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## Effects of Coronavirus Disease (COVID-19) on Agricultural Sectors in Bangladesh: A Review

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### Abstract

The ongoing COVID-19 pandemic has resulted in a new era in the efficacy of the agricultural sectors while the costs of this new era on humanity, the economy, and the food sector are still under examination. For example, the agrarian sectors like agriculture, fisheries, and livestock are vital aspects of food systems directly affected by COVID-19. This review paper summarizes COVID-19 and its effects on the agricultural sectors. The COVID-19 affects the profit of agriculture, livestock, and fisheries and has opened up inequalities within the food chain. As a result, the epidemic has shown that our food chain is fragile. Since the worldwide population and urbanization will be raised in the coming decades, epidemics will occur more often. To that end, we have highlighted the need to ensure contingency plans and mitigation strategies about agricultural systems which would make more sustainable and resilient.

**Keywords:** COVID-19, Coronavirus, Agriculture, Fisheries, Livestock, Food security and Bangladesh.

### Introduction

The human novel coronavirus has been episodic by a lethal pandemic threatens for every nation in the world. SARS-CoV-2 is a beta coronavirus genetic closely linked to the SARS-CoV-1 (79% sequence identity) than to the MERS-CoV (50% identity) (Lu *et al.*, 2020; Zhou *et al.*, 2020; Xia *et al.*, 2020). Initially from Wuhan City, China,

on December 31, 2019, the COVID-19 epidemic was immobilized globally by its fitness and economic shock (Zhu *et al.*, 2020; Khan *et al.*, 2020, Alanagreh *et al.*, 2020). The World Health Organization (WHO 2020) stated the name of this novel coronavirus as 2019-nCoV (Chen *et al.*, 2020), and has explained worldwide since then, inflicting epidemic threat for the world, conjointly

in the Asian nation, Bangladesh (Yang *et al.*, 2020, Khan *et al.*, 2020). The common signs and symptoms were dry cough, dyspnea, fever, tiredness, and lung trouble. Some patients, mostly the aged and also with other chronic symptoms can develop into pneumonia, with chest tightness, chest pain, and shortness of breath and additionally, people may have no symptoms at all (Favalli *et al.*, 2020). The COVID-19 spreads extremely quickly in infestation, also fast in mortality rate in the world (Khan *et al.*, 2020). It has been changing at a rate of about 1–2 mutations per month [<https://www.nature.com/articles/d41586-020-02544-6>]. It is a scourge issue in the People's Republic of Bangladesh that breaks family relations and social bonding. Within the initial, diagnostic tests were shown by IEDCR solely. However, from last month fifty-nine diagnostic facilities were opened broad therefore the infection cases square measure enhanced. Since then, tests, infestation, recovery, and death were step by step increasing, and up to now April 30, 2021, it reaches (5357294, 747761, 669995 and 11250), severally in Bangladesh (Khan, 2021). March 26, 2020, was first declared shutdown and lockdown (Shawon and Mamun 2020). The second lockdown was declared on April fourteen, 2021 in Bangladesh. The lockdown has been increased in Bangladesh. Partial imprisonment aimed toward social disaffection could enable virus management a few times (Hellewell *et al.* 2020). As of early April 2020, WHO was commentary a continuous steep rise in the number of cases and deaths globally, with the pandemic dispersal to at least 240 countries and territories (Lagiso 2020, Khan *et al.*, 2020). As its health dangers and high mortality became more seeming, first Wuhan city and then Hubei province in China applied travel restrictions and lockdowns. Because it happened during the Chinese New Year, appeal for luxury seafood weakened and markets collapsed for Canadian and American lobsters, Australian crayfish, Vietnamese shrimp and many other fisheries (Tester 2020; Johnson 2020; Nathan 2020). This was an indication of huge and life-altering changes that were about to explain in small-scale farmers, agriculture, livestock, fisheries, and coastal fishing communities globally.

In general, poor populations and their immediate needs in agriculture and the production cable should be identified, quickly met, helpful and hopeful assistance packages should be measured (Zarei and Rad, 2020). Plans to purchase agricultural products, especially from small farmers, and to shorten the production to consumption route should be followed and applied to reduce the risk of infection as the cycle shortens. Free donations to poor people who have lost their income should be considered alongside economic support to start

again production. For managing COVID-19, all the Ministry of Bangladesh should work thoroughly with the Ministry of Health and additional departments and also with Agriculture and the Faculties of Agriculture. Fishers, doctors, scientists, processors and sellers also face risks of COVID-19 spread and infection and thus have to make problematic results feeding their relatives or endangering contact. Agriculture and fishing societies and ports could become hotspots for fast infection due to the migrant nature of fishers and the regularity of global visitors (FAO, 2020). Access to health services in rural farmers and fishing groups is tough even under typical circumstances (Orlowski, 2020), and thus these sites likely have a tougher time accessing testing, treatments, and sanitation foods needed to tolerably speech COVID-19 spread and infection (CFFA, 2020).

COVID-19 has affected all sectors of agriculture in Bangladesh. It affects animals (O'Connor *et al.*, 2020; FAO, 2020). The interconnectivity of humans, animals and the environment are important in empathetic and beginning any fears to food systems, food chain, agricultural production and livelihoods. Rural livestock farming is also important for society and food security which is providing, income, transport, fuel and clothing as well as food. That impact has been going on since the second week of March. As the number of human deaths increases, so does the number of patients. In the middle of March, the peasantry had to gain a lot of momentum in Bangladesh to cut Borodhan (Khan and Khan, 2020). At first, the lever was not available and the lever wanted to take a lot more money. Everything was affecting the farmer. This time the paddy crop has been good but the farmers are not getting the price. Due to the lockdown, the traders who used to come out did not come this time, so some local traders had to sell paddy at a lower price than the desired price. Among the fruits, jackfruit and mango are the main fruits in Bangladesh (Khan *et al.*, 2020; Khan *et al.*, 2021). This time, due to the vampire yield, rice is ranked third in the world, and mango is ranked seventh among fruits. Despite good yields, the lockdown char coronavirus has also affected local markets. Here also the farmers are not getting the price. This time our team went to a local market but COVID-19 had an impact here. Farmers say that no one is coming from outside to buy cows and goats and they are not able to sell big cows and goats. As a result, the farmers are suffering. Even though it is being sold, there are many losses. Given the globalization of the virus, there are worries about the upcoming at all levels, and it is obligatory to contemplate the significances on different scales in the form of dissimilar scenarios so that, this serious crisis can be managed and overcome. Agricultural sectors and food security may be injured, and there is a need to abate the occurrence and

contamination in agricultural societies and farms with rules and commendations. Keeping the threats of COVID-19 in human life, this study focuses on the effect of in agricultural sectors for this virus diseases and the general objective is access to the effect of COVID-19 in agricultural sector.

### Effects of COVID-19 on agricultural sectors and human life

COVID-19 is a virus that mostly affects humans and can cause serious health problems within a very short time. Besides the health issue, the virus greatly impacts the agriculture, fisheries, and livestock sector, which ultimately affects a country's economy. Agrarian economies like India, Bangladesh, and Vietnam, where agriculture accounts for 12-16 percent of GDP, have been hit the hardest by the Covid-19 scenario.

### Effects of COVID-19 in Agriculture

The effects of the COVID-19 pandemic can be seen in the agriculture sector in terms of supply chain disruptions and agricultural production. Most of the countries had declared lockdown several times to control the rapid spread of this disease. The lockdown restricts on the movement of farming goods and communities, especially laborers who must generally move from one place to another to work and earn income. In Bangladesh, to harvest boro rice in the haor region before the flash flood, a large number of laborers need to go to that area from different parts of the country. But the labors were unable to move due to social distancing and decreased transportation. To solve this problem agricultural mechanization was practiced but it was new to some farmers and felt difficulties in operating it due to lack of proper training. The three-week lockdown in India resulted in farm labor shortage which coincided with the harvesting time of rabi crops like wheat, mustard, pulses, and others. The planting of spring crops like maize, sunflower, spring wheat, barley, canola and open-field vegetables can't be operated due to shortage of labor. It was estimated that 3.11 percent or 17.03 million tons of agricultural production is reduced during the first four months of 2020 in Southeast Asia only because decline in agricultural farm labor. Edible lablab beans were effective against blocking the infections of influenza viruses and SARS-CoV-2 due to the presented carbohydrate binding protein (Liu *et al.* 2020, Khan *et al.* 2020). Insect pests are the main barriers to cultivating bean vegetables (Khan *et al.* 2018; Khan *et al.* 2019) and COVID-19 effect on income. It is also related to the environment (Khan *et al.* 2020) and some studies also said that the environment is liable for COVID-19. The cinnamon plant used for inflammation, cough, toothache, antiseptics expectorant, and some fungal infection (Khan

*et al.* 2020). The fruit of mango, jackfruit, and citrus lemon also effect in human health (Haque *et al.* 2019). The agricultural sectors lead the GDP of the Southeast Asian region to drop about 1.4% which is equivalent to USD 3.76 billion (Gregorio and Ancog, 2020). In 2020, agricultural products in Bangladesh have been higher than last year, but the cost has also been much higher (Table 1). From Table 1 rice, fruit, and animal production increase but also increases the cost. As a result of the lockdown, the farmers could not move from one place to another. However, in 2021, sophisticated machinery has been procured in every area, which has resulted in no shortage of farmers this year. Consequently, increased production cost increases the price of the product. Global Alliance for Improved Nutrition (GAIN) examined 136 countries to know food price changes (in percentage terms) over the 2.5 months from 14 February (pre-pandemic) to 30 April. Price increases were seen in 118 of the 136 country-food pairings. For at least eight of the 14 (apples, bananas, bread, cheese, eggs, lettuce, beef, chicken, onions, oranges, potatoes, milk, rice, and tomatoes) commodities studied, every country saw a price increase. Rwanda, Tanzania, and Mozambique experienced the highest average price increases. The smallest average price increases were in Nigeria and Bangladesh.

Besides, restrictions on movement hampered the smooth flow of agricultural inputs and outputs, causing supply chain disruption (Barrett, 2020). The pandemic greatly impacted the demand and supply of foods that might lead to food security at risk (Gu and Wang, 2020). Demand for an item is dependent on the desire and purchasing power of the consumer. In developing countries like Bangladesh, many people lose their job amid the pandemic and their purchasing power reduced. As a result, demand for expensive goods is also reduced. Perishable goods, such as fresh fruits and vegetables are the most affected area of agriculture. The lack of adequate storage facilities, combined with transport disruptions and a fall in demand, has led to the wastage of perishable goods. On the other hand, the consumer paid special attention to vitamin C rich fruits as it can boost up the immunity system.

**Table 1.** Yield of agriculture products in 2020 in Bangladesh

Product name	Positive	Negative	Cost
Rice	Yes	-	High
Fruit	Yes	-	High
Animal	Yes	-	High
Lockdown	-	Yes	High

Source: Khan and Khan 2020

The floriculture sector all over the world is under great threat due to COVID-19. December to April has considered the season of flowers and the chrysanthemum is a very important flower in this session. Sometimes, it is also used as medicine (Khan *et al.*, 2021). The demand for flowers rises in Bangladesh, especially on Victory Day, Ekushey February, Independence Day, Pahela Falgun, Valentine's Day, and Bengali New Year's day. But the pandemic has changed the scenario. Thousands of tons of flowers remain unsold and ultimately perished; sometimes farmers used matured flowers as cattle feed. This is mostly because people prioritize their basic demands like foods not aesthetic demands like flowers in such a crisis period. Due to lockdown and restricted movement social, cultural, religious programs were not celebrated in as usual manner. Most of the celebrations and outdoor events were canceled to limit the transmission of the deadly virus. The pandemic affects the whole world in a more or less similar manner. Most of the countries import agricultural inputs from other parts of the world. Lockdown has made the shipment of these products expensive due to the closing of the international border and restriction on commercial flights. South African countries such as Burundi, Djibouti and Eritrea, and landlocked countries, including South Sudan and Uganda, are mostly affected due to limited access to agricultural inputs (seed, fertilizer, veterinary inputs, fish fingerlings and feed) (FAO, 2020). The agriculture sector in developed countries such as the United States has also been affected by the pandemic. There was the restricted outflow of agricultural produce from California which supplies over third of country's fruits, and vegetables.

**Table 2.** Ranking of agriculture products of Bangladesh in the world in 2020

Product name	Ranking
Hilsa ( <i>Tenualosa ilisha</i> )	First
Fish	Second
Jute ( <i>Corchorus capsularis</i> )	Second
Rice ( <i>Oryza sativa</i> )	Third
Vegetables	Third
Potato ( <i>Solanum tuberosum</i> )	Seventh
Mango ( <i>Mangifera indica</i> )	Seventh

Source: Khan and Khan 2020

It is a great achievement for Bangladesh to secure top 10 positions in different areas of agriculture. It ranks 3rd in global rice production and total rice area and production levels are projected to increase slightly to 11.8 million hectares (HA) and 36.3 million metric tons (MMT) (Table 2). It may become possible due to the farmer's preference for HYV and hybrid seeds. Bangladesh ranks third in vegetable production next to china and India,

producing 16 million tons (1 crore 60 lakh) annually. According to FAO, last fiscal Bangladesh produced 12 million (1 crore 2 lakh) tons of potato and secured 6<sup>th</sup> position in the world ranking (Table 2). Globally, 3.7 million (37 lakh) tons of jackfruit are produced annually, and Bangladesh is the second highest producer of jackfruit, next to India, producing 1 million (10 lakh) tons of the fruit in a year. It produces 2.4 million (24 lakh) tons of mango in a year and ranks 8<sup>th</sup>. Bangladesh was once renowned for its jute, the 'golden fiber'. It is now the second largest producer of jute and produces 42 percent of the world's jute, at 13,35,000 (13 lakh 35 thousand) tons. But Bangladesh ranks at the top in jute exports. It exports 285 types of jute products. Bangladesh ranks third, globally, in the production of freshwater fish. Despite the pitiful state of its rivers and streams, FAO says Bangladesh produces 10 percent of the world's freshwater fish. Bangladesh produces 86 percent of the world's hilsa, that is, 533,000 tons and ranks 1st in global hilsa production (Table 2).

#### Effects of COVID-19 in livestock

The same scenario is also seen in the dairy and poultry industry. Because the maximum amounts of raw materials for feed are imported, an interruption in the import-export business created a crisis of poultry feed. The poultry sector also has been affected by the spread of misinformation suggesting that COVID-19 can be contracted through eggs and chicken. Consequently, there has been a drop in demand for eggs, chicken and fish. Due to a lack of storage opportunities, thousands of gallons of milk, eggs, vegetables and fruit have been wasted. In Bangladesh, about 12–15 million liters of milk have remained unsold, as a symbolic protest farmer has thrown away milk on the street, which has caused a daily loss of 570 million Bangladeshi Taka (6.7 million USD) in the dairy sector only (Rahman and Das, 2021). Different super shops, dairy food outlets, and restaurants remain closed during the lockdown period, as a result, the daily consumption rate of milk, eggs, and meat decreased. Travel ban in many countries has affected delivery breeding stock and hatching eggs. The poultry sector in Bangladesh faced a loss of about 115 billion BDT (1.35 billion USD) within the first 15 days of lockdown. It also resulted in a scarcity of animal feed and other logistical supplies, as well as inadequate veterinary services. There is no scientific proof of viral transmission from animals to humans, either directly or through the ingestion of meat. It is a human pandemic that may pose a threat to domestic animals.

#### Effects of COVID-19 in fisheries

COVID-19 broke out in April, right in the middle of the harvest season. COVID-19 prevention protocols interfere

with the supply chain and demands. As a result, instead of harvesting, several farmers wanted to keep the fish in their ponds. Farmers' uncertainty and inability to empty their ponds have caused demand for fish seed to fall dramatically. Some hatcheries do not have separate nursing ponds and are unable to store seed for more than five to seven days. Export-oriented shrimp farming and transportation of prawn seeds from hatcheries to the coastal region were greatly affected. Hatcheries and nurseries also face rising production costs, as many inputs such as pituitary glands, hormones, probiotics, and prebiotics are imported. In Bangladesh, 70-80% of the ingredients used in fish feed are imported. Obtaining imported inputs has become more difficult, and prices have risen. According to some analysts, Input shortages would trigger a 40% reduction in feed supply.

Fishing operations at sea had encountered difficulties due to national lock-down measures in many countries. Due to a severe labor shortage in India, shrimp processing plants have not operated at full capacity. Shrimp exports in India and Thailand have been hit hardest by decreased, delayed, or canceled orders from major markets such as China, the EU, Japan, and the United States. Because of the decline in demand, manufacturing plants were forced to lower down, resulting in an oversupply of raw materials. Transport disruptions in Indonesia made it difficult for manufacturing plants in cities to procure raw materials. The prices of two staples, milkfish and rice, have risen in the Philippines (FAO, 2020).

### Effects of COVID-19 in the economic sector

The economy is deafening, and despite calming attempts, continues to totter. The grouping of an epidemic with financial prudence in reducing in the world is decreasing food security across the world (FAO 2020). The pandemic greatly affected the world's economy. With the implementation of stay-at-home orders, food consumption switched dramatically from restaurants to households. The pandemic also changed the food behavior of a person. For example, the tendency to eat healthy domestic diets instead of unhealthy rich food (Hassen *et al.*, 2020). As a result, demand for homemade fruits has increased consequently prices also increase. All the necessary foods were increased in agriculture and homemade products both were increased where the cost was high in agriculture products but the cost was low in homemade products (Table 3). To take advantage of this situation a large number of people involve themselves in online business where they sell homemade food products. By using social networking sites, they communicate with their customers and provide home delivery services through some delivery agencies. It has a great impact on the global economy because it creates a lot of entrepreneurs within a very short time.

**Table 3.** Condition of the price of agriculture and homemade products in 2020

Agriculture products			Homemade products		
Product name	Increase	Cost	Product name	Increase	Cost
Cake	Yes	High	Cake	Yes	Low
Fruit	Yes	High	Fruit	Yes	Low
Animal	Yes	High	Animal	Yes	Low
Others	Yes	High	Others	Yes	High

Source: Khan and Khan 2020

### Food security during epidemics and the COVID-19 pandemic condition

According to the FAO of the United Nations, "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life." There is mainly mention of food security, including food availability, access, utilization, and stability of food supplies at global, national, and local levels. Food security states to the availability and convenience of an adequate amount of healthy food consistently. The COVID-19 epidemic has been a wake-up call for food schemes, which have already been inactive on a knife-edge for decades (IPES, 2020). Due to decay in international trade, trouble in the food supply chain and food production, food diffidence may arise (Boyacı-Gündüz *et al.*, 2021). Thus, lockdowns and distractions activated by COVID-19 have complex interactions among these various food system elements. From the prime supply to the ending demand, the whole food system was troubled during the COVID-19 epidemic (Workie *et al.*, 2020). FAO had mentioned that smallholder farmers and fishers may face trouble in marketing their product which in turn causes a reduction in their profits and procuring capacity. Food security reduced due to COVID-19 will extremely disturb the poorest and the most susceptible sections of the population (FAO, 2020). At present, 820 million public are facing chronic starvation and 113 million are facing acute severe diffidence (FAO *et al.*, 2019). The governmental and non-governmental organizations should be taken the necessary steps to maintain food security and their role to maintain constant food supply chain. FAO is working with the main aim to keep the food value chain and maintain the food supply going (FAO, 2020). In the world food situation, despite fears over the effects of COVID-19, the food price index and worldwide cereal markets are likely to remain stable and fiscally steady, largely determined by request contractions (FAO, 2020). Thus, trouble in food access brought by pandemic affects these groups immediately and severely. Around 10 million children depend upon

school meals to fulfil their nutritional requirements. But due to the closing of schools and suspension of school meal programs, these children are no longer receiving daily school meals, which may reduce their capacity to cope with diseases (FAO, 2020). The current pandemic has already affected the entire food system, presenting an extraordinary challenge with profound social and economic consequences, including compromising food security and nutrition, as outlined in the Joint Statement on COVID-19 Impacts on Food Security and Nutrition (FAO, 2020).

### Conclusions

In conclusion, as the number of deaths from COVID-19 in the world has increased, so has the adverse effects on agricultural sectors, including crops, livestock, fisheries, the economic sector, and the food security system. To monitor the rate of infection, most countries have implemented policies such as home detention, travel bans, and company closures. As a result, farmers are experiencing a shortage of labor and scarcity of agricultural products such as seeds, fertilizer, and pesticides. Thus, the production cost, ultimately the price of the product, increases. The travel ban also disrupts the food supply chain and lead food security at risk. In this situation, people should avoid public places as much as possible. It would not be right to go out without an urgent need. If you have to go, you will have to go out after the necessary masks and return home as soon as possible after finishing work. The government should develop new mega projects to help the agricultural sectors so that Coronavirus can be kept under control.

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### References

Alanagreh, L., Alzoughool, F. & Atoum, M. (2020). The Human Coronavirus Disease COVID-19: Its Origin, Characteristics, and Insights into Potential, *Pathogens*, 29; 9(5), 331. Available from: [doi.org/10.3390/pathogens9050331](https://doi.org/10.3390/pathogens9050331).

- Barrett, C. B. (2020) Actions now can curb food systems fallout from COVID-19, *Nature Food* 1(6), 319–320.
- Boyacı-Gündüz, C.P., Ibrahim, S.A., Wei, O.C. & Galanakis, C.M. (2021). Transformation of the Food Sector: Security and Resilience during the COVID-19 Pandemic, *Foods*, 10, 497. <https://doi.org/10.3390/foods10030497>
- Chen, N., Zhou, M., Dong, X., Qu, J., Gong, F., Han, Y., Qiu, Y., Wang, J., Liu, Y., Wei, Y., Xia, J., Yu, T., Zhang, X. & Zhang, L. (2020). Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study, *Lancet*, 395, 507–13. [http://dx.doi.org/10.1016/S0140-6736\(20\)30211-7](http://dx.doi.org/10.1016/S0140-6736(20)30211-7)
- Coalition for Fair Fisheries Agreements (CFFA). (2020). African artisanal fishermen call for measures to help them cope with the COVID-19 Epidemic. Coalition for Fair Fisheries Agreements. April 6, 2020. <https://www.cffacape.org/news-blog/african-artisanal-fishermen-call-for-measures-to-help-them-cope-with-the-covid-19-epidemic>.
- FAO, IFAD, UNICEF, *et al.* (2019). The State of Food Security and Nutrition in the World 2019, Safeguarding against economic slowdowns and downturns. Rome, FAO. 2019.
- FAO. (2020). COVID-19 pandemic impact on food and agriculture.
- FAO. (2020). FAO Director-General urges G20 to ensure that food value chains are not disrupted during COVID-19 pandemic.
- FAO. (2020). FAO warns of the impact of COVID-19 on school feeding in Latin America and the Caribbean. 2020.
- FAO. (2020). Food and Agriculture Organization. 2020. The effect of COVID-19 on fisheries and aquaculture in Asia. Bangkok. <https://doi.org/10.4060/ca9545en>
- FAO. (2020). How is COVID-19 affecting the fisheries and aquaculture food systems.
- FAO. (2020). How Is COVID-19 affecting the fisheries and aquaculture food systems. Rome: Food and Agriculture Organization of the United Nations. 10.4060/ca8637en.
- FAO. (2020). Joint Statement on COVID-19 Impacts on Food Security and Nutrition; FAO, IFAD, the World Bank and WFP on the Occasion of the Extraordinary G20 Agriculture Minister's Meeting: Rome, Italy; Washington, DC, USA. Available online: <http://www.fao.org/news/story/en/item/1272058/icode/> (accessed on 5 May 2020).

- FAO. (2020). World Food Situation. Available online from : <http://www.fao.org/worldfoodsituation/foodpricesindex/en/> (accessed on 25 April 2020).
- FAO. 2020. Urban food systems and COVID-19: The role of cities and local governments in responding to the emergency. Available from: <https://www.fao.org/3/ca8600en/CA8600EN.pdf>. Accessed 23 Apr 2020.
- Favalli, E. G., Ingegnoli, F., De Lucia, O., Cincinelli, G., Cimaz, R. & Caporali, R. (2020). COVID-19 infection and rheumatoid arthritis: Faraway, so close. *Autoimmunity reviews*, 102523.
- Gregorioa, G. B., & Ancog, R. C. (2020). Assessing the impact of the covid-19 pandemic on agricultural production in Southeast Asia: toward transformative change in agricultural food systems, *Asian Journal of Agriculture and Development*, 17(1362-2020-1097), 1-13.
- Gu, H. Y. & Wang, C. W. (2020). Impacts of the COVID-19 pandemic on vegetable production and countermeasures from an agricultural insurance perspective, *Journal of Integrative Agriculture*, 19, 2866–2876.
- han, M. R. & Khan, M. J. (2020). Coronavirus Fallout: Vegetable growers count huge losses. The Daily Star. Retrieved from <https://www.thedailystar.net>
- Haque, R., Maleque, M. A., Rahman, S. M. L., Khan, A. U. & Bhuiyan, M. A. H. L. (2019). Evaluation of New Molecule Insecticides Against Lemon Butterfly (*Papilio Demoleus* L.) Infesting Jara Lemon in Sylhet, *Bangladesh Journal of Entomology*, 29(2), 1-12.
- Hassen, T. B., El Bilali, H., & Allahyari, M. S. (2020). Impact of covid-19 on food behavior and consumption in Qatar, *Sustainability*, 12(17), 1-18. <https://doi.org/10.4060/ca9545en>
- Hellewell, J., Abbott, S., Gimma, A., Bosse, N. I., Jarvis, C. I., Russell, T. W., Munday, J. D., Kucharski, A. J. & Edmunds, W. J. (2020). Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts, *Lancet Glob Health*, 8, 488-96. Available from doi:[10.1016/S2214-109X\(20\)30074-7](https://doi.org/10.1016/S2214-109X(20)30074-7).
- IPES. (2020). International Political Economy Society. The International Panel of Experts on Sustainable Food Systems, COVID-19 and the Crisis in Food Systems: Symptoms, Causes, and Potential Solutions; Communiqué by IPES-Food: Brussels, Belgium, 2020.
- Johnson, K. (2020). Coronavirus shuts down Chinese market for live lobsters, sends industry into panic mode. The Chronicle Herald, January 30, 2020. <https://www.thechronicleherald.ca/business/local-business/coronavirus-shuts-down-chinese-market-for-live-lobsters-sending-industry-into-panic-mode-404744/>.
- Khan, A. U. (2021). Information about the covid-19 in Bangladesh (March 2020 to February 2021). <https://www.researchgate.net/publication/351151990> Information About The Covid-19 In Bangladesh March 2020 To February 2021. [Online]
- Khan, A. U., Choudhury, M. A. R., Dash, C. K., Khan, U. H. S. & Ehsanullah, M. (2020). Insect Pests of Country Bean and Their Relationships with Temperature, *Bangladesh Journal of Ecology*, 2 (1), 43-46.
- Khan, A. U., Choudhury, M. A. R., Ferdous, J., Islam, M. S. & Rahman, M. S. (2019). Varietal Performances of Country Beans Against Insect Pests in Bean Agroecosystem, *Bangladesh Journal of Entomology*, 29(2) 27-37.
- Khan, A. U., Choudhury, M. A. R., Islam, M. S. & Maleque, M. A. (2018). Abundance and Fluctuation Patterns of Insect Pests in Country Bean, *Journal of the Sylhet Agricultural University*, 5(2), 167-172.
- Khan, A. U., Choudhury, M. A. R., Khan, A. U., Khanal, S. & Maukeeb, A. R. M. (2021). Chrysanthemum Production in Bangladesh: Significance the insect Pests and Diseases Management: A Review, *Journal of Multidisciplinary Applied Natural Science*, 1(1), 25-35. <https://doi.org/10.47352/jmans.v1i1.10>.
- Khan, A. U., Choudhury, M. A. R., Maleque, M. A., Das, C., Talucder, M. S. A., Maukeeb, A. R. M., Ema, I. J. & Adnan, M. (2021). Management of insect pests and diseases of jackfruit (*Artocarpus heterophyllus* L.) in agroforestry system: A review, *Acta Entomology and Zoology*, 2(1), 37-46. doi: <https://doi.org/10.33545/27080013.2021.v2.i1a.29>
- Khan, A. U., Choudhury, M. A. R., Talucder, M. S. A., Hossain, M. S., Ali, S., Akter, T. & Ehsanullah, M. (2020) Constraints and solutions of country bean (*Lablab purpureus* L.) Production: A review, *Acta Entomology and Zoology*, 1(2), 37-45. DOI: <https://doi.org/10.33545/27080013.2020.v1.i2a.17>.
- Khan, A. U., Choudhury, M. A. R., Tarapder, S. A., Maukeeb, A. R. M. & Ema, I. J. (2020). Status of Mango Fruit Infestation at Home Garden in Mymensingh, Bangladesh, *Current Research in*

- Agriculture and Farming*, 1(4), 35-42. doi: <http://dx.doi.org/10.18782/2582-7146.119>.
- Khan, A. U., Khan, A. U., Khanal, S., & Gyawali, S. (2020). Insect pests and diseases of cinnamon (*Cinnamomum verum* Presl.) and their management in agroforestry system: A review, *Acta Entomology and Zoology*, 1(2), 51-59. DOI: <https://doi.org/10.33545/27080013.2020.v1.i2a.19>.
- Khan, A. U., Khan, F. U., Khanom, S. & Khan, A. U. (2020). Novel Coronavirus Disease (COVID-19): Pandemic Situation in Bangladesh, *Nujs Journal of Regulatory Studies*, 5(2),1-10.
- Khan, A. U., Khan, F. U., Khanom, S., Khan, A. U. & Afsana, A. S. (2020). COVID-19 Pandemic Situation in Bangladesh, International Conference on Multidisciplinary Industry and Academic Research (ICMIAR). Candelaria, Quezon, Philippines. December 12, 2020. 1(1), 25. [www.iiari.org](http://www.iiari.org).
- Khan, A. U., Proma, A. A., Akter, M., Rahaman, M. M. & Das, S. (2020). A Review on Coronavirus Disease (COVID-19) Epidemic Threat for Global Health in 2020, *American Journal of Microbiological Research*, 8(2), 57-62. doi:10.12691/ajmr-8-2-3.
- Khan, A.U. & Khan, A.U. (2020). The Impact of COVID-19 Pandemic Threat on Agriculture Sector Proceeding of 8th International Conference of Biotechnology, Environment and Engineering Sciences 18 October 2020, Stockholm-Sweden, 15. DOI: 10.46617/icbe8.
- Khan, A.U. & Khan, A.U. (2020). The Impact of COVID-19 Pandemic Threat on Agriculture Sector, Presentation, [https://www.researchgate.net/publication/346003092\\_ICBE-8-COVID-19\\_and\\_Agriculture-Ahasan\\_Anayat](https://www.researchgate.net/publication/346003092_ICBE-8-COVID-19_and_Agriculture-Ahasan_Anayat)[Online].
- Lagiso, D. (2020). Challenges and Opportunities of Covid-19 in Agricultural Economy: The Case of Ethiopia, *International Journal of African and Asian Studies*, 65, 24-29.
- Liu Y-M., Al-Mahmud M. S., Chen, X., Chen, T-H., Liao, K-S., Lo, J. M., Wu, Y-M., Ho, M-C., Wu, C-Y., Wong, C-H., Jan J-T. & Ma, C. (2020). A Carbohydrate-Binding Protein from the Edible Lablab Beans Effectively Blocks the Infections of Influenza Viruses and SARS-CoV-2, *Cell Reports*, 32, 108016. <https://doi.org/10.1016/j.celrep.2020.108016>
- Lu, R., Zhao, X., Li, J., Niu, P., Yang, B. & Wu, H. (2020). Genomic characterization and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding, *The Lancet*, 0(0), [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30251-8/abstract](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30251-8/abstract)
- Nathan, J., Bennett, Elena, M., Finkbeiner, Natalie, C., Belhabib, D., Stacy, D., Jupiter, J. N., Kittinger, S. M., Joeri, S., David, G. & Patrick, C. (2020). The COVID-19 Pandemic, Small-Scale Fisheries and Coastal Fishing Communities, *Coastal Management*, 48(4),336-347. DOI: 10.1080/08920753.2020.1766937.
- Orlowski, A. (2020). Small-scale fishermen suffering significantly from COVID-19 pandemic. Sea food Source, April 27, 2020. <https://www.seafoodsource.com/news/supply-trade/small-scale-fishermen-suffering-significantly-from-covid-19-pandemic>.
- Rahman, M. S., & Das, G. C. (2021). Effect of COVID-19 on the livestock sector in Bangladesh and recommendations, *Journal of Agriculture and Food Research*, 4, 100128.
- Shawon, A. A., & Mamun, S. (2020). Bangladesh likely to extend shutdown till May 16. Dhaka Tribune, May 02, 2020.
- Sohrabi, C., Alsafi, Z., O'Neill, N., Khan, M., Kerwan, A., Al-Jabir, A. & Agha, R. (2020). World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19), *International Journal of Surgery*, 71-76.
- Tester, H. (2020). Coronavirus impact: Florida fishing industry smacked hard by pandemic. CBS Miami, April 22, 2020. <https://miami.cbslocal.com/2020/04/22/florida-fishing-industry-coronavirus/>.
- WHO. 2019-nCoV Situation Report on 30 February, 2020. <https://www.who.int/docs/defaultsource/coronavirus/situation-reports/>
- Workie, E., Mackolil, J., Nyika, J. & Ramadas, S. (2020). Deciphering the impact of COVID-19 pandemic on food security, agriculture, and livelihoods: A review of the evidence from developing countries, *Current Research in Environmental Sustainability*, 2, 100014.
- Xia, S., Liu, M., Wang, C., Xu, W., Lan, Q., Feng, S. & Qin, C. (2020). Inhibition of SARS-CoV-2 (previously 2019-nCoV) infection by a highly potent pan-coronavirus fusion inhibitor targeting its spike protein that harbors a high capacity to mediate membrane fusion, *Cell research*, 1-13.
- Yang, J., Zheng, Y., Gou, X., Pu, K., Chen, Z., Guo, Q., Ji, R., Wang, H., Wang, Y. & Zhou, Y. (2020). Prevalence of comorbidities and its effects in



patients infected with SARSCoV-2: a systematic review and meta-analysis, *International Journal of Infectious Diseases*, 94, 91-5. DOI: [10.1016/j.ijid.2020.03.017](https://doi.org/10.1016/j.ijid.2020.03.017)

Zarei, M. & Rad, A. K. (2020). Covid-19, Challenges and Recommendations in Agriculture, *Journal of Botanical Research*, 2(1), 12–15.

Zhou, P., Yang, X-L. & Wang, X-G. (2020). Discovery of a novel coronavirus associated with the recent pneumonia outbreak in humans and its potential bat origin. *bioRxiv*. 2020.01.22.914952.

Zhu, N., Zhang, D., Wang, W. Li., X. Yang, B. & Song, J. (2020). A Novel Coronavirus from Patients with Pneumonia in China, 2019, *New England Journal of Medicine*.

#### **Author Contributions**

This work was conducted in collaboration with all authors. Author AUK<sup>a</sup>, was planned, structured, wrote, revised and rechecked the manuscript thoroughly. Author AUK<sup>b</sup> was surveyed in Mymensingh, Bangladesh. Author IJE was wrote the effect of COVID-19 in agricultural sectors. Authors ASA, AZ, MRF and SR were contributed to revise and improve the manuscript thoroughly. All authors reviewed carefully and approved the final version of the manuscript.



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