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Nepal at the edge of sword with two edges: The COVID-19 pandemics and sustainable development goals

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ABSTRACT

Humanity has been threatened by pandemics since several decades with devastating effects on all human activities including the economy, and environment. Currently, the world is reeling from the COVID-19 pandemic. The COVID-19 pandemic has been a major threat to the livelihood of billions of people worldwide. Nepal is not an exception to this and has been seriously threatened by the COVID-19 pandemic. The thousands of the peoples who depend on daily wages to join hand to mouth has been under the brunt of the COVID-19 pandemic because of job loss, disruption in the food supply chain. Also, the COVID-19 pandemic has thwarted Nepal's targets to achieve UN Sustainable Development Goals including an unprecedented state of vulnerability to hunger and poverty in the country. Though some informal shreds of evidence have reported the negative impacts of COVID-19 on Sustainable Development Goals, none of the scientific literature has been available regarding such impacts in Nepal yet. This review aims to synthesize extant literature that reports the effects of COVID-19 on the Nepalese economy and implications for achieving UN Sustainable Development Goals. We found that the COVID-19 pandemic has created unprecedented challenges to achieve the country's committed United Nation's Sustainable Development Goals for Nepal. Further, the COVID-19 pandemic has created a unique "income shock" that is supposed to precipitate household food insecurity in developing economy like Nepal. Our review indicated that the percentage of populations below poverty could rise even more than the present national reported value of 18% in the post-pandemic era. We emphasized generating employment and income-earning opportunities to build a resilient food system. Further, we urged to build international consensus to reset and rethink the course of sustainable development goals.

1. Introduction

Nepal has developed the United Nations Sustainable Development Goals (SDGs) status and roadmap 2016–2030, SDGs needs assessment, costing and financing strategy, and SDGs localization guidelines that spell out baselines, targets and implementation and financing strategies for each indicator. The National aspiration of ‘Prosperous Nepal, Happy Nepali’, in the 15th periodic plan (2019/20–2023/24) has mainstreamed the SDGs. Furthermore, SDGs have been integrated into the Sub-National Governments’ periodic plans with effective monitoring and evaluation guidelines. Specific SDGs codes are assigned for all national development programs through the Medium-Term Expenditure Framework (MTEF).

Assessment of the SDGs implementation over the last four years demonstrated that Nepal has made significant progress in achieving UN Sustainable Development Goals [1]. The poverty incidence of Nepal has been reduced from 25% in 2016 to 18.7% (SDG1) at the end of 2018 [2]. The country’s absolute poverty has declined by 1% point each year and HDI improved by one point per year [1]. This indicates excellent progress in poverty reduction. Similarly, the prevalence of underweight, stunting and wasting among children under five years of age has decreased significantly (SDG2) [1]. In the health sector, infant mortality, maternal mortality, and child mortality rates have been reduced (SDG3) [1]. The gross enrolments in basic and secondary level education stood at 93% and 46% against the 2019 targets of 98.5% and 72%, respectively.
2. Economic impacts of COVID-19

2.1. In developed countries

The COVID-19 pandemic has swiftly infected all around the world causing a health crisis. Following the fear of contagion, many countries in the world are in a lockdown situation that allows limited mobility and transport thereby threatening the global economy into the great recession in world economic history after the great depression in 1930 [7,8]. At the moment, the majority of the rich countries in North America and Europe are severely hit by the COVID-19 while the poor countries showing a relatively lesser number of cases in South Asia and Africa [9].

The major developed economies including G7 countries have already begun to feel the macroeconomic hit due to the COVID-19 outbreak [10]. The G7 countries contribute 60% of world GDP, 65% of world manufacturing, and 41% of world manufacturing exports [10]. The economic contraction in the G7 countries would have implications for the rest of the world.

To contend with the spread of COVID-19 and economic impacts, the richer countries in the world and financial institutions have announced economic stimulus packages for the affected countries and entrepreneurs. For example, the International Monetary Fund (IMF) has already mobilized US $8 trillion and the USA passed US $2 trillion to support the deteriorated economy in the world and at the local level [11]. Unfortunately, most of the studies focused on addressing only isolated economic dimensions, and the results are partial since the direction and the span of the outbreak impacts in the coming days are uncertain. The uncertainty also makes it difficult to produce any useful quantitative estimates of the future impacts of the current outbreaks. Therefore, a comprehensive assessment of the economic implications of the COVID-19 pandemic including production, supply chain, trade, investments, prices, finances, exchange rates, growth, and cross-border cooperation is urgently needed.

2.2. In developing countries

The developing countries are more affected by the COVID-19 pandemic than the developed countries/economies and are more vulnerable to economic shock than developed countries due to their lower resilience capacity to cope with such shocks. The COVID-19 pandemic has severely hit developing countries [12,13], where people are more vulnerable to poverty, hunger and malnutrition compared to developed countries. The farm workers were unable to harvest crops due to movement restriction. Further, they were affected due to hike in prices of food crops. Many of the developing countries reported slower growth of the national economy due to the lockdown [14].

The countries with an oil-based economy, are also affected by the reduced global market of oil as the oil demand reduced because of the global economic crisis [15]. The reduced trade of oil hampered the economy of oil-based economies, leading to adverse effects on their national food security [16]. This detrimental effect of COVID-19 on food security is supposed to be more perceptible in upper-middle-income economies than in the least developed countries [17]. Inadequate food supply and associated food price inflation in the least developed countries due to COVID-19 is associated with health crises [17]. However, in higher-income countries, COVID-19 has more effect on the availability side of food security risks (food trade restrictions and currency depreciation) [17] whereas, the effects on food accessibility and health risks are not prominent [17]. The more focus towards the engagement of developed countries to support their own citizen in health and food adversely affects the economic activities of developing countries which depend on foreign aid for economic activities. A report by the International Monetary Fund (IMF) showed that developing countries require $2.5 trillion to meet immediate COVID-19 financing needs. Unfortunately, developing countries cannot meet financial needs due to reduced foreign investment, lower economic activities, and reduced work mobility leading to low GDP. But, the decline in work mobility after lockdown is significantly lower in regions with higher poverty rates compared to regions with low poverty rates [18]. The lower mobility rates reflect several factors including national lockdown stringencies and spontaneous behavior, possibly with local factors such as poverty [19]. On the other hand, the risk of contagion is higher when people go outside to work. India is the second-largest country after the USA in numbers of COVID-19 infected people with more than 9 million infected people as of November 2020 [9].

Also, the cost associated with medical care and supervision during lockdown could further worsen the economic crisis. This is shown by the current interruption in medical care and supervision increased by 21.95% in Brazil during the period of the last 10 months [20]. The situation could precipitate the already worse economic crisis in the future because of an increase in disease burden and complication loads [14]. Moreover, the pandemic has also increased the socio-economic inequalities [14] in developing countries, which might lower the health and nutrition indices of the countries and the overall prosperity of the nation.

In sum, the people in the developing countries are in double axed trouble with the COVID-19 pandemic and lockdown, either die with hunger and poverty if they are not allowed to work or die with the
disease when they are allowed to go out of their shelter.

2.3. In asian continent

The COVID-19 pandemic significantly affected almost all Asian countries in terms of economy and food security (Table 1). The magnitude of the economic impact of the pandemic in Asian countries depends on the degree of the outbreak that evolves, which is uncertain. A sharp but temporary decline in domestic consumption was realized in outbreak-affected Asian countries [21]. A decline in tourism and business travel accelerates a weaker demand for other sectors and economies [22]. Tourism arrivals and receipts in many Asian countries declined sharply because of movement restrictions applied for preventive and control measures. There has been a substantial supply chain disruption as a result of forced business closures and the inability of workers to get to work as a result of border closures, travel bans, and other restrictions [23].

Nepal, in particular, is dependent on other countries for goods and partially for food. Thus, Nepal experienced a higher negative impact on the supply chain and import. The economic and social isolation cost was also higher for Nepal. The country is dependent on remittance at a greater extent received from foreign migrant workers as a major source of foreign currency. The remittance flow was estimated to fall by around 14% during this fiscal year of 2020/21 [22]. However, a recent report of the Central Bank of Nepal indicated a 12% increase in remittance inflow and a 24% decrease in foreign direct investment (FDI) compared to the initial months of the pandemic. The impact will be in the labor market as a mass exodus of people from Nepal to India [24]. Employment is significantly affected in the tourism-based business and aviation, which account for around 7.9% of GDP in Nepal [25]. As a result, Nepal has already been under economic crisis. And, this economic crisis has put many families under significant financial pressure in Nepal [26].

3. Food security and food supply chain amidst the COVID-19 pandemic in Nepal

Millions of people around the world have no income security, no unemployment insurance, or sick pay [29] and often very limited savings, whose living conditions will be further worsened by the pandemic. The lockdown prevented people from going to work, which will have unprecedented results rest of 2020 and beyond.

The COVID-19 pandemic mainly imposed immediate effects on household income and potential aspirations thereof. The informal economy of Nepal constitutes a large share of the national economy [5]. This indicates that the Nepalese economy is highly fragile and particularly prone to shocks. Studies reported the great depression of the national economy of the countries [30]. Nepal's economy is expected to contract by 2.1% (year-on-year) in 2021 [22]. Even before the pandemic, approximately 4.6 million Nepalese peoples experienced food insecurity [31]. The COVID-19 pandemic rendered 1.6 to 2 million people jobless in Nepal [32]. Income is a crucial factor determining the purchasing power of each household and the severity of food insecurity [30]. Food security in Nepal has been threatened because of the income reduction of the people and the disruption of national and international food supply chains [32].

The current COVID-19 pandemic has exerted shocks on all food supply chain segments, impacting agricultural production, food manufacturing, transport and logistics, and final demand at the same time [65]. At various points of the supply chain, different products have undergone disruptions. Farm production has been affected by the acute shortage of inputs, most notably labor and farm inputs [32]. Also, the restrictions on people's mobility in many countries have limited the supply of seasonal workers in the fruit and vegetable sector for planting and harvesting [33]. Agricultural and food products in Nepal are mostly transported using truck containers, which was disrupted in Nepal leading to the broken supply chain of the agricultural commodities. Besides, the pandemic has led to a drastic shift in consumer demand away from the food service center to home [32].

Table 1

| Continent         | Category | Countries                                      | No. of cases | Impacts of COVID-19                                      | References |
|-------------------|----------|-----------------------------------------------|--------------|----------------------------------------------------------|------------|
| South Asia        | LICs     | Afghanistan                                    | 1,86,58,255  | At least 35% of the population is in a state of a food crisis | [27]       |
|                   | LMICs    | Bangladesh, India, Nepal, Bhutan, Pakistan, Sri Lanka |             | • The number of people with insufficient food consumption increased |           |
|                   | UMICs    | Iran, Maldives                                 |             | • The number of registered COVID-19 cases increased due to food insecurity |           |
|                   | HICs     | –                                              |             | • A heavy blow to remittances of expatriate workers         |           |
| South-Eastern Asia| LICs     | Vietnam, Philippines, Cambodia, Timor-Leste, Myanmar, Laos | 10,71,819    | Disruption of the supply of various agricultural inputs | [17]       |
|                   | LMICs    | Indonesia, Malaysia, Thailand                  |             | Food supply disruptions                                    |           |
|                   | UMICs    | Singapore, Brunei                              |             | Suspension of agricultural activities due to the agricultural labor shortage |           |
| Eastern Asia      | LICs     | Korea Democratic People's Republic             | 2,36,919     | NA                                                       | [17]       |
|                   | LMICs    | Mongolia                                       |             | US-China trade tensions                                   |           |
|                   | UMICs    | China                                          |             |                                                          |           |
|                   | HICs     | Japan, South Korea                             |             |                                                          |           |
| Western Asia      | LICs     | Yemen                                          | 25,63,011    | Decline in consumption of higher-value products | [17]       |
|                   | UMICs    | Turkey, Iraq, Jordan, Armenia, Palestine, Azerbaijan |             | The reduced income of the people                          |           |
|                   | HICs     | Cyprus, Kuwait Qatar, Saudi Arabia, UAE, Bahrain, Israel, Oman, Georgia, Lebanon |             | Food price spikes                                          |           |
| Central Asia      | LICs     | Tajikistan                                     | 1,77,941     | Market uncertainties                                      | [28]       |
|                   | LMICs    | Uzbekistan, Kyrgyzstan                        |             | • The collapse in the oil price                           |           |
|                   | UMICs    | Kazakhstan, Turkmenistan                       |             | • Demand for natural gas reduced                          |           |
|                   | HICs     | –                                              |             | • Remittances outflow reduced                              |           |

* The classification of the countries is as defined by the World Bank. LICs: low-income countries (GNI per capita of $1025 or less); LMICs: lower-middle-income countries (GNI per capita between $1026 and $3995); UMICs: Upper-middle income countries (GNI per capita between $3996 and $12,375); HICs: High-income countries (GNI more than $12,375). The number of cases in the table was at end of 20 November 2020 as reported by WHO.
4. Research methodology

A review was conducted to search for available literature through google scholar, PubMed and Scopus. For the grey literature, information was retrieved from official websites of related organizations such as the Ministry of Agriculture and Livestock Development (MoALD), National Planning Commission (NPC), Central Bureau of Statistics (CBS), Ministry of Finance (MoF), World Health Organization (WHO), World Food Program (WFP), Asian Development Bank (ADB), World Bank (WB) and International Monitory Fund (IMF); newspapers, available statistical records and policy debates. Relevant policies, laws, and regulations existing in SDGs were also taken into consideration. A total of 81 articles were retrieved from online peer-reviewed journals, whereas 74 articles were obtained presentation reports of different related departments, blogs, and websites, respectively. Of the total 155 articles retrieved, only 41 articles were included in the study; the rest articles were excluded having not met the inclusion criteria (Fig. 1). Obtained data were analyzed for descriptive statistics using Microsoft Excel var. 2019. We identified the four themes, ‘innovation in supply chains and markets’, ‘an innovative post-pandemic policy for the country’, ‘implementation and of social food programs’ and ‘stimulus packages for smallholder farmers. For each theme, we underpinned future interventions.

5. Results and discussion

5.1. Impacts of the COVID-19 pandemic on UN sustainable development goals

Reports showed that COVID-19’s social and economic effects are unparalleled and continue to be unveiled in the post-COVID-19 era. The effect of movement restriction has impacted the achievement of the UN sustainable development goal of Nepal. The movement restriction has positive impacts on SDG12 (responsible consumption and production), SDG13 (climate action), SDG14 (life below water), SDG15 (life on land); however, negative impacts on SDG 1 (no poverty) SDG2 (zero hunger), SDG3 (good health and wellbeing), SDG 8 (decent work and economic growth) and SDG10 (reduced inequalities) (Fig. 2).

5.1.1. Agriculture and small business

The agriculture production of Nepal has been affected severely by the COVID-19 pandemic. The immediate impact was seen in perishable products, poultry and product marketing Agriculture in Nepal is labor-intensive, which employs more than 70% of the workforce [34,35]. Women workers are mostly employed in agriculture (84.3%) compared to men (62.2%) [36]. Due to COVID-19, the mobility of goods in the agricultural sector regarding the supply chain was broken. Various stages of the supply chain such as sale, storage and supply of perishable agriculture commodities like vegetables, poultry products and dairy products in hotels, restaurants, and shops were affected. The demand for agricultural produce declined sharply due to travel restrictions, social distancing measures and the closure of schools, colleges, hotels, restaurants, etc. Additionally, during the early days of the COVID-19 outbreak, there was a myth of the people that the virus is transmitted through goods such as meat products, dairy products, fish and sometimes even fresh vegetables, which caused a decline in demand for these agricultural produces. Out-migration of people from big cities to rural areas, decrease in household income has caused demand decline [37].

Vegetables, poultry, dairy and cut-flower were the hardest hit sub-sectors by the COVID-19 outbreak and its containment measures. Fishery, tea and banana production are a few other affected sub-sectors [37]. Travel restrictions had impaired the flow of agricultural produce from farm to markets resulting in huge losses of agricultural produce at the farm and supply chain level. The supply of vegetables in major markets of the country was reduced by 50–60% [38]. A survey report of Fruit and Vegetables Trader's Association of Nepal reported that 65% of fresh vegetable collector terminated their business due to pandemic. The loss of fresh vegetables worth 1890.8 billion dollars has been reported [37]. During the initial weeks of lockdown, the price of fresh vegetables hiked

Fig. 1. Flow diagram of the study selection process.
by 20–50% [38], however, two weeks after lockdown the price of vegetables especially farm gate price was dropped sharply due to a decrease in demand. The price again reached to normal level in September and reported a hike by 12–16% as of December 20, 2020. The trend has negative impacts on the overall economy of the country. However, economists predicted no prominent impact in agriculture sector in the long run because of the small scale and subsistence nature of farming in Nepal [5, 39].

5.1.2. Supply of agricultural inputs

COVID-19 pandemic-imposed shocks on all segments of food supply chains, simultaneously affecting farm production, food processing, transport and logistics, and final demand. The supermarkets in the cities might face fewer problems because of enforcing the law of social distancing measures. The production side of the supply-chain also received less impact of the pandemic because most the small farmers in Nepal rely on family labor. However, these small farmers might be affected indirectly due to disruption of input supply chains, and consumer demand associated to loss of income and other economic impacts of the pandemic.

Nepalese farmers were not sufficiently protected by the local legislation in the past [39] and even not after the COVID-19 pandemic [40]. Though agriculture and food services are regarded as essential services in many countries of the world, Nepalese farmers and agricultural entrepreneurs were restricted during the major cropping season, from March to September 2020 [32]. Movement restriction has affected on crop harvesting (e.g. wheat) which has inflated the seed prices resulting in added cost in farming. The COVID-19 adversely affected the quality assurance of the seed material. A minimum quality assurance activity like standing crop inspection and laboratory testing to certify seed were halted, which resulted in seed scarcity, an increase in seed price, and some entrepreneurs move to the market carry-over or substandard seed [8].

Rice is the primary source of livelihood and income for more than two-thirds of farm households of the country that contributes to around 20% of Agricultural Gross Domestic Product (AGDP) and more than 7% of the total GDP in Nepal [41]. And, it is one of the major affected crops due to a shortage of chemical fertilizers during paddy planting season. The country requires 0.6 to 0.8 million MT of chemical fertilizers every year [42]. However, the supply was only 0.45 million metrics tons [43] to date. This shortage of chemical fertilizers has resulted in a lesser increase in the yield of paddy despite the most favorable climatic conditions (onset of monsoon on time) and timely planting [37].

5.1.3. Production and harvesting of staple crops

The lockdown period coincided with the critical planting time of spring maize, summer vegetables and rice seedbed preparation [38]. Though agriculture and food services are regarded as essential services in many countries of the world, Nepalese farmers and agricultural entrepreneurs were restricted during the major cropping season, from March to September 2020 [32]. Movement restriction has affected on crop harvesting (e.g. wheat) which has inflated the seed prices resulting in added cost in farming. The COVID-19 adversely affected the quality assurance of the seed material. A minimum quality assurance activity like standing crop inspection and laboratory testing to certify seed were halted, which resulted in seed scarcity, an increase in seed price, and some entrepreneurs move to the market carry-over or substandard seed [8].

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5.1.3. Production and harvesting of staple crops

The lockdown period coincided with the critical planting time of spring maize, summer vegetables and rice seedbed preparation [38]. Also, this period (April–May) was the wheat harvesting time in Nepal. Rice plantation faced the labor and fertilizer shortage. Even if only rice farming is good, the food security of the majority of Nepalese is maintained. Unfortunately, farming has been seriously hampered. Farmers did not get the machinery, labor, seed, fertilizers, pesticides, and other inputs required for wheat planting and harvesting [44]. China and India are the major suppliers of pesticides to Nepal, and movement restriction disrupted the availability of pesticides. As a result, the yield of staple food crops is expected to fall [23].
5.1.4. International trade

Nepalese economy is typically an import driven [5]. The country depends on the neighbors for almost everything—from agricultural seeds to industrial raw materials, from daily consumable goods to medicines and so on. About 66% of our foreign trade is dependent on India, 22% on China and the rest on other countries [45]. Nepal has already witnessed a fall in both exports and imports by 12.88% and 7.45%, respectively [46] due to the five-month stay-home order, which is likely to exacerbate the economic shock in the future. Moreover, the Supreme Court’s interim order to import vegetables and fruits only after testing them for pesticides and coronavirus has seriously affected the trade. Sadly, Nepal lost nearly 5.10 billion dollars in exports of high-value products in the fiscal year 2019/20 as the COVID-19 pandemic hampered foreign trade [46]. The shipment of high-value products in the last fiscal year stood at 25.10 billion dollars, down by 18.65% from fiscal year 2018/19.

Nearly 40% of total revenue is generated from the foreign trade-based tax [47]. The total import of Nepal declined by 7.45% [46]. The revenue collection decreased by ~1.7 billion US dollars [5]. Trade of palm oil sole accounted for the export revenue of US$ 45 million for Nepal, which is above 20.4% of the total export from Nepal [46]. The exports of palm oil have also been hampered by further serious damage to export [49]. International trade dropped by over 6%, imports decreased by 7.45%, and the growth of exports confined to 12.88% due to COVID 19-induced lockdown [46]. The total trade volume of Nepal shrank to 10.11 billion USD from 11.31 billion USD during the same period as of the previous fiscal year [46].

5.1.5. Remittance inflow

Remittance in Nepal contributed to a poverty reduction and human development by increasing household investment in education and health [50]. Remittance accounts for around 26% of Nepal’s economic output giving the fifth-highest remittances-to-GDP ratio in the world [51]. More than 167 countries are open to Nepalese workers for overseas employment, however, only a few of Gulf countries such as Saudi Arabia, the United Arab Emirates, Qatar and Malaysia have dominated migrant stocks, with more than 90% of workers working in these four countries [35]. Further, of the total 30 million population of the country, 2.8 million workers have migrated to India [52]. The remittance sent by such migrant workers back home has been estimated to constitute a quarter of the income of rural households [53]. An estimated 127 thousand migrant workers are likely to return to Nepal due to job loss, while an additional 400 thousand may follow in the mid-term due to visa expire and non-renewal of contracts [54]. Nepalese workers are in danger of losing jobs because of the economic recession associated with the negative prices of petroleum products in Gulf countries and a shrinking economy in Malaysia.

Surprisingly, the remittances inflow into Nepal did not decline sharply as predicted by the economist but increased despite the COVID-19 and decreased economic activities in the world market. Remittance inflow in Nepal increased by 23% [49] as against the World Bank prediction of 14% decline [22] and Nepal Rastra Bank prediction of 15% reduction [49]. This might be due to the closure of the informal money transfer system between Nepal and other countries. For example Hundi transaction and the money received only through the formal system, which contributed to major part of money received. The hundi-based transaction is not part of the national database of money transactions.

5.1.6. Socio-economic impacts

The COVID-19 pandemic has affected the social and mental health of individuals, households and communities [55]. Three out of every five Nepalese workers in both formal and informal micro, small and medium-sized enterprises (MSMEs) lost their employment due to the COVID-19 pandemic [8]. This job loss has threatened livelihood and purchasing power. The burden on unpaid care work has disproportionately fallen on women. Women, especially from lower-income groups, have been affected by the pandemic differently compared to men because women are usually employed in sectors such as hospitality, wholesale and retail, which care more are vulnerable to the pandemic [8]. Women in general, due to their leadership role in feeding families, combined with a greater negative impact on their income earning possibilities, have suffered more from physical and mental health impacts.

6. Way forward

Several efforts have been undertaken by the federal government, provincial governments and local governments to keep agriculture activities running amid the COVID-19 pandemics. Key policy response from the federal government includes advocacy and campaigns against the misconception of food as virus carriers, notices, appeals, and guidelines on production, processing, distribution/supply and consumption of agricultural products and increasing access of inputs at farm level. Some provincial ministries subsidized interest on agricultural loans. Some local governments have also implemented various initiatives particularly directed to encourage farmers to grow more [37]. These efforts together with efforts from other stakeholders have played an important role to continue production and distribution/supply of agricultural produce. Despite the government’s interventions, several gaps have been seen visible at the implementation level therefore it is unlikely to achieve the country’s UN Sustainable Development Goals. In this regard, the following initiatives by concerned authorities are necessary to minimize the shocks created by current COVID-19 pandemics and post-pandemic policies to attain the targeted of SDGs in Nepal.

6.1. Policy to tackle poverty and hunger

6.1.1. Innovation in supply chains and markets

The COVID-19 pandemic has placed unprecedented stress on the food supply chains of Nepal. The country’s supply chain is typical of traditional models-based around subsistence agriculture or short local supply chains [56]. To make the food system of the country vibrant, we purposed a framework in the post-pandemic era (Fig. 3).

The harvest of the crops will be reduced because of no access to buying inputs during the planting season resulting in lower-income for the farmers. Restrictions on the movement of farm logistics will increase transaction costs and thus food prices. Higher food prices are, in turn, likely to cause social unrest [57].

All these situations might trigger food insecurity in the country. The risk to food security currently does not come from disruptions along supply chains, but rather from the devastating effects of COVID-19 on jobs and livelihoods [8]. In developing countries, where social safety nets are less developed, COVID-19 increased poverty and hunger [38]. The governments should bring the supply chain to new normal and respond to minimize supply chain disruptions. The first general strategy might be to address food security impacts through bringing schemes such as cash-for-work schemes to employ workers to distribute emergency foodstuffs (SDG1 & SDG2). The second strategy might be transparent dialogues among the stakeholders to address future emerging risks (SDG2). Thirdly, long-term investments to improve the supply chain is outmost (SDG1).

6.1.2. A post-pandemic policy for the agricultural development plan and food balance

The global pandemic of COVID-19 unprecedented social and economic damage. The pandemic has also unfolded many shortcomings of our national food production and distribution systems. About 4.6 million people in Nepal are food-insecure [31], who cannot afford any possible interruption of their livelihoods or access to food that a situation with
COVID-19 could bring. COVID-19 brings extraordinary new challenges to hunger, and we will need a new solution [59]. A hunger pandemic could swiftly follow the COVID-19 pandemic, doubling acute food insecurity by the end of the year [22], and 40–60 million more people could be thrown into extreme poverty globally [60].

The timely unavailability of required agricultural inputs and proven quality to the farmer’s field might reduce the crop yield. Also, many agricultural farms have already faced labor shortages and reduced staff due to government restrictions on migration, making timely harvest difficult. The transportation of seeds and fertilizers has been delayed, which will have an impact on the following year’s crops such as rice. The yield of rice in Nepal is expected to decrease by 0.60%, wheat by 0.45% and corn by 2.64% [61]. The reduced yield might create a food deficit in the country and vulnerable groups would suffer from hunger. Nepal could witness a potential increase in the number of poor people, relative to the 2018 figures. The country could suffer from a food deficit of 71,400 tons [44]. A study estimated that the COVID-19 economic shutdown will push 420–580 million people into poverty globally, causing global poverty to rise for the first time after the economic recession of 1990 [29]. Therefore, the country needs to establish a guideline on national food security to handle the possible nutrition crisis (SDG2 & SDG12). At the same time, the coordination committee among the three tiers of governments needs to be established. And, the coordination committee should work on the preparation of agriculture development plans and food balance sheets in seven provinces of the country.

6.1.3. Implementation of social food programs

About 170 thousand people working for a daily wage are landless [52]. The Nepalese agricultural sector is mostly seasonal and deploying informal workers, represents 60% of the total labor force, have lost a job due to COVID-19 outbreaks. For example, more than 60% of micro and small business workers have lost their jobs [8], adding the extra challenge of providing daily food required for themselves and their families. The population below the nationally defined poverty line in Nepal is estimated to be around 5.5 million; yet, they have access to food only for three months and rely on a job for the rest of the months. Most of them have lost their jobs during the lockdown period. The increase unemployment rate will have social implications for the country (SDG5, SDG8, SDG10). The current pandemic not only caused food insecurity but also might increase the conflicts in the country and jeopardize national peace and justice. Thus, generating employment opportunities to increase economic activities is the prime importance to the country (SDG5 & SDG8). Critically, there needs to be more national solidarity, in the form of a greater political commitment across the nation (SDG17).

6.1.4. Stimulus packages for smallholder farmers

Smallholder farmers are affected mostly by the COVID-19 pandemic. Restrictions on movement hindered farmers’ access to markets to buy inputs and sell products [18]. Fresh produce is accumulating at farms, resulting in food loss. As many smallholder farmers are vulnerable to financial shocks and do not have high savings levels, the indirect economic effect of COVID-19 will pull them deeper into extreme poverty. Smallholder farmers produce up to 80% of the food consumed in Nepal [62], making it essential for agricultural input supply systems to be safeguarded. COVID-19 has exacerbated pre-existing obstacles for smallholders in accessing necessary inputs and extension services. Micro and small-sized firms reported being impacted by the COVID-19 measures of decreased sales, difficulty in accessing inputs, and difficulty in paying staff [38].

Many Asian countries such as Cambodia, Indonesia, Lao PDR, Myanmar, and the Philippines have borrowed a total of US$6.7 billion from the World Bank, the Asian Development Bank (ADB), and the Asian Infrastructure Investment Bank (AIIB) to respond to the economic distress due to the COVID-19 pandemic [63]. Farmers need cash handouts and safety net programs that can prevent them from short-term “income shock” (SDG1, SDG2 & SDG12). Banks should wave fees on
farmers’ loans and extend payment deadlines. A capital injection in the agricultural sector can help small and medium agri-businesses to continue operations. Improving storage can help to reduce post-harvest crop losses along the supply chain. Any constraints to domestic trade, including bureaucratic hurdles, should be removed to link smallholder farmers to markets. The concept of food banks can play a significant role given their knowledge, as well as horizontal and vertical coordination mechanisms with farmers’ associations engaged in contract farming arrangements. The country should establish warehouse receipt systems for farmers to use the receipts to get their payments. Smallholder farmers must have access to finance so that they can continue to produce.

7. Limitations and future research

In this paper, we have reported the potential impact of the COVID-19 pandemic to achieve UN Sustainable Development Goals in Nepal. Although this report has substantial limitations because they are focused on the scientific papers, neutral assumptions, which crucially lack the considerations of the labor market, impact assessment through a household-level response, social and fiscal policy to economic contractions. Also, this paper examines the COVID-19 pandemic in Nepal, which might differ from a global perspective. The pandemic has imposed a financial burden on Nepal. Some studies reported that low-income countries could have faced serious post-pandemic effects because of international funding to achieve the targets of Sustainable Development Goals [64].

Author contributions

Conceptualization, Joshi, and Mainali; Methodology, Marasini, and Joshi; Writing—Original Draft Preparation, Joshi, Marasini and Acharya; Writing—Critical Analysis, Revisions, Review & Editing, Joshi, Acharya and Mainali.; Validation, Joshi, Adhikari and Acharya.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Annex 1. Impacts of COVID-19 on sustainable development goals in Nepal

| Sustainable Development Goals | Status | Impacts | Nepal’s targets affected |
|-------------------------------|-------|---------|-------------------------|
| **Goal 1: No poverty** | Highly threatened | 1. A total of 1.6-2.0 million people lost their job | 1.1 Reduce extreme poverty to less than 5% |
|  |  | 2. About 10-30% of the jobs held by Nepalese in the Gulf countries and Malaysia lost their job | 1.2 Reduce the poverty gap to 2.8% |
|  |  | 3. Shortage of crop production inputs | 1.3 Raise per capita income to US$ 2500 from US$ 766 |
|  |  | 4. The supply and demand for food affected | 1.4 Reduce nationally defined poverty to less than 5% |
|  |  | 5. Reduce MPI less than 7% from 12.8% | 1.5 Reduce MPI less than 7% from 12.8% |
| **Goal 2: Zero hunger** | Highly threatened | 2. About 20% of total households struggling for daily food availability | 2.1 Reduce the prevalence of undernourishment to 3% |
|  |  | 3. Shortage of crop production inputs | 2.2 Reduce the prevalence of underweight children under-five years of age to 9% |
|  |  | 4. The supply and demand for food affected | 2.3 Reduce the prevalence of anemia among women to 10% |
|  |  | 5. Piped water supplies projects ve years of age | 2.4 Increase the food grain production by 66% |
| **Goal 3: Good health and well-being** | Highly threatened | 1. Hospitals were occupied with COVID-19 patients: | 3.1 Reduce the maternal mortality rate to less than 70 per 100 thousand live births |
|  |  | 2. The pandemic posed the aggravated nation’s priority to control tuberculosis, malaria and neglected tropical diseases | 3.2 Reduce preventable deaths of newborn and children to less than 1% |
|  |  | 3. Mental health of people degraded | 3.3 Eliminate HIV, TB and malaria and other tropical diseases, and water-borne diseases by 2030 |
| **Goal 4: Quality education** | Threatened | 1. Schools and colleges closed for almost seven months | 3.5 Increase institutional deliveries to 90% |
|  |  | 2. About 7.5 million students deprived of education | 4.1 Almost 99.6% enrolment and completion of primary education |
|  |  | 3. Mental health of people degraded | 4.2 Attendance at pre-primary education by 90% of children |
|  |  | 4. A 75% increase in the number of young and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship | 4.3 Eliminate gender disparities at all levels of education by 2030 |
| **Goal 5: Gender equality** | Threatened | 1. Income of the people reduced | 5.1 Eliminate gender disparities at all levels of education by 2030 |
|  |  | 2. Women suffered from income risk | 5.2 Eliminate wage discrimination for similar work |
|  |  | 3. Mental health of people degraded | 5.3 Eliminate physical and sexual violence |
| **Goal 6: Clean water and sanitation** | Threatened | Piped water supplies projects & improved sanitation program affected | 5.7 Gender inequality index declines to 0.05 from 0.49 |
|  |  | 1. More than six million people unemployed | 6.1 A 99% household access to basic water supplies |
|  |  | 2. Nepal’s tourism sector has lost about $29 million in earnings, which engages 272,000 people who have lost their jobs | 6.2 A 95% of households have access to a piped water supply and improved sanitation |
|  |  | 3. GDP growth rate shrunk to 0.02% | 6.3 A 98% of households have access to a sanitation facility |
|  |  | 4. About 10% of total households struggling for daily food availability | 6.4 Accessibility of 99% of households to electricity |
| **Goal 7: Affordable and clean energy** | Highly threatened | Hydropower works delayed | 6.5 The generation of at least 15,000 MW of electricity |
|  |  | 1. More than six million people unemployed | 8.1 Increase per capita GDP growth at least to 7% |
|  |  | 2. Nepal’s tourism sector has lost about $29 million in earnings, which engages 272,000 people who have lost their jobs | 8.2 Reduce underemployment to less than 10% |
|  |  | 3. GDP growth rate shrunk to 0.02% | 8.4 Increase the direct contribution of tourism to GDP by four-fold |
| **Goal 8: Decent work and economic growth** | Threatened | Low supply of raw material | 9.1 Increase road density to 1.3 km/sq km and paved road density to 0.25/sq km |
|  |  | 1. Low supply of raw material | (continued on next column) |
|  |  | 2.75% SMEs shut down | 9.2 Increase road density to 1.3 km/sq km and paved road density to 0.25/sq km |
| Sustainable Development Goals | Status | Impacts | Nepal’s targets affected |
|-------------------------------|--------|---------|-------------------------|
| Goal 10: Reduced inequalities | Threatened | 1. Number of poor increased | 10.2 Reduce income inequality from 0.46 to 0.23 |
|                               |         | 2. Income of the people reduced | 10.3 Increase the share of the bottom 40% of the population of national income from 12% to 18% |
|                               |         | decreased by 50–75% | 10.4 Increase the ratio of the nominal wage index to the consumer price index from 2.94 to 3 |
| Goal 11: Sustainable cities and communities | Threatened | The number of cases in cities increased | 11.2 Construct at least 60 new satellite cities |
| Goal 12: Responsible consumption and production | Partially threatened | 1. Shortage of agricultural inputs during crop planting season | 11.5 Repair and rebuild all cultural and religious heritages and houses by 2020 destroyed by the earthquakes of 2015 |
|                                 |         | 2. Construction of agricultural markets across the country delayed | 11.6 Make at least 50% of highways safe by global standards |
| Goal 13: Climate action | Threatened | The focus on ecosystem and biodiversity conservation reduced | 12.1 A 75% of total cultivated land to be available for cereal production by 2030 |
| Goal 14: Life below water | Partially threatened | The SDG 14 target is not relevant for Nepal as it is a landlocked country | 12.2 Post-harvest loss of food reduces from 15% to less than 1% |
| Goal 15: Life on land | Partially threatened | Conservation of ecosystem get less priority | 12.6 Improve transparency and accountability scores on globally benchmarked indices |
| Goal 16: Peace, justice and strong institutions | Threatened | 1. Suicide rates increased | 12.7 Revenue collection reaches 30% of GDP by 2030 |
|                                 |         | 2. Violence against women & children increased | 12.8 Government Expenditure financed by domestic revenue reached 80% |
| Goal 17: Partnerships for the goals | Threatened | 1. Government revenue collection decreased by 28% | 12.9. Foreign direct investment increased by at least five-fold from the present level |
|                                 |         | 2. FDI decreased | – |

Nepal has localized the UN Sustainable Development Goals. The country has 479 targets against 169 targets set by UN.

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