



A review on impacts of COVID-19 on global agricultural system and Scope for Bangladesh after pandemic

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Abstract

COVID-19 pandemic has had a devastating effect on the global food production system. Large-scale food producing countries restricted exports for food sovereignty, while small and import-dependent countries are at risk. After COVID-19 pandemic, integrated and planned action is necessary to overcome this global stalemate. In this review paper, we have tried to show the damage caused to global agriculture as well as in Bangladesh due to COVID-19 pandemic. At the same time, the prospects and tasks of Bangladesh in the post-pandemic global economy have also been discussed. Due to the middlemen-based marketing system in Bangladesh, farmers have been deprived of their profits from the early period. The government should move forward with a long-term planning to find alternative food market such as processing and export alongside the one-way marketing system. On the other hand, it will benefit the farmers' community of Bangladesh, as well as ensure global food security after this pandemic.

Keywords Agriculture, COVID-19 · Food · Farmer · Production · Rural Bangladesh

Introduction

On December 31, 2019, the very first occurrences of infection with a novel coronavirus (2019-nCoV) were identified in Wuhan, China (WHO - World Health Organization, 2020),

which causes the disease termed as COVID-19 (Wang et al., 2020). Quarantine and panic have been demonstrated impact on human activities and economic development in the past (Hanashima and Tomobe 2012; Bermejo 2004; Arndt and Lewis 2001); however, the effect also happens in agricultural operations. There is an upsurge in hunger and malnutrition when an infectious illness outbreak occurs (Burgui 2020; Sar

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et al. 2010). As the disease spreads, movement limitations become increasingly rigorous, resulting in labor scarcities during the harvest or obstacles for farmers bringing product to the market. Agriculture is associated with food security and is one of the most significant areas in social progress (Abdelhedi and Zouari 2020; Kogo et al. 2020; Lopez-Ridaura et al. 2019). The global impact of the COVID-19 epidemic on agriculture necessitates immediate and long-term responses. First above all, in order to develop necessary actions, it is essential to analyze and understand the direct consequences of the current pandemic on agricultural and food systems. As a result, the risks, vulnerability, resilience, and systemic shifts of agricultural systems to adapt to the present situation must be properly understood (Boughton et al. 2021; Cattivelli and Rusciano 2020; Darnhofer 2020; Diesner 2020; Gunther 2020; Henry 2020). Therefore, a thorough literature review and analysis being needed to assist relevant authority around the world in developing appropriate policies to combat COVID-19's agricultural effects.

The economic impacts of COVID-19 disturbances on farms and agricultural workforce-dependent households, agribusiness firms, and rural and urban buyers were severe, according to Boughton et al. (2021), who conducted research across Myanmar's agri-food system. Several crises have impacted the agri-food industry, including internal and overseas demand shocks, supply disruptions owing to movement limitations, and financial constraints. In India, Cariappa et al. (2021) found that movement restrictions, transportation issues, and reverse worker migration affected internal distribution networks, resulting in wholesale and retail price increases for several goods such as pulses, wheat, flour, milk, and vegetables. Economic distortions in key rice exporters such as Thailand and Vietnam, pushed up world prices, hurting African countries that rely heavily on imported food (Sers and Mughal 2020). In various parts of India, the virus outbreak chain of events has had varying effects on domestic farming production, notably production, marketing, and consumption. The provinces with significant economic or agricultural development suffered labor shortages and migration, whereas states with low development suffered interruptions in input supply and the danger of illness from contact to varied processes. Distress sales have been witnessed for the marketing of perishable goods, especially in states with low resources like Odisha, because of logistical instability and inadequate sale sites. Nonperishable goods saw a decrease in sales, despite the fact that the loss was less than perishables.

Popescu and Popescu (2021) undertook a complete review of the COVID-19 pandemic's consequences on Romanian agricultural systems, compliance with limitations, and relationships with authorities, and made some recommendations for future management of such circumstances. They also gave a clear picture of the hardships and

challenges Romanian farmers experienced throughout the pandemic. Farmers had challenges with farming technologies and agri-food product sales. They stated that Romania's agricultural systems were weak, and that the sector needed to be actively supervised and supported in order to preserve food security during a crisis. Rapid answers and solutions from government, accelerated digitalization, adapting to difficulties, supporting local cultivars, and investments in improved agricultural mechanization and innovation should all help to alleviate the consequences of crises and ensure food security stability. At the same time, they argued that a crisis like this might be an "opportunity" for evaluating agricultural production systems and implementing more innovative tactics, sustainable practices, and digital agriculture solutions.

Tripathi et al. (2021) investigated the effects of COVID-19 on agriculture, local farming systems, and farmer adaptation techniques in Tanzania and South Africa. Their study revealed that COVID-19 had a significant impact on agriculture and food security, owing to indirect channels of affect that resulted in (i) income losses and falling demands, (ii) supply chain breakdown, (iii) changed consumer reactions and dietary changes, and (iv) international and domestic trade disruptions. Farmers' coping activities and tactics differed depending on the size of their business, their production style, their level of financial access and market activity, and the diversification of their farming systems. COVID-19 had a lower impact on farmers in diverse and mixed farming systems, such as those seen in Tanzania, where farmers grow both cash and food crops and are less reliant on overseas markets. Due to market instability and closure, large-scale commercial apple and potato producers who rely on cash and single commodity systems have incurred financial losses.

In Bangladesh, about 37.75% workforces are involved in agriculture and GDP from agriculture was 128.57 million USD which was 12.65% of total GDP of Bangladesh during 2020 (World Bank 2021; O'Neill, 2021). The total agricultural sector has a significant impact on principle goals of macroeconomics such as poverty reduction, employment generation, food security, and human resource development. Bangladesh Rural Advancement Committee (BRAC) conduct an experiment 2020 to find out the initial loss in the agricultural sector for the lockdown started in March 2020 in Bangladesh. According to their study from the last week of March to starting of May 2020, more than about 56,536 thousand cores BDT has been loss by the farmer. Because of artificial crisis at the onset of the pandemic has led to a slight increase in market prices, however, no avail to farmer. As the production of perishable goods continues and restrict the transportation facilities, it becomes difficult to sell the produced product. 88% farmer and about 100% fishers reported their financial loss. The significant problems mentioned by the farmers, getting no fair price (66%), keep the market open

for the limited time (52%), high price of raw materials (45%), and lack of laborer (28%). Poultry prices have dropped about 44% since restaurant closed due to the holidays during lockdown. Because of decreasing demand, farmers are reduced the production which results supply shortage. As a result of shortage of supply, prices of poultry and eggs increased by 26% and 8%, respectively. COVID-19 also effects on the dairy field also. Demand of dairy products drops by 33–60% resulting in farmers reducing production by 18% of their ability (BRAC 2020). In Bangladesh, COVID-19 and its consequences have caused havoc on an approximate 0.3 million dairy plants and 65–70 thousand poultry farms. Most of them lost their capital investment because of gradual losses. Approximately 12 to 15 million liter milk remain unfarmed that caused 6.7 million USD loss only in the milk production sector. In poultry industries from March 20 to April 4, 2020, within 2 weeks, estimated loss was 1.35 billion USD (Rahman & Das 2021).

The lockdown for the COVID-19 pandemic disrupted the whole agricultural system due to the stagnation in the transportation system. The products those produced on the farm are being wasted as it cannot be sold. Marginal farms are suffering most, because they are forced to sell their products at nominal prices. As the price of food is rising, on the other hand, the farmers are struggling to recover the cost of production. The farmer is being deprived of his fair price for the agricultural marketing system centered on middlemen, brokers, or warehouses. In present study, we have tried to find out the problem of developing proper agro-marketing system, effects of COVID-19, and opportunities after pandemic situation for Bangladesh in light of the published literatures on the same themes till to date.

Impact of COVID-19 on agricultural systems

Immediate impact of COVID-19 on agricultural system

Worldwide combined efforts to inhibit the virus by keeping down the human activity irresistibly caused financial shocks and costs which have the impacts on agricultural and food

production system. Huge sloping of demand for commercial and restaurant associated with labor abridgment less storage ability led the farmers has been throwing away a lot of their produce. Quarantine severely impacts on the availability of labor for the time bounding farming such as vegetable, crops, and fruit picking. These effects become deeply in food production sector and global economics as the problem increases day by day. The consequences of the covid-19 pandemic on the agriculture sector can be divided into five categories: food security, labor availability, agricultural system resilience, farming system interconnection, and others (Cranfield 2020; Darnhofer 2020; Jámboer et al., 2020; Siche 2020; Villulla 2020; Zarei and Rad 2020). Impacts of COVID-19 are graphically shown in Fig. 1.

Food security

Due to a loss of income and temporary workers reduce the food purchase ability. Panic buying breaks up the market supply system. People store food more than their demand for fear of not getting later. Perishable products like fruits, vegetables, and milks are ruined because of transportation restriction. Food security defines having unrestricted access to food sufficient to encounter their basic needs (Rosales and Mercado 2020). If instant action is not taken, a food catastrophe will loom, causing havoc on the utmost vulnerable people. The priority should be on sustaining global food supply systems operational and limiting the pandemic's impacts across the food management system. Short-term crises are mitigated by social services, which operate as an umbrella (Boughton et al. 2021). Around 820 million people across the world suffering from chronic hunger and do not eat enough calories to live a normal life are treated as first vulnerable group. (Boughton et al. 2021; FAO, 2020a). This group of people cannot afford any disruption in their livelihoods or access to food that a COVID-19 outbreak may cause. Small farmers are second vulnerable group, as they may be unable to operate on their land or enter markets to sell their crops or purchase seeds and other vital commodities (Ragasa et al. 2020; Workie et al. 2020; Varshney et al. 2020).

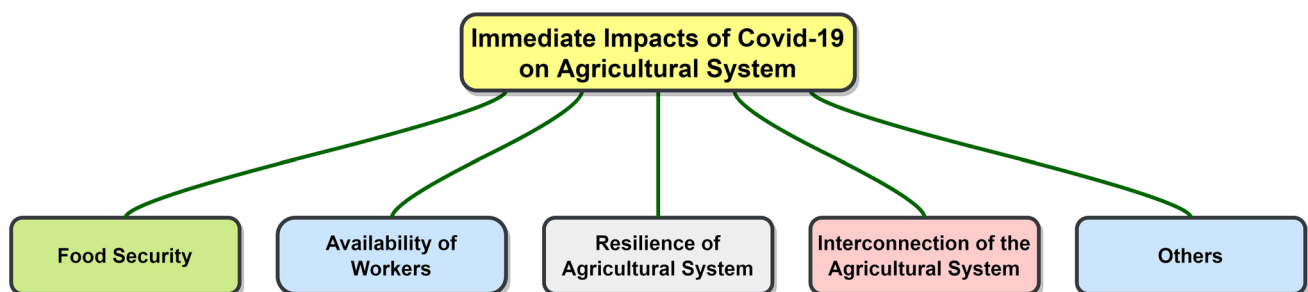


Fig. 1 Impacts of COVID-19 on agricultural system develop from Stephens et al. (2020)

The third vulnerable group is children from limited income families, who are mostly fed by social programs; the pandemic has placed these programs on hold, putting food security and nutrition at risk, as well as the existence of youngsters with insufficient capacity to manage with diseases (FAO – Food and Agriculture Organization, 2020; Workie et al. 2020; Varshney et al. 2020; Timilsina et al. 2020; Principato et al. 2020). As a result, each government must emphasize its efforts on sustaining social food programs while simultaneously taking the necessary precautions to prevent an outbreak of the virus.

Availability of workers

The economic and social shock caused by the COVID-19 epidemic is a global phenomena that has impacted people from all walks of life. Transport restriction hampered the movement of workers which severely impacts on horticultural, livestock, and food processing industries. Plantation and harvesting operation are impeded due to the lack of expert workers. Skill development is difficult because of lockdown. COVID-19's effects on worker availability vary depending on the nature of the employment, location, type of work, and age of the workers. Workers have become precarious due to a lack of formal safety and recognition, a social security system, and limited benefits from institutional sources (Haque et al. 2022). The pandemic had a smaller influence on the income of rural informal laborers, particularly those who work in agriculture-based employment (Swarna et al. 2022). Urban informal sector laborers, on the other hand, are the hardest effected by the pandemic, as they were restricted from moving throughout communities during lockdown (Swarna et al. 2022; Siche 2020). With their low daily wages, most urban informal workers live in deplorable conditions, and they were the hardest struck by the pandemic (Sakamoto et al. 2020). The workers' well-being was influenced by their income decreases. Swarna et al. (2022) discovered that they had to cut more than a quarter of their food spending. Because of lockdown, quarantine, and other constraints, COVID-19 produced a vicious circle between workforce availability and income.

Resilience of agricultural system and interconnection of the agricultural system

Basic variation of economy, technology, demography, ecology, and social environment creates struggling condition for many farming system (Meuwissen et al. 2020). Border restrictions, travel bans, and lockdowns added threat to the agriculture sector especially for perishable products (European Commission, 2020). Agricultural system resilience to the COVID-19 pandemic is another index to measure the effects COVID-19.

Small farms that primarily use family labor, are less dependent on externally hired labor, more resilient than large farms which depend on external labor (Ragasa et al. 2020; Workie et al. 2020; Meuwissen et al. 2020).

The COVID-19 virus outbreak has strong influence on international relationships that extends far beyond the workforce of the agro-food sector. Export restriction of various states creates barrier for the entrance of agricultural product into the market. Flight and port shutdown hampers the international supply chain. By the sake of 'Food sovereignty' few nations seriously impacted on global agro-marketing system.

Other consequences

The COVID-19 epidemic has had a substantial impact on humanity's behaviors and activities, and agriculture is not out of it. Food security is significantly impacted due to mobility restrictions; purchasing power has decreased; conversely, food demand has increased, and an unbalanced impact on the most vulnerable population groups has also been seen. (Swarna et al. 2022; Siche 2020). Increased focus on public health and sanitation creates greater competition for vital inputs, specifically water. Impacts on achieving SDGs become more difficult. Research works are severely hampered in agro-sector. Impacts of supply chain and processing disrupt on animal welfare (Workie et al. 2020; Meuwissen et al. 2020).

Impact of COVID-19 on fisheries

The open water fish catching was greatly affected by COVID-19 pandemic globally. At the peak of the coronavirus crisis in the United States of America, as for example, catches declined by up to 40 percent over the nation (White, 2020). The demand was dropped resulted in abridged prices of fish and fish products. Constrains of input supplies (e.g., ice, gear, bait) are another limit on the scenario. The effects on catches have varied around the world, with several nations experiencing substantial decreases in production in the early weeks of the Covid-19 problems. The aquaculture production has also been plagued by COVID-19 pandemic. The economic scenario for aquaculture production and markets is still quite unstable and uncertain, which has an impact on pandemic-related operations (OECD 2021). But, in many countries fish production is considered as main financial sources for fishers but this sector will feasibly struggle to withstand its activity or sustain its scheduled production cycles due to lockdown and related economic slowdown worldwide (Zhang, 2020). Travel barriers, hard rules of seed import, and labor crisis can be some obstacles against aquaculture in the medium to long term (Virginia Agricultural Research and Extension Centers (VT), 2020). Some nations have exempted the aquaculture sector from lockdown actions (Ramsden and Harkell 2020) or

established strategies to regulate the exercise of the free movement of workers during COVID-19 outbreak (EUR-Lex 2020) but the less developed countries like Bangladesh, Pakistan, Thailand, Sri Lanka, Myanmar, Nepal will face difficulties in the coming days. Low market demand, closure of international markets (e.g., China, European Union) (Pham, 2020), travel ban, and insufficient quality seed will severely impact the production of aquaculture in the aforementioned countries. Food service demand has decreased significantly as a result of the effective shutdown of the restaurant industry in several areas, while retail sales have been distinguished by great volatility. Fresh fish sales, for example, have decreased by 30 percent in France, Italy, and Spain. In addition, several seafood trade events around the world have been cancelled, leading to lost transactions between large buyers and suppliers that depend on these regional events. Fish processing factories in many countries have closed owing to Covid-19 positive workers (Xuemin 2020). Changes in demand affected storage of fish and seafood resulting in increased food loss and waste. Global aquaculture production is now expected to fall by some 1.3% (FAO 2020a). Global catches from wild fisheries are likely to fall marginally as a result of COVID-19-related restrictions on fishing vessel crews and low market circumstances, which are expected to diminish overall fishing effort. The market effects of the pandemic are likely to persist in the long term as measured by the Fish Price Index (FAO 2020b) were down year-on-year for most traded species.

Rahman et al. (2021) conducted an experiment on *Baor* fishery (oxbow lake) to find out the effects of COVID-19 pandemic on food security. The *Baor* fishery community was also severely impacted by the epidemic in case of income, food security, and health issues. Because of diminished

customer and demand during the lockdown, fishermen have had to halt harvesting or limit the quantity of fish, which was the major source of income for the *baor* fishing community (Fig. 2). According to the Bangladesh Poultry Industry Central Council, poultry meat supply has dropped by 40 to 45% over previous one and half year; roughly, production was 90,000 tons per month in pre-pandemic periods (BPICC). BPICC also stated that more than 40% of farms already stopped farm because they are unable to withstand pandemic-related losses (Ali and Chowdhury, 2021).

Impacts of COVID-19 on poultry, dairy, and livestock sector

The impact of COVID-19 on the livestock industry is mostly unknown and undefined. Although formal assessments are not yet attainable, recent findings show that livestock supply chain is disrupted. From previous epidemic's study suggest that these disruptions as well as their devastating socio-economic implications are only going to get worse. However, steps may be done to safeguard this field and the services and goods that it provides to the entire world. Daily milk demand was being decreasing gradually at the beginning of the lockdown because of COVID-19 and produced milk remains unsold. Farmer faced large financial loss at the time of pandemic period (Popat et al. 2020). Low milk rates also affected the sector, which fell by 4.6% on average across 70 nations, and even fell by 29 and 19% in the USA and India, respectively (IFCN (International Farm Comparison Network), 2020). Consequently, COVID-19 is estimated to cost the cattle sector \$13,617,418,450 in economic losses. Many cattle growers and marketers have lost access to national and

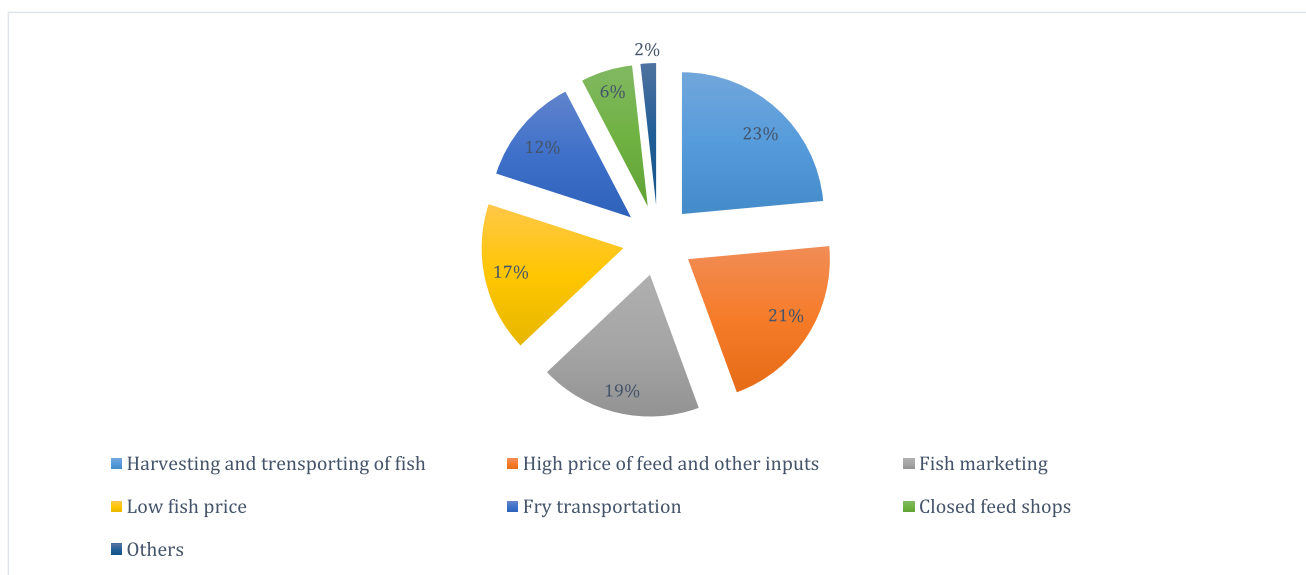


Fig. 2 During COVID-19, a baseline survey revealed main obstacles in oxbow lake fisheries (data collected from Rahman et al. 2021)

international markets, and as a result decrease income. Border controls in Asia have halted livestock commerce from Lao PDR, Thailand, Myanmar, and Vietnam to China (FAO 2020c). Argentina and Uruguay were losses their earning because of export restriction. In the USA, hog price reduced 27% in a weak due to the restriction of movement. The restoration of border inspections in Europe has hampered the transportation of live animals affecting industry (Hashem et al. 2020).

Long-term effects of COVID-19 on agriculture and food supply

Providing food security and nutrition to a growing global population, assuring the livelihoods of millions of people working throughout the food chain from farm to fork, and ensuring the environmental sustainability of the industry are all essential objectives (OECD 2021). However, legislative initiatives have not progressed in this direction, and global agriculture and food commerce remain unbalanced. COVID-19 has prompted policymakers to make quick decisions in order to keep food supply networks running. Continued investment in the long-term objective of resilient, sustainable, and productive food systems is also important. Ending ineffective and harmful support would free up resources for a more forward-thinking policy package that could better meet the triple issue. COVID-19's unexpected shock emphasizes the importance of departing from "business as usual" (OECD 2021).

Country-wise government policy to overcome the impact of COVID-19 on food production system

Coronavirus demonstrated that the globe is a little village. The virus outbreak has afflicted people all across the world. Below is a list of countries and the impact they have had, as well as the initiatives they have already made are given.

Bangladesh

The entire marketing and shipping of fruits, vegetables, eggs, chicken meat, and milk in Bangladesh have been severely hampered. COVID-19 has lowered the product's purchase ability. The vegetable exporting industry has suffered a \$20 million loss. To reduce the cost of manufacturing, the government granted subsidies to agricultural machines. Boro rice harvesting has already been allocated 800 combine harvesters and 400 reapers. The government recently announced

a grant of 5000 core BDT (1 US dollar = 84 BDT) to marginal farmers. In addition, the government will collect additional 1 lakh metric tons of rice from farmers and millers at a rate of 26 BDT/kg paddies and 36 BDT/kg milled rice. The Bangladesh government has also announced aid packages for rice, potatoes, lentils, oil, onions, and salt (Hossain, 2018).

America and Canada

In the USA and Canada, the closure of hotels, restaurants, schools, and other similar institutions in food demand has already fallen. Due to transportation restrictions, there is a shortage of manpower for field activities such as harvesting, processing, and packing. Consumer panic buying causes a shortage in the food market. During the peak season in late April 2020, weekly beef production fell by a third (USDA-AMS 2020). Grain demand has also decreased as a result of the reduced usage of ethanol as a fuel. As a result, the cost of production rises. Soybean and other oil seed prices have recently fallen as well (Weersink et al. 2021). USDA implements the CFAP program for agriculture, livestock, and dairy farmers to help them cope with the loss of income caused by COVID-19 (Paulson et al. 2020).

China

China is a country where quarantine and movement limitations have resulted a significant decline in farm income throughout the year. Migrant laborers have been unable to attend work, which has had a significant impact on harvesting and post-harvest activities. Wildlife farming has recently been negatively impacted. COVID-19 has also reduced cereal crop yields of the three main grain crops — rice, wheat, and corn — due to a scarcity of agricultural production resources and restrictions on spring plowing. Due to constraints on enterprises restarting operations and road closures, agricultural production commodities such as seeds, fertilizers, pesticides, and other agricultural inputs were impossible to provide on time (Pan et al. 2020). With the restoration of animal feed, slaughtering, and meat processing sectors, special travel cards, a public collection platform and e-commerce, were created to enable the distribution of fresh agricultural commodities. Government subsidies were given to the pig and poultry industries, which are the most fatally affected. Social insurance payments were cut by RMB 1 trillion by the Ministry of Finance. Organizations that are deemed to be experiencing temporary difficulties as a result of the coronavirus pandemic in China's major cities (Beijing, Shanghai and Guangdong) may be eligible for a refund of unemployment compensation payments if they do not lay off employees or limit layoffs. The People's Bank of China opened a national market to reverse repurchase activity worth 1.2 trillion Yuan.

Cambodia

Cambodian Royal government gives permission for export only fragrant rice which harmfully effects on production and livelihood of farmers. Government allocates USD 50 million in low interest for agricultural sector. State owned Rural Development Bank would distribute the fund to enhance the local production capacity. Especial care should be taken to the small farm owners by the Ministry of Agriculture, Forestry and Fisheries. Government started training on modern agricultural technologies to create job and income generation activities in rural households (Hossain, 2018).

India

Harvesting activities in India are being hampered by a scarcity of migrant workers. Prices of agricultural commodities have fallen as a result of the closure of businesses such as hotels, restaurants, sweetshops, and teashops. Incorrect information regarding chicken has a negative influence on the poultry industry. Fertilizer shortages, pesticide and insecticide shortages, veterinary medicine scarcity, and other factors all affect agricultural production. Horticulture has a score of 5.7% production loss. Declined percentage of availability of agricultural inputs remain in the range of 9 to 11 percent (seed 9.2%, fertilizer 11.2% and pesticides 9.8%). and increase percentages of the prices of farming inputs: seeds 8.8%, fertilizers 10.0%, and Pesticides 9.0% (NABARD 2020). Agriculture has been designated by the Indian government as one of the state's most essential activities. Lockdown does not apply to any activities relating to agricultural operations. The government has asked public and commercial seed companies to give farmers with high-quality seeds for the coming planting season. To keep the agricultural supply chain running smoothly, the Indian government concentrated on monitoring.

Pakistan

COVID-19 has hampered access to agricultural inputs and supplies in Pakistan. As a result of the shortage of inputs, the cost of production increased. During the wheat harvesting season, workforce movement restrictions hinder production. Agriculture and small-medium-scale businesses were each given 100 billion Pakistani rupees (USD 612 million), with interest payments for both sectors delayed. Wheat purchases are expected to cost 280 billion Pakistani rupees (USD1.76 billion) (Hossain, 2018).

Sri Lanka

Restrictions prevent the distribution and storage of perishable agricultural products in Sri Lanka. Although the price of tea increased in auction, production declined due to the

curfew. The Sri Lankan government launched the Saubhagya Gewatta (Prosperous Home Gardens) program to expand home gardens and enhance fruit and vegetable production. The government is attempting to improve the rural seed farm project, organic fertilizer application, and home garden items production for family consumption (Hossain, 2018).

Indonesia

Mismanagement of agricultural inputs such as seed, fertilizer, herbicides, and other chemicals makes farm application problematic in Indonesia. Intercultural operations, harvesting, post-harvest activities, and the supply chain of agricultural commodities are all hampered by a lack of workers and transportation barriers (Rozaki 2020). To shorten the supply chain between producer and customer, the Ministry of Agriculture collaborated with the province government to construct the Farmers' Cooperative Market, also known as Pasar Mitra Tani.

Japan

SMEs in Japan were impeded, particularly those involved in importing, wholesaling, and transportation. The Japanese government announced a subsidy program worth JPY108 trillion (USD 989 billion). The effort is aimed at assisting low-income individuals, small businesses, and Japanese corporations (Hossain, 2018).

Malaysia

During the lockdown in Malaysia, night markets, farmers' markets, and street sellers were destroyed (Movement Control Order-MCO). The demand for fresh food has dropped dramatically. MCO has influenced the food manufacturing process. Between March 23 and March 31, 2020, 21.9% of employees in the farming business lost their jobs. The government allows the agriculture, fishery, and cattle supply networks to operate on standard time. The government has unveiled the PRIHATIN Rakyat Economic Stimulus Package (MYR250 billion). The Ministry of International Trade and Industry established a special committee to develop new strategies to address the economies and labor market's current difficulties. FAMA (Federal Agricultural Marketing Authority) is assisting vegetable growers in resolving a massive supply problem. Agriculture, food security, the economy, transportation, and public health are among areas where the Ministry of Higher Education gives research funding (Hossain, 2018).

Middle East and Sub-Saharan area

In the Middle East and Africa's Sub-Saharan region, labor shortages and transportation restrictions restricted

the gathering of fresh agricultural products. The demand for food products is reduced when cafés, restaurants, and schools close. Reduce rice and maize production due to the combined effects of the global recession and rising transaction value and increase the production cost (Ayanlade and Radeny 2020). In Egypt, Tunisia, and Morocco, national governments, have proposed one-time subsidies for informal workers, such as market vendors. The Moroccan government gives logistical help and creates an e-marketplace for local products that have been affected by the cancellation of the ongoing International Agriculture Fair. Migrant workers receive mobile money transfers. The government provides grain and agricultural inputs to the poor.

Europe

The volume of agriculture industry production declined 1.4% in 2020. When compared to the average of the 2015–2019 seasons, sugar production has decreased by 12%. During the first wave, the flower and plant sector suffered significant financial losses of 4.12 billion EUR. COVID-19 the production of vegetables, fruits, and honey is hampered. Because of the EU's travel ban restriction, it also causes a labor scarcity during harvest season. Increase the price of agricultural inputs including pesticides, fertilizer, and seeds, among other things. Aside from school closures, businesses and motels see a drop in demand for meals (OECD 2021). The biggest farmer's group in Italy has launched a #MangiaItaliano (Eat Italian cuisine) campaign. The Italian Ministry of Agriculture has set aside 6 million euros for farmers in the fields of agriculture, food and forestry, dairy, and cattle.

Scope for Bangladesh after pandemic

During the ongoing COVID-19 issue, several countries have moved to limit export of agricultural products to maintain their own food security. This action has the potential to have serious unintended repercussions for vulnerable individuals in food-importing countries, such as raising prices and intensifying food insecurity issues already exacerbated by the COVID-19 epidemic. Figure 3 shows the contribution of agricultural and food product export during 2020. Here, the bar diagram indicates that the contribution of Bangladesh in agricultural exporting sector is very low comparing to the other countries. However, in every year, about 31% food product being destroyed in Bangladesh because of poor transportation, processing, and as well as alternative market like exportation (Roy, 2021). As of March 6, 2020, Rep. of Korea, Mongolia, Indonesia, India, Pakistan, Kyrgyzstan, Kazakhstan, Tajikistan, Jordan, Turkey, Azerbaijan, Georgia, Egypt, Cameroon, Mauritius, and Russia impose restriction on exports agricultural commodities from China (Cao et al., 2020). Large populated country like China and India are restricted their food export to ensure their own food security. It is high time for the agriculture-based county-like Bangladesh to improve the food quality for take a position in overseas market and boost up the total agri-business system as well as financial development.

Recommendations for agri-business development during new normal period

In new normal condition, the government of Bangladesh has to take a long-term plan. The global economic downturn will reduce the chances of getting loans from developed

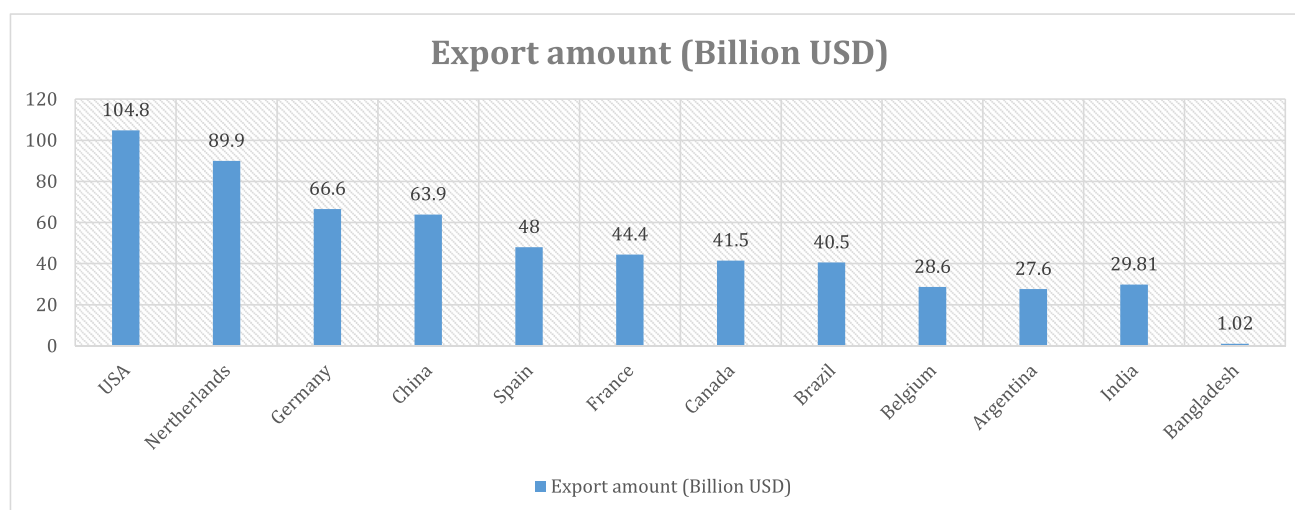


Fig. 3 Contribution of agricultural and food export in 2020 (Ahmad R 2021)

countries. As a result, it is important to look at how to maximize profits using limited domestic resources. To overcome from the condition, the following incentives should have been established by the government. In existing marketing system, middlemen are being highly benefited rather than producer because there is no alternative market for the producers. In our study, we proposed a new marketing chain which is a combination of different alternative ways like food processing, export to abroad etc. (Fig. 4). In the proposed system, we also tag the different GOs-NGOs and research institute with the total production system in the way of training, information transforming, and market researching.

At present, there is no farmer's association. However, it is very essential for breakdown the traditional syndicate-based market and developing an independent agri-marketing system. Emphasize on the buildup strong association which also help the farmer to search the new opportunities such as food processing and export. It also acts as a medium between credit organization and farmer. It helps the farmer to take soft loan from banks and NGOs and also helps the credit office to collect money from farmer. Farmers are generally illiterate; in our proposed system, we also keep a window to improve post-harvest technology development skill through DAE, research organization, and different NGOs. It helps to improve the quality of the agricultural goods and also value adds which facilitates the exporters to export product to the suitable country especially Europe and North America.

Here, we proposed to set a central Market Information System which collect the customer's feedback and analyzed the market demand. In developing country, reliable market information is very rare. In our system, we remain a chance to farmer to collect information via phone through

call center, online, department of agro-marketing, and also from relative NGOs.

Due to the lockdown to restrict the corona virus spread, small and marginal farmers are affected most. To overcome the poor financial condition, it is necessary to ensure that the loans given on easy terms among the marginal level farmers. Arrangements should be made for free distribution of agricultural inputs. Obtaining agricultural loans should be made easy. The decision to waive interest on previous loans needs to be considered.

Market monitoring is very necessary to maintain a sound marketing chain after COVID-19 pandemic. Syndicate is a great problem for the proper distribution of benefit among all stakeholder associated with supply chain. Some malpractices like syndicate and illegal stocking hamper the profit distribution. Proper monitoring helps to reduce the chance of any mal practices by unscrupulous marketers.

During 2018, there were only 393 cold storages remain which capacity was 2.4 million MT (Express TF 2018). In order to be interested in producing jams, jellies, or sauces, large industrial entrepreneurs need to be provided with incentives including subsidies. Post-harvest storage capacity is very inadequate in Bangladesh. One-third of the country's fruits and vegetables are wasted due to lack of proper processing. Entrepreneurs in small and cottage industries need to arrange easy loans. Government has to focus on the export of processed food to fight against movement restriction or movement delaying.

The facilities provided by the government to reach the marginal farmer level need to create an accurate database. Government has to make Farmer's ID card to reach the subsidies to the grassroots. An accurate database would ensure

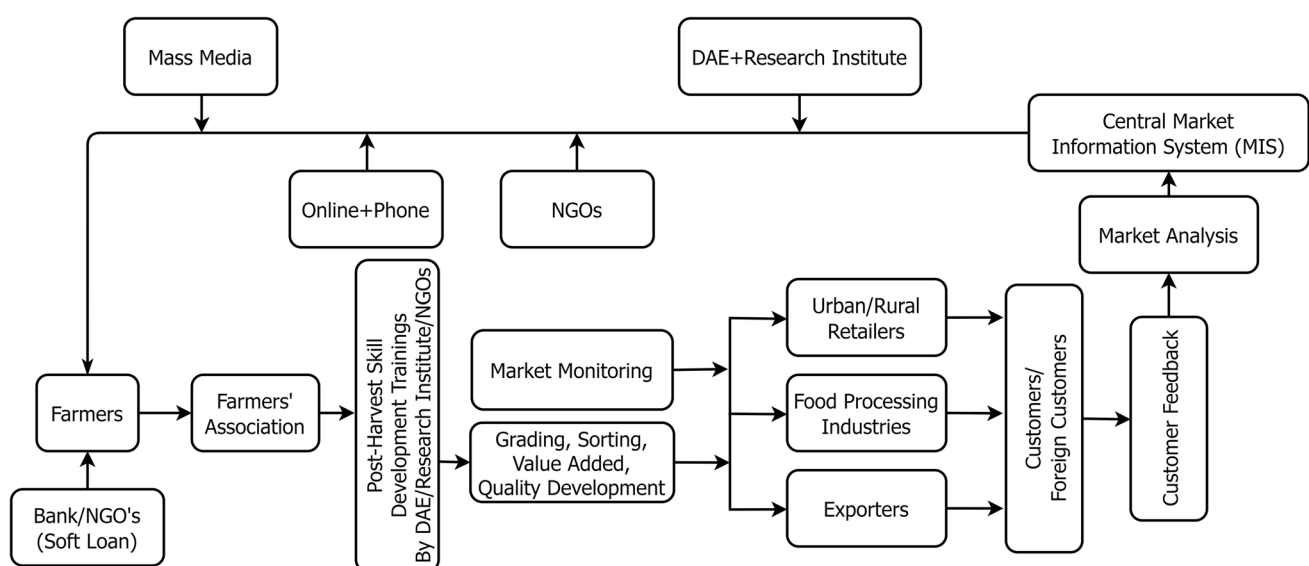


Fig. 4 Proposed agri-business chain. DAE Department of Agricultural Extension

the fruitful implementation of government policies to overcome from the disequilibrium condition after pandemic.

To increase the income of the farmer, it is necessary to increase the cropping density. Irrigation facilities, crop protecting equipment, seed, and fertilizer supply should be ensured during the lockdown. To enhance the irrigation, facilities needed to increase the capacity of BADC. A statistic from Department of Agricultural Extension stated that at present, single cropped and double cropped areas are 2,440,659.10 and 3,820,637.14 hectare, respectively (Baki et al. 2018). Sufficient irrigation facilities might be turned those land into double and triple cropped land.

Farmers are needed to become efficient for using modern agricultural technology. In order to cope with the labor crisis in Corona, it is necessary to get accustomed to the use of modern machinery for sowing seeds, threshing paddy, or harvesting crops. The government of Bangladesh intended to grant farmers with up to 50% subsidies (70% percent in the *Haor* area) on the purchase price of combined harvesters (MoFood 2020).

Warning of natural disasters should be broadcast seriously. Coordinated measures need to be taken to deal with tidal surges, floods, or droughts. Flood control dams need to be repaired, damaged dams rebuilt, and capacity of old weak dams increased. Occupied rivers and canals need to be re-excavated in order to reduce the flood waters. Irrigation work should be done to reduce the dependence on ground water and increase the use of surface water. Care should be taken to ensure that there is no crop loss occurs because of any sudden natural disaster during new normal condition.

Identify the unproductive sectors and the manpower used in these sectors should be mobilized into the productive sector. Manpower engaged in the profession of rickshaw pullers, beggars, peddlers, etc., should be involved in the production-oriented sector through training. Necessary steps have to be taken to achieve self-sufficiency in seed production by increasing the capacity of government and non-government organizations including BADC by getting out of the import dependent seed supply system. In the lure of cash gain, agricultural lands are now being dug for fish farming and used as ponds. Flower cultivation is becoming popular as a cash crop. Due to high profits, farmers in many areas are becoming more and more interested in tobacco cultivation. In the new normal circumstances, these are gradually become a threat to food security. Strict laws need to be enacted to stop such risky farming during disasters.

Conclusion

Bangladesh's ready-made garments (RMG) business is being ripped apart by COVID-19. The industry is the backbone of the economy, providing eighty four percent of all exports.

However, the pandemic has affected raw material supplies, causing delays in shipping, cancellations or suspensions of orders, and factory shutdown. Furthermore, the devastating impact comes at a time when local manufacturers were already vulnerable prior to COVID-19. This global catastrophe is life-threatening; the economic downturn also threatens food security. Bangladesh is a populated country with limited resources. If failure of the transformation of this huge population into manpower through planned measures will make it difficult to overcome the economic downturn. There is no alternative to keeping the food production system running to ensure food security for the large population. Only the integrated activities of all the concerned departments with long-term plans can prevent disasters like famine in future. Now is the high time to overhaul the agricultural production and marketing sector with the coordinating of integrated activities.

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Declarations

Ethics approval This is an observational study. We confirmed that no ethical approval is required.

Consent to participate Not applicable.

Consent for publication Not applicable.

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