findings from key informants' interviews with selected

government and non-government agriculture officers and farmers and literature review. Ten government officers and fifteen civil society and NGO officials working at different administrative levels were interviewed through telephone once in mid-April 2020 and again on mid-October 2020 (see Table 1 for details on checklists and questions used in panel discussions and interviewing the key informants).

2. Poverty and food security situation in Nepal

Nepal has now become a net importer of food. Its ability to produce enough food has been hampered by several factors, some of which are small farm sizes, remoteness of farms, insufficient support to farmers in terms of access to inputs like seed, fertilizer, irrigation, and technical know-how (Adhikari, 2020a). The farming systems have largely been oriented towards subsistence living. Indigenous food systems have also been obliterated, and regions where indigenous populations dominate have largely been food insecure, and where malnutrition is widespread (Singh, 2016). Only in the peri-urban areas and in Terai plains, there is some commercial farming, where farmers grow crops and keep animals mainly for the market. Nepal's farm products generally cannot compete with cheaper products coming from India (Nepal and India have open border and free trade policy), where cost of production is low due to subsidies in fertilizers, irrigation, machineries and services like technical help, and guaranteed marketing through minimum support price (Sunam and Adhikari, 2016). On the other hand, since the 1990s, opportunities to work in foreign countries expanded with globalization that also coincided with Nepal government's openness in letting its people go out for work. Slowly labor migration – within and outside the country - emerged as a major source of livelihood contributing equivalent to about 30% of GDP (about USD 8.4 billion in 2018–19) (World Bank, 2020c) with remittances entering to 56% households (CBS (Central Bureau of Statistics), 2013). Many poorer people including marginalized indigenous groups go to India or to cities within Nepal for work, whereas lower and upper middle class generally seek jobs in Malaysia, Gulf, and other wealthier countries. It is mainly because of migration of youths and use of remittance to purchase food from the market that a significant proportion (30%) of cultivated land, especially in the hills and mountains, has been abandoned from farming (Upadhyay, 2018). Nevertheless, Nepal still produces about 80% of the basic required cereals in the country, even though there are annual



Fig. 1. Map of Nepal showing seven provinces and 75 districts (Province No. 6 is named as 'Karnali', No. 4 as 'Gandaki', No. 3 as 'Bagmati', No. 5 as 'Lumbini', and No. 7 as 'Sudur Pacchim'). The country runs from east to west with high altitude northern areas covering high hills and mountains, mid-altitude middle areas with mid-hills, and low altitude southern areas with plain lands called Terai (map source: <http://nepalsbuzzpage.com/new-map-of-nepal-with-7-province/>).

Table 1
Methodology structure and checklists and questions used in panel discussions and for interviewing with key informants.

Type (number)	Date (number of participants)	Thematic area inquired (specific questions also asked in the discussions)
Panel discussions (3)	1) 28 April 2020 (27) 2) 16 July 2020 (21) 3) 31 Oct 2020 (25)	General spread of COVID-19; general impact on the lives of people – health, food, social, psychological and economic impact across the country; impact on farmers and farm production, distribution of food or farm products through trade/ transportation; ground reality in terms of access to food, various safety nets implemented, how people suffered, who suffered; media reports and reality observed; forecasting as to what will happen in coming months in terms of food production, marketing, access to food, and health services; people's (farmer's) response to cope with the crisis on their own initiative and how is it helping; what should be done to improve food security.
Key Informants – Government policy makers (2)	1) Mid-April 2020 (10) 2) Mid-Oct 2020 (10)	Government policies to deal with such crisis; what supports are provided, how and to whom; policy gaps in agricultural sector in general and food security in particular as exposed by the crisis; experience/idea with regard to resiliency of prevailing farming systems to cope with such crisis; role of indigenous food systems in such crisis; what new initiatives taken at different government levels to deal with the crisis and continue with food production, marketing, distribution through trade/ transportation, supply of inputs, new incentive structures; effectiveness of these new initiatives and which seem to work effectively; what could be the policies options for the future to deal with the crisis.
Key informants- NGOs and civil society organizations (CSOs) (2)	1) Mid-April 2020 (15) 2) Mid-Oct 2020 (15)	NGOs provide emergency services, food provision; livelihood support; agricultural knowledge; and support services. Checklists and questions used: Effects on people in general, especially to marginalized groups and women; practical measures taken by CSOs/NGOs, communities to deal with the crisis and support people in problems; gaps in such support mechanisms; kind of emergency services required; how the work of CSOs/NGOs affected by the crisis and how this, in turn, affected people/farmers; supports available for farm production, marketing, storage, supply of inputs and the like; effectiveness of various measures taken to support farmers and other people; role of indigenous food systems in such crisis; measures to be taken make safety net, food production

Table 1 (continued)

Type (number)	Date (number of participants)	Thematic area inquired (specific questions also asked in the discussions)
		and marketing effective so that overall food security is ensured for all.

fluctuations as farming is mainly dependent on monsoon rain for irrigation (MoAD, 2017). Nepal also made some significant improvements in poverty reduction (people living under the line of poverty came down from 42% in 1996 to 18.6% in 2019) and food security and nutrition in the past two and a half decades (GoN-NPC, 2020) thanks mainly to increase in remittances and non-farm income contributing about one-third to one-half of the poverty reduction (World Bank, 2020b). Government has developed plans for SDGs with the aim that it would be able to achieve most of the goals by 2030 (UN, 2015; GoN-NPC, 2017).

3. Impact of COVID-19 on farming systems and food security, and SDGs 1–2

A rapid assessment of socio-economic impact of COVID-19 in Nepal revealed that the virus will seriously derail the achievement of SDGs if external donor supports are not made available on scale needed to fight the disease and its impact (UNDP, 2020). Our analysis from the current study reveals that the consequences will spill over to multiple SDGs with an immediate threat to two intricately interrelated Goals (Goal 1: no poverty; Goal 2: zero hunger) and negative effects on all pillars of the food security (i.e., availability, access, utilization, and stability). Of the four pillars, the profound impact in short-term is seen in availability and access to food and in long term, it will impact all the four pillars of food security. Similarly, different farming systems are also being affected differently.

4. Farming systems resilience and impacts on farming

There are around 3.7 million landholdings (family farms) in Nepal, 95% of which are owner-cultivated (FAO, 2013). Average size of a farm family is of only 0.6 ha. These smallholders produce a wide range of foods, using mainly family labour and consume a main part of the production in-house. They sell just 12% of their production in the market and generate just 5% of their total income due to low productivity, limited surplus to sell and lack of access to market and infrastructures like road and transportation networks (FAO, 2015). On the other hand, these smallholder farms were found to be somewhat resilient in the face of COVID-19 as they depended on local inputs - local indigenous seeds, compost, and family and community labour exchange (personal communication with Bakhat Khadka, Agriculture Development Office, Ministry of Agriculture, Karnali Province and with Amrit Gurung, Gandaki Province) and did not need market as the products were consumed at home or locally. These smallholder farms also had potential to initially absorb about half a million youths who returned to their villages from cities from Nepal or from India and other countries because of COVID-19 pandemic (UNDP, 2020). Some of these returnee migrants already started cultivating some of their abandoned fallow land. For instance, in Dailekh, a mid-hill district in the Karnali Province, these returnee migrants have now started ginger and turmeric farming in the traditional fallow lands employing themselves (Dhamak Daily, 2020). The strong community that is built around this type of farming is also useful in sharing the resources like seeds and labour. For example, it is seen that community seed banks maintained by such communities played an important role in this pandemic as these ensured local seeds, conserved biodiversity, and contributed to a diversified food system (De Falcis, 2020). The resiliency of such farms (measured by robustness and recovery of system productivity) was also observed during the Great

Earthquake of 2015 when Nepal was hit by 7-rector scale earthquake causing over 9000 deaths and widespread damage of infrastructures (Epstein et al., 2017). Resilience can also play a major role in the survival and expansion of many agricultural systems and great empires and strengthen the resilience of nations against future pandemics and other shocks (Haldon et al., 2020).

In other countries (e.g. Spain) too, family farms are seen to provide cushion against the pandemic (FAO, 2020). On the other hand, the limitations of such subsistence farms were also realized when, despite potential, they could not fully engage these returnee migrants, and so a reverse migration has started to Nepal's cities and to India (see also Ayer, 2020). Low productivity and inadequate ability to provide full livelihood security is a limitation of such farming systems despite the fact that they are somewhat resilient. Moreover, these smallholder subsistence farms have also been neglected by government, and hence their potentials have not yet been realized. The land consolidation, use of fallow/barren land, irrigation, improvement in indigenous landraces, and promotion of market for niche products would have helped increased production. For example, Meuwissen et al. (2019) developed a conceptual framework to assess the resilience of farming systems and presented a methodology to operationalize the framework with a view to diverse farming systems of Europe. Such learning could have been useful in developing contextualized concept in case of Nepal as well as in other countries of South Asia.

Commercial or semi-commercial farms in Nepal, which are generally located near the urban centres especially in downstream Terai plains and produce mainly cash crops such as perishable fruits and vegetables, and eggs and milk, faced greater problems in this pandemic as they were neither able to sell their farm products to or purchase farm inputs (seeds, fertilizers, etc.) from markets on time due to lockdown and transport restrictions. Situation of Chitwan valley, a breadbasket for Nepal and a centre of commercial and modern farming, clearly illustrates the plight of market-driven farming in such pandemic when marketing practices are not made resilient. Its production of eggs and chicken has made the country more or less self-reliant in poultry production. In addition, it produces vegetables, fruits and milk to meet the significant market demand in cities like Pokhara and Kathmandu. It produced around 0.3 million litres of milk per day prior to COVID-19, but then due to lockdown and unavailability of feed (mostly imported from India), production declined and that too did not get the market (Onlinekhabar, 2020). Immediately after the COVID-19, farmers had to throw their milk, eggs and vegetables and on the street, as they did not have any plans for such immediate breakdown in market channel (Timilsina and Ghimire, 2020) and to show wrath to Government for not helping in the marketing of the products. Banana did not sell and so were left rotten on the plants. Lack of on-farm processing and cold storage facilities aggravated these problems for the commercial farmers. Because of higher incomes, farmers even in high hill districts of Province 7 and Province 3 with accessibility to roads had slowly converted to commercial vegetable production prior to the pandemic. But these farms had to incur losses due to marketing problems triggered by COVID-19 (Adhikari, 2020b; Adhikari and Hussain, 2020).

A survey of 4416 households conducted in April - about a month after lockdown- revealed that COVID-19 increased food insecurity by 8 percentage points, pushing the proportion of food insecure households to 23% and deterioration of the dietary diversity by 2% affecting mainly children. The survey also showed that 10% households lost livelihood source altogether, and 30% faced a reduction in income (Subedi, 2020). Vulnerability of Karnali Province, which had been suffering from food insecurity for a long time and was getting support from food-aid programmes, was most affected. By September 2020, the vulnerability to food security had deepened, especially in Karnali. For example, there were reports that all the food depots responsible for the distribution of food to people in Mugu district in Karnali had become empty of food stocks, and people could not buy food at all (Shahi and Gautam, 2020). A second large survey conducted in August 2020 revealed that there is

slight decrease in food insecurity overall in the country because of resumption of some supply networks. There was slight increase in loss of income (by 0.6%), but more households faced severe and moderate loss of income (by 13%). For more than 20% households increases in food price was a major concern during the COVID-19 crisis. Lost income and increase in food price created a precarious food security situation (Reliefweb, 2020).

COVID-19 also exposed Nepal's vulnerability to dependency on other countries for inputs required in production of crops, livestock and poultry. As Nepal has started modern farming methods, demand of these inputs is met through imports. However, this year, there was a serious shortage of chemical fertilizer for rice because of transportation restrictions and lack of preparedness from the government (Prasain and Giri, 2020). The annual demand of chemical fertilizer is about 0.7 million tonnes and in most years the government imports about half of this. But this year, supply was delayed due to trade restrictions. As a result, farmers were distributed with only 15 kg of Urea per household during the peak season of fertilizer use in rice, which will result in lower productivity. In the same line, productions of other crops and livestock and poultry are also expected to decline.

5. Impact on food availability

As the prolonged lockdown started to impact food production and distribution, Government allowed people to carry out their farming activities like harvesting of wheat and planting of maize and rice, respecting its COVID-19 related precautionary health guidelines. Nevertheless, the lockdown has continued to adversely impact food availability through production as well as trade/distribution as the supply chains of inputs and farm products were disrupted. On the other hand, the pandemic has now made the country and the people realize the problem when a country depends on others for food. This has now triggered a policy debate on the necessity to become self-sufficient in food production (Adhikari, 2020a).

COVID-19 has also revealed the importance of federal political and administrative governance structure, which was created only in 2015. The Federal Ministry of Agriculture and Livestock Development created "rapid response teams" at different administrative levels (MoALD, 2020a) to provide services to farmers to tackle their immediate problems in marketing and input supply, though they have not been as effective as planned because of lack of vertical and horizontal coordination with other related Ministries, especially the Ministry of Health and Population and the Ministry of Home Affairs. The devolvement of power and resources at sub-national governments has however made it easier to make quick decisions to solve contextualized problems. For example, in the Karnali Province, a perennially food insecure region, the federal government responded by providing NRs 0.5 billion (1US\$ = NRs 121.5) for the agricultural sector including production of off-season potato and the local governments in the province responded by announcing minimum support price for wheat and timely supply of threshers for wheat harvest. Likewise, a few best practices have also emerged from the actions of local governments across the country during this pandemic. These include, as observed by authors while working in the field, free threshers for wheat harvesting (e.g., Saptari district in eastern Terai); a system of buying vegetables from farmers and distributing them free to the affected people (e.g., Khotang district in eastern hills); a program to pay four months' interest for loan taken by the affected people (e.g., Province 2 government); 'agriculture ambulance service' for transport of farmers' products (e.g., Province 5 government), and cash grant to farmers if they use existing fallow lands for farming (e.g., Gulmi district in western hills). Now, the questions have arisen as to how these best practices are to be institutionalized and scaled-up, which could support farmers and produce more food locally in future.

This pandemic and food insecurity caused thereby led to the realization that indigenous/local food systems are also important. In the

past, these indigenous foods and local farming systems were overlooked and, in many cases, discarded, which in fact adversely affected indigenous populations. This has also been emphasized in a wider context in a recent article in *Lancet* (Zavaleta-Cortijo et al., 2020). Support to increase production of food from such systems strengthen resiliency in food security with other positive consequences like self-reliance and mitigation of micronutrient deficiency and overall malnutrition especially among children and women. This would also help to conserve local agricultural biodiversity and a local food-culture. Initiatives launched by Government of Sikkim, India to make the whole State 'organic' through the promotion of organic farming based on indigenous farming systems could also be an alternative in the hills and mountain environments (Hussain et al., 2020). As a silver lining of the COVID-19 crisis, there is, thus, an opportunity to promote local foods and increase food availability locally (IIED, 2020). Realizing this, provincial and local governments in Nepal are now more focused to increase availability of food locally, and so have placed priority in bringing fallow land (estimated to be 30%) under cultivation by engaging the returnee migrants from both within the country and overseas. For example, Gandaki Province has announced that it would provide NRs 5000 per Ropani (1 ha = 20 Ropani) of fallow land, if the same is brought into cultivation. Besides, COVID-19 has also forced people to engage in backyard, balcony, and rooftop farming, which could increase food production, and government has initiated a policy of giving free seed and fertilizer to people interested in such farming. Other measures of the Government that came after the incidence of COVID-19 include: Policy intervention to support insurance of selected crops and livestock; minimum support prices of major crops; providing extension and advisory services; providing easy and cheap loans; and providing subsidy on improved/hybrid seed, fertilizers, and machines (MoALD, 2020b). In terms of technology, it is now felt necessary to introduce labour saving technologies because of shortage of labour, especially male labour, because of their out-migration and to reduce work burden on women and elderly, who now carry the farm work. Further participatory research is needed to find out context specific and scale-appropriate mechanization and other labour-saving techniques such as zero or reduced tillage, and direct seeding of rice (Basnyat, 2017; Paudel et al., 2019). In the same line, key informants which were government officials identified measures that are essential to increase food availability, which include: Establishment of agro-processing industries, agri-businesses and post-harvest facilities, development of cold storage and grain storage facilities, and expansion of irrigation facilities especially in the currently rainfed lands in hills.

6. Impact on access to food

COVID-19 reduced people's access to food through the loss of livelihoods and income. According to a survey conducted in April 2020, access to food and vulnerability to shocks has further deteriorated among daily wage laborers and female-headed households. About 25% non-agriculture daily wage laborer and 12% farm related daily wage earners were reported to have lost their jobs because of the COVID-19, and 33% of wage laborers experienced reduced income. Income reduction was most common among traders (48%) and remittance receivers (46%) (Subedi, 2020). However, wage labourers were most vulnerable to food insecurity as they had no food stocks and reserve funds as there was no social safety-net as such, except for a temporary distribution of food that would last only for a few days. Lack of this safety net was a major reason why there was exodus of wage workers from cities like Kathmandu, who walked for weeks to reach home despite the restrictions to move out during lockdown. Most of these migrant workers in cities (almost 90%) were involved in informal sector (Spotlight, 2020), which faced major loss in jobs. A study has revealed that 60% job losses in small and medium enterprises and 95% in informal daily wage job markets made many people unable to sustain their lives smoothly (Spotlight, 2020).

For many families, remittances had been propping up the food security. At the national level, Nepal received USD 8.2 billion remittances, equivalent of 28.4% of GDP, in 2019 (World Bank, 2020c). COVID-19 has two major consequences – return of migrants leading to further demand in food, and reduction in income. Remittance in Nepal is estimated to decline by 29% in 2020 – highest decline in Asia (ADB, 2020). Between 400,000 and 750,000 migrant Nepalis entered Nepal from India via land borders, and this migration had been the main coping mechanism, especially for the food-deficit and food-insecure households in Karnali and Sudur pacchim Province. Nepal government estimated that of about 2.5 million Nepalis working in Gulf and Malaysia, about 0.5 million migrants are estimated to return due to COVID-19 (ACAPS, 2020). By September, however many migrants who had returned from India started going back to India again despite the increasing threat of COVID-19 there (Ayer, 2020). These migrants, which were mainly from Karnali and Sudur pacchim Province, reported that they could not sustain their livelihoods in their villages. This clearly showed that poorer people are more worried about food and livelihood than the COVID-19 infection itself.

Gender dimension has emerged as a crucial issue in the analysis of vulnerability and safety net. This pandemic brought to light various unseen dimensions of the gender issues that made women further vulnerable in such crisis, for instance increase in women's workload at home and decline in their income from wage work or sale of vegetables and milk. Digital illiteracy and lack of driving skills also made them more vulnerable (Barooah et al., 2020; Ghale, 2020). In quarantine/isolation too, women were not given food that is nutritious to their specific requirements, suffering badly the health of pregnant and lactating women and weaning children. Domestic violence against women has increased rapidly (by 60%) since this pandemic started (Ghale, 2020). In Dang district in Province 5, women reported higher income losses leading to more often having insufficient food, eating less, skipping meals and going hungrier than their male counterparts during the pandemic (Barooah et al., 2020). The main coping mechanisms for income losses were the reliance on savings (70% of respondents) and borrowing funds (51%).

Another issue regarding the access to food was related to its distribution. Whatever small relief the government provided was confined mainly in cities, and was marred by lack of information as to who is vulnerable and who is entitled or not. As a result, conflicts were witnessed among the people and between poorer people and relief agencies. A lesson was learned that it is wise to support everyone who comes to line for taking the minimum basic food.

7. Impact on utilization of food

During the pandemic, a few issues about the sanitation of food, and contamination and decaying of food emerged. For example, people were confused about how to sanitize the food that was obtained from the market or touched by many people. Availability of and access to vegetables, fruits and other nutrient-dense foods were limited, and whatever came to the market, it was sold without cleaning following safety and sanitization standards. Harris et al. (2020) report similar situation in India. Foods distributed as relief package consisted only rice and pulse, and, as reported by authors working at the grassroots, it was often found to be contaminated, decayed, or of sub-standard quality. The chronic problem of malnutrition among children and women was exacerbated by COVID-19. Children's immunization and safe birth in hospital was compromised, leading to health problems in these groups (Singh et al., 2020), impacting food utilization.

8. Stability in food security

The pandemic has given a lesson to the policy makers that preparations are to be made for the unexpected events of vulnerabilities, especially about the need to keep higher amount of food stock. The

immediate action of the government has, of course, been focused on supporting the people and in increasing food production in the next cropping season. A major issue that emerged from discussions and key informants in this regard was the small amount of buffer 'food stock' that government maintained, and whatever was there was just meant for regular food-aid to some food insecure regions, mainly the Karnali Province.

9. Policy options and conclusions

Aside from UNDP (2020), there is still no systematic impact assessment of COVID-19 on poverty, food security, and wellbeing in the country. Our study pointed to some important directions as to what should be the policy choices and institutional mechanisms to deal with such problems based on the panel discussions, field observation, and information obtained from key informants and secondary sources.

Nepal has several active policies for agriculture and food security that emphasize right to food. Key informants and discussants emphasized that these policies have not anticipated disasters like COVID-19 pandemic, and so there were no preparations to deal with such crisis. The 2018 Right to Food and Food Sovereignty Act and Zero Hunger Policy provide strong support for the achievement of SDGs 1–2, but they lack concrete action plans to improve food availability, access and utilization, and strategies to deal with crises like epidemics or pandemics. Apart from strengthening safety net, Nepal needs to increase food production in the smallholders through provision of appropriate inputs and build marketing networks that work even during such crisis. Lack of this support mechanism had led to abandonment of cultivation from about 30% of the cultivated land. Key informants indicated that some of these lands are already being utilized by returnee migrants in the recent rice season. With appropriate policies and support, remaining fallow lands could be brought back into cultivation, which would also help in conserving traditional and indigenous food system with positive consequences on food diversity, biodiversity and maintenance of food culture.

Immediately after the lock down, there was a shortage of food in the market. Government did not have enough food-stock for food distribution to so many people in urban areas, especially to daily wage workers. In addition, food had to be supplied to food dependent regions like Karnali. As a policy option, the panel discussions, especially the last one, emphasized a much larger amount of food to be kept as 'buffer stock' for the emergencies like this. Nepal Food Corporation that maintains the buffer stock for public distribution and for emergencies has been keeping around 20 thousand tons of food against a minimum required 25 thousand tons. But emergencies like a drought and pandemic would mean such stock should be around 300 to 500 thousand tons (Himalayan News Service, 2016). Moreover, a diversified mixture of food has to be kept in food reserve. As of now, it is only rice that is being kept as reserve with a small amount of lentil. As a result, food obtained from public distribution, as was the case in this pandemic, is generally of low nutritional value. A large stock would also make the food price more stable, and safety net wider and strong. It is also one of main indicators highlighted for monitoring food system disruption caused by COVID-19 in Bangladesh (Amjath-Babu et al., 2020).

The COVID-19 pandemic also revealed that it is important to identify, collect, conserve and research the indigenous species of crops, animals and other useful plants and promote the resilience aspects of subsistence farming especially in the hills and mountains to achieve resiliency at the time of future shocks due to climate or pandemics while also promoting commercial or semi-commercial farming to achieve food sufficiency. Among the innovations made during the pandemic for increasing production, it is helpful to continue three innovations, which were found to be effective. The first innovation is providing support for mechanization that is suitable to the terrain – like larger machines (tractors and harvesters) in Terai and small machines for seeding, plowing and threshing in the hills (Paudel et al., 2019). Because of

migration of young people, there is labour shortage in farming, and such mechanization helps in coping with such shortages, and makes farming less drudgery, especially taking into women's heavy involvement in farming. The second innovation of cash support for bringing fallow lands into cultivation was found to be promising, which called for more funds allocation to local governments for this purpose. As a matter of fact these two policies would help in bringing abandoned farmland into cultivation. If the currently abandoned land is brought under cultivation and the rest of the farmland is intensively cultivated, Nepal's desire to become self-sufficient in food could be achieved. The third innovation in relation to digital marketing that connects local producers and consumers as implemented in few sites deserve further developments and up-scaling (see Kumar et al., 2020 in case of India). Sincere implementation of these policies is also equally important, as many good policies have not been implemented in the past. Accordingly, good institutional infrastructures and governance structures are to be set-up so that these policies are effectively implemented and would enable Nepal to achieve SDGs 1 and 2 by maintaining all four pillars of food security even during crisis times like COVID-19 pandemic.

Declaration of Competing Interest

It is to inform that there is no conflict of interests in publishing this article.

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