

## Impacts of COVID-19 pandemic on livestock industry and food security: A review

Sharmeen Islam<sup>1</sup>, Md. Tanvir Rahman<sup>2</sup>, Syed Md. Ehsanur Rahman<sup>1</sup>, Md. Rokibul Islam Khan<sup>1\*</sup>

<sup>1</sup>Department of Animal Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

<sup>2</sup>Department of Microbiology and Hygiene, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

Received:

August 17, 2021

Accepted:

December 30, 2021

Online First:

March 09, 2022

Published:

\_\_\_\_\_, 2022

### Abstract

COVID-19 is a worldwide pandemic that spread over 192 countries and caused more than 3 million people deaths by 2021. It arises a concern on livestock cultivation, their production, and maintaining the supply chain to sustain the existing economy worldwide. The prediction of potential consequences on livestock production and food security is unexpected. Numerous cases among workers in animal farms and product processing plants are evolved during the panic situation, leading to a negative impact on livestock management, and the distribution of products to human doors simultaneously. One of the significant contributions to the drastic decline in livestock operation is the high cost of animal feed. Social distance also slows down all regular activities in livestock farms, resulting in a considerable upset on outcomes. Not only that shutting down transportation flexibility leads to be a burden for farmers in case of high production costs. In the context of consumers, the sublime price of meat, milk, and eggs has addressed the exacerbating risk to worldwide nutrition security. Hence, the world is experiencing an outbreak challenge in resilient, fair, and flexible animal production systems and ensuring food safety globally.

**Keywords:** COVID-19, Food security, Livestock production, Supply chain, Economy

### How to cite this:

Islam S, Rahman MT, Rahman SME and Khan MRI. Impacts of COVID-19 pandemic on livestock industry and food security: A review. Asian J. Agric. Biol. xxxx(x): 202104142. DOI: <https://doi.org/10.35495/ajab.2021.04.142>

\*Corresponding author email:  
rikhan.as@bau.edu.bd

This is an Open Access article distributed under the terms of the Creative Commons Attribution 3.0 License. (<https://creativecommons.org/licenses/by/3.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

## Introduction

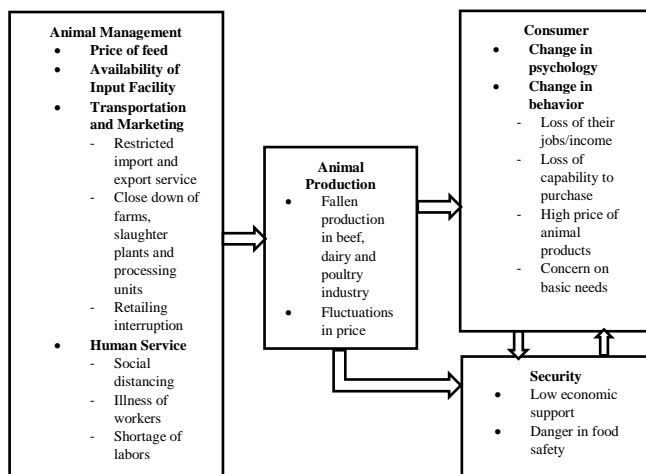
Within 100 years, the world endured surprisingly emerging two pandemic diseases named the 1918 influenza and the 2009 swine flu, which infected about 500 million and 61 million people, respectively. Currently, the strong outbreak of coronavirus (COVID-19) has been dominating the world (Marchant-Forde and Boyle, 2020). The first identification of COVID-19 was discovered in

December 2019 in Wuhan, China, which had created fear among people globally (Chen et al., 2020a). From the beginning of the easing of COVID-19 in China, it had grasped millions of people worldwide (Al-Hasan et al., 2020). The epidemic was one of the concerning issues that established tremendous pressure globally. The unpleasant situation caused social anxiety, loss of human life, and especially economic failure throughout the world (Olivera-La Rosa et al., 2020). To control the actions of



coronavirus disease 2019, most of the countries followed social distance, quarantine, isolation process, the closing of social activities, limiting import-export facility and controlling border areas. These disruptions in the community had turned into a crisis in the worldwide economy and food security (Hashem et al., 2020; Khalifa et al., 2020).

Global food insecurity was a concern particularly due to the pandemic effect on the livestock production systems. It had become acute during the disruptions in animal management systems. All scenarios of COVID-19 impact on the livestock industry were perceived worldwide (Figure-1).



**Figure-1: Effects of COVID-19 on the livestock industry**

The scheme was exacerbated because of reducing the accessibility to animal feedstuffs and slaughterhouses, generating the scarcity of laborers, raising constraints, increasing animal feedstuffs price, and having illness in many employees. In the availability of input facilities, many movement restrictions were applied in domestic and international supply systems for machinery and agrochemicals. Similar complications were found in the feed supply chain and hatchery operation that had impeded the livestock and poultry sector. Not only that, livestock operations had been obstructed by delays in feeding and stocking, diminishing potential output, and complicating marketing procedures. Besides, the market had challenges with limited buyers intending to buy commodities especially for perishable items such as meat, milk, and eggs. The high-income opportunities from these perishable products were being obstructed by the declines in demand due to price hikes. Furthermore, the shutting

down of food catering services and restaurants had invaded the requirement for livestock products. Therefore, farmers were facing a capital shortage problem for lower revenue from products that affected decision-making for input purchase. This impediment resulted in the reduction of cash flow between retailers and wholesalers which had a detrimental consequence on food security (Amjath-Babu et al., 2020). The loss of production in the egg, milk, and meat industry for the influence of COVID-19 was also remarkable.

This review illustrates how the outbreak of COVID-19 has affected worldwide livestock production including the dairy, beef, and poultry sector, and their management systems by collecting information from available organizational reports, cited observations, and scientific papers. Such knowledge and data may assist in taking measurable steps to ameliorate the current state and to assert learning for our future, with an emphasis on food safety and security.

### Animal management

#### Price of feed

Agriculture is an important sector in the aspect of the development of humans and is related to the security of food (Siche, 2020). The range of the impacts of the COVID-19 pandemic on food, agriculture, and their food sectors differs by country (Elleby et al., 2020). In developing countries, small-scale livestock production imparts livelihoods to a large extent of the population. As an example of Thailand, the small and large-scale meat industry had been driven forward since 1980 (Petrikova et al., 2020) which was interrupted by the COVID-19 epidemic. Especially, export and import activities of the raw materials had been failed during the circumstance which harmed the continuous process of animal raising. At one time, the market of livestock products narrowed, and the prices of related items became elevated. Particularly, the feed industry was experiencing the problematic condition to collect the raw materials from crop cultivation and provided final products for animal production. Therefore, the supply of raw elements and the production of animal feedstuffs were being troublesome (Deeh et al., 2020).

During the COVID-19 epidemic, inflated feed price was a common scenario in many countries for several reasons. In Brazil, domestic animal feed prices such as corn, soybean meal, and soybean oil were recorded high due to the shipment of these crops, leading to a deficit in the feed supply to the local processing

industry. The climbed prices caused an increase in the production costs and partially in dairy and meat products. To encounter the elevated price, Brazil suspended import tax on these crops from non-Mercosur countries during the pandemic (Ustinova and Aquino, 2020). In European Union, about two-third of member states pointed out the spike in feed prices in the livestock industry. To support the animal industry in case of high prices, Agriculture Commission attempted to form financial support, effective mechanisms, and subsidiary programs through their common Agricultural Policy (Fortuna, 2021). In the USA, high feed price was overlooked during COVID-19 due to limited export of corn and soybean and less production of these crops in their country. To maintain livestock production during the pandemic, various government stimulus programs were initiated to reduce the effects immediately (Ledbetter, 2021).

In African countries, from the months between April and May 2020, the devastating stocks from previous cultivation had mounted the price of grains. Additionally, the lockdown strategy followed by governments had troubled the trading of grains in African countries. The logistic challenges, reduction of border transactions, and peak price of agricultural raw materials during the moment had risen the price of food throughout the regions (Ejeromedoghene et al., 2020). In Romania, the government banned grain export, for example, maize, flour, wheat, barley, bakery ware, and soybean to the non-European countries that changed the demand-supply, and raised the feed price (Nandini, 2020). In Italy, the livestock sector is dependent on the availability of raw elements, especially maize which is imported from foreign countries. Even, for the critical situation of feed mills and farms, it was going to be impossible to have plenty of feedstock. The price of grains mainly cereals and the unavailability of raw ingredients had been risen, due to the obstacles of trading from foreign merchants (Barcaccia et al., 2020). In the United Kingdom, the sublime price of barley, soybean, wheat, soybean meal, sunflower meal, corn-gluten feedstuffs, oat, and molasses was observed from the period of January to May 2020 due to the lower production performance and high demand (Deeh et al., 2020). In India, the key ingredient and soybean meal price in the poultry industry had been increased by 82% and above 50%, respectively (Sutanuka, 2021). The reason was that most of the ports were closed that inhibited the supply chain of

animal feed during the COVID-19 period (Nandini, 2020).

Including these reasons in different countries. the elevated feed prices highlighted other causes of the lower crop production than expected in regions and banned importing from the supply country (Agrilife Today, 2021). Besides, increasing the demand for feed for the new installment of the livestock industry also created an opportunity for raising the price of animal feeds. Another factor that affected the price was the competitive behavior across the countries for feed. Individual producers, individual companies, and individual countries mainly affected the competitiveness and the market size throughout the world. Though, the industries were attempting to adjust with the elevated price what would be a challenging period for them, the settlement between processors and producers among the countries could solve the feed prices (Sarah, 2021).

#### **Availability of input facility, transportation, and marketing**

The animal production system and its supply service were encountered challenges nationally and globally by the interruption of marketing, the block of export and import, and lower consumption of animal foods. The interrupters were the shortage of farming inputs such as animal feedstuffs resources, equipment, pasture facilities, etc. due to the social distance of the COVID-19 pandemic. Moreover, the livestock production facilities and materials, such as feedstuff, animal stocks (gilts, day-old chicks, heifers, piglets, and semen straws), vaccines, drugs, feed additives, and other livestock elements were driven to lose their sustainability. These barriers in the animal production supply chain generated pressure on farmers. Not only that, it threatened to sustain global livestock sectors and food security (Hashem et al., 2020).

The pandemic situation not only limited the foreign trade systems but also kept down the local agricultural stuff. Moreover, feed additives, milk test kits, livestock health items, vaccines, and milk pasteurizing equipment were unavailable due to COVID-19 and had destructed the production of animals and the profitability of farmers (Seleiman et al., 2020; Hashem et al., 2020).

The supply chain of food is a system that creates a network between agricultural systems and consumers (Chen et al., 2020b). Due to the shutting down of the transportation system during the COVID-19 condition, the supply chain of animal feedstuffs and



animal products faced a serious obstacle. In China, due to the restricted traffic, milk transportation was obstructed and led to dumping (Xie et al., 2020). In African regions, the movement of agricultural elements through the border and trade service was restricted. Around 75% reduction of border trade was viewed during the 1st quarter of 2020 (Ratin, 2020). There was a direct impact of the COVID virus on the food supply chain and an indirect influence on animal food production, distribution, and marketing (Poudel et al., 2020; Abbas et al., 2021). It had been estimated that the global service of trade had been declined by about 12-22% due to the emergence of COVID-19 (CRS, 2021). In the Philippines, the delayed service in the transportation of raw components for the process of meat caused a threat in shortage until the movement of people banned (FAO, 2020a). In Argentina, around 50% of feed manufacturing industries had stopped feed ingredients export leading to a critical situation on animal farm management (Seleiman et al., 2020). In Brazil and the USA, a similar condition had been observed. In the COVID-19 situation, corn and soybean exports were limited (Seleiman et al., 2020). In Europe, national border and movement restrictions had a strike in the delivery of food and raw materials in livestock sectors. As an example, the shortage of packaging lamb and beef cuts to the restaurant had been signaled. Even, the import of veterinary outputs for livestock from China faced the same challenge (Research and Market, 2020).

### **Human service**

COVID-19 war is a critical situation that worsens the environment through horrific legislation. In the livestock production system, its stringent caused labor shortage and difficulty in farm management and bringing the products to the markets. In China, during the COVID-19 situation, the livestock sector faced a great challenge in the accessibility of animal feed and labor shortage (Zhang, 2020). The absence of employees under lockdown declined the operation system including lower meat supply in local markets such as the biggest wholesale market of Xinfadi, Beijing (Hashem et al., 2020). In developing and developed countries including European countries, COVID-19 was problematic in the aspect of working areas due to the severe insufficiency of workers (Euractiv, 2020). Particularly, quarantine and limited movement imposed the deficiency of workers (FAO, 2020b). In south Asia, farmers rely on migratory

laborers in rural areas for agricultural activities (Mottaleb et al., 2016). Though the farmers were keen to recruit laborers in their farms, restricted social movement slowed down the operation (USAID, 2020). Even, moving animal products (egg, meat, and milk) and live animals to markets was challenging for the reduction of labor facilities under strict logistics (FAO, 2020c). To follow social distance during COVID-19, farmworker's numbers were limited and the routine of animal husbandry including water, equipment, and pasture movement, product processing, and vaccination became interrupted. Moreover, livestock product processing (milk and meat) and their delivery had undergone obstacles to complete the production activities leading to lower production and product loss. (Gortázar and de la Fuente, 2020). In Bangladesh, the government declared its official lockdown on 26 March 2020 in an effort of controlling the spreading behavior of COVID-19 and the ultimate consequences widely. The strategy of lockdown restricted the movement of the community in farm sectors, especially the farm laborers who always move from one place to another place for working and earning a livelihood (Jalal Uddin and Fazlay, 2020). In Africa, it had been affirmed that the restriction on laborers movement during the lockdown situation for COVID-19 adversely affected the supply cycle of livestock. South Sudan, Sudan, Zimbabwe had also been resisted for this reason (Blanke, 2020). Additionally, infected workers became isolated during the pandemic period that created a miserable situation. Some were not able to cross the border for high restrictions. The circumstance restricted seasonal, domestic, and migrant laborers to work and diverted them into a severe shortage in production centers (Hein, 2020). For social and family safety, many workers quitted their jobs. For example, in France including Egypt, Italy, Jordan, and Tunisia, staff shortages were commonly caused by quarantine in the slaughterhouses (Hashem et al., 2020). In the USA and Canada, the reduction of working people in meat processing plants was also a great headache. Pork and beef production was stopped at around 20% and 10% respectively due to the spilling of staff (Hashem et al., 2020). In Europe, the availability of labor was a concern in the supply chain of food. The restricted movement reduced the workers' availability from the farm, warehouses to transport and retail. Moreover, the inclined transportation cost affected the labor-



intensive services e.g., milk powder production in the dairy industry. The lack of seasonal and cross-border labor in the livestock sector was also a negative factor (Research and Market, 2020). In Austria, their meat industry was dependent on a European workforce that had been impeding. Not only that, the dairy industry having a lower number of drivers had been suffering from disruptions in the distribution of milk and milk products (Hashem et al., 2020).

**Animal production**

The coronavirus had largely affected global livestock production including beef, dairy, and poultry. In the beef industry, beef production was put down the production of 1.36 MMT from 2019 to 2020 in which the world beef production in 2020 was 60.28 MMT (Beef2Live, 2020).

**Table-1: The beef production worldwide by the country during the pandemic period.**

Region	2020 (Metric tons)	2019 (Metric tons)	Change in tons	Change in Percentage (%)
Australia	2,123,000	2,432,000	-309,000	-12.71
Brazil	10,100,000	10,200,000	-100,000	-0.98
Canada	1,310,000	1,342,000	-32,000	-2.38
Colombia	744,000	770,000	-26,000	-3.38
Egypt	367,000	373,000	-6,000	-1.61
European Union	7,810,000	7,878,000	-68,000	-0.86
India	3,760,000	4,270,000	-510,000	-11.94
Iran	350,000	365,000	-15,000	-4.11
Israel	81,000	86,000	-5,000	-5.81
Jordan	25,000	28,000	-3,000	-10.71
Malaysia	25,000	26,000	-1,000	-3.85
Philippines	180,000	202,000	-22,000	-10.89
Saudi Arabia	42,000	43,000	-1,000	-2.33
South Africa	950,000	1,019,000	-69,000	-6.77
Ukraine	350,000	378,000	-28,000	-7.41
Uruguay	520,000	562,000	-42,000	-7.47
USA	12,379,000	12,384,000	-5,000	-0.04

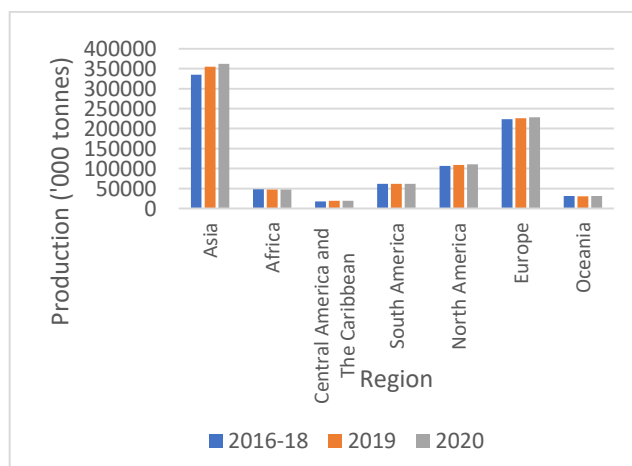
(Source: Beef2Live, 2020)

The most beef-producing countries are the US, Brazil, and the European Union (EU) which produced approximately 12, 10, and 7 million metric tons of meat, respectively, in 2021 (Katharina, 2021). From the table, it is figured out that the beef production in the USA, Brazil, and EU was comparatively less hampered. Though beef production was affected by restricted supply chain, illness of workers and slow production in the USA, public-health precautions taken by later summer in

2020 reduced the COVID-19 cases at meat-packaging industries and had turned towards normalcy (Joseph and Joseph, 2021).

In Brazil, the COVID cases among the beef industries were the most concerning issues. To battle the COVID-19 virus in the meat plants, the Brazilian companies reached an agreement with the prosecutors for conducting systematic and ongoing testing of the workers to keep operation and reduce the spread (Ana, 2020). In European Union, the meat sectors adjusted the COVID-19 situation remarkably well. The disruptions of labor, supply chain and feed production had been improved, particularly in beef industry through ensuring the health measures and free-movement of goods and labors in European union countries (Short-Term Outlook, 2020).

Numerous changes had appeared from the attack of COVID-19 in the dairy industry. All of the business was working and running from home, having on the mask to visit the grocery but all of these changes had major negative outcomes in the sectors of milk production (Liz, 2020).



**Figure-2: Production of Milk and Milk Products During the COVID-19 Pandemic (Source: FAO, 2020d).**

In Asia, the milk yield was predicted to  $362 \times 10^6$  tonnes in 2020 and upped 2% by years, for the expansions in China, Japan, India, Turkey, Pakistan, Saudi Arabia, and Korea. In China, farm production and efficiency were improved and their production growth in 2020 was about 3.3%. In Japan, milk production was stable due to the support of the government during the period of COVID-19. India's dairy sector flourished their production to  $195 \times 10^6$  tonnes, an increase of 2.1% as a result of the



improvement of cow numbers and feedstuff availability. Even, during the lockdown of COVID-19, the cooperatives of villages assisted in the

collection of milk and quality assurance.

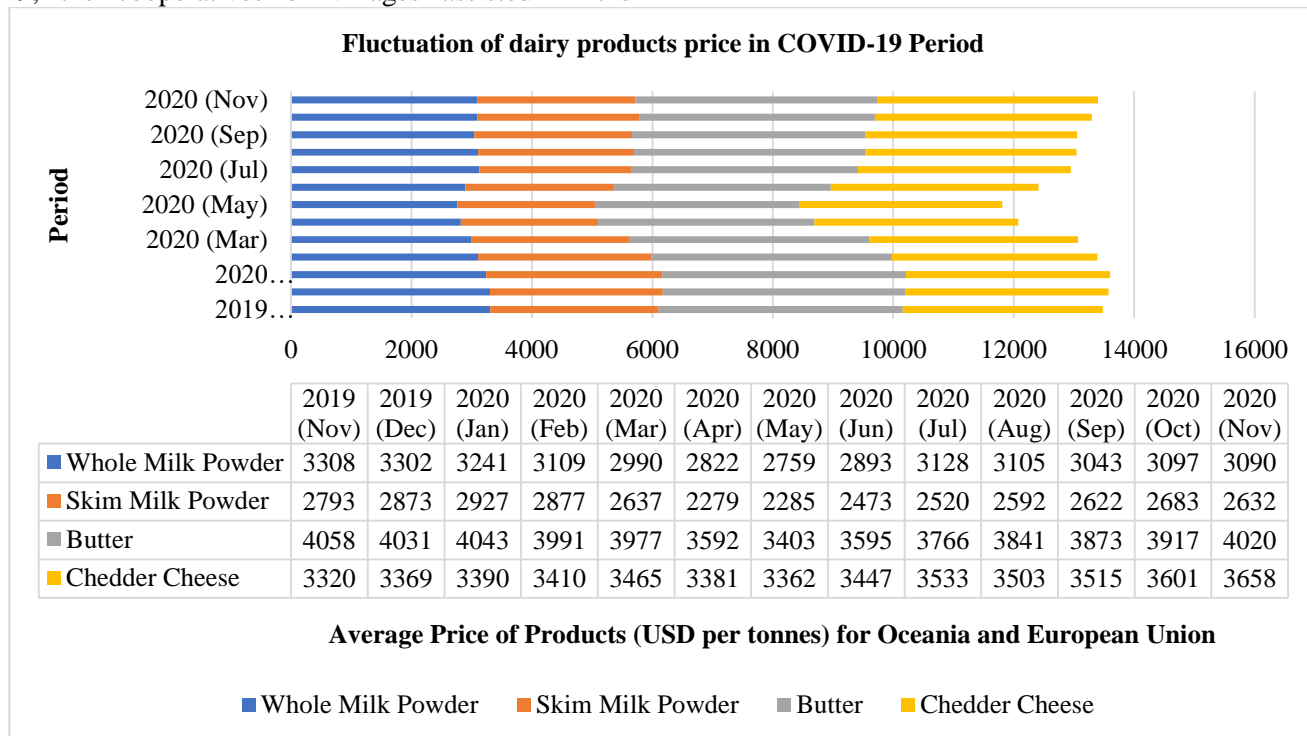


Figure-3: Fluctuation of dairy products average price in COVID-19 Period for Oceania and European union (Source: FAO, 2020d)

In Turkey, the dairy output seemed higher for the efficiency in the farm operation and improvement of cattle numbers. Though Syria and Iran showed fallen production, Pakistan’s dairy output was likely to improve but slowly, because of the interruption in quality and value chain. In Africa, the milk yield in 2020 increased slightly by 0.3%, forecast at  $47 \times 10^6$  tonnes due to the COVID-19 interruption, market displacement, conflicts, floods, and draughts. In America and Central Caribbean, the milk production reached  $19 \times 10^6$  tonnes, upped 1.3% in 2020. Though the output was hampered by consumer demand, the yield continued the improvement by herd genetics and modern technology. In South America, in 2020, the output was likely to  $62 \times 10^6$  tonnes, a slight down of - 0.2% due to the contraction in Colombia and Brazil. The main challenge in the dairy industry was to sustain the stability of input cost and labor. In North America, the milk output, in 2020, showed an increase of 1.6% with the production of  $110 \times 10^6$  tonnes due to the government assistance during the crisis of COVID-19. In Europe, the growth rate of milk yield reached  $229 \times 10^6$  tonnes, upped 1%, as a

result of government support, increased herd number, and improved pasture facility. In Oceania, the dairy improvement, continuous government assistance, pasture improvements, and stable management during COVID-19 supported the expansion of dairy production, reached  $31 \times 10^6$  tonnes, a growth of 2.2% in 2020, (FAO, 2020d).

The price of dairy products started collapsing from February (2020) to May (2020) and rising then. The fluctuations of price were triggered by negative reflections from COVID-19 including market fallout, economic slowdown, port congestion, transport disruptions, and reduced internal sales in Oceania and European Union (FAO, 2020d).

The outbreak of COVID-19 also created a massive challenge in the poultry industry, especially the broiler industry. The detrimental disruptions in the demand for chicken led to a standstill in the supply of chicken meat by the broiler producers. The farmers had faced a risk in the dropdown of bird’s price also that brought out grower losses in a certain period. It had been reported in USDA that the production of broiler meat was forecast at 45.8 billion pounds in



February 2020 and the average price was 0.87 dollars per pound annually. Even, the prices of poultry meat were high from March to April. A sudden significant decline in production in August 2020 were remarked to 44.7 billion pounds and an average annual price of 0.704 dollars per pound. The dramatic changes in prices eventuated due to the processing disruptions, demand shocks and closures of meat packaging industry in the 2<sup>nd</sup> quarter of COVID-19 (Maples et al., 2021; Robert, 2020).

In European Union, poultry production raised its growing tendency for the increased demand at +1.6% in 2019. But in 2020, the growth rate was +1.2% and relatively lower than in 2019. The export outlined +6.7% in 2019 and +1.0% in 2020. On the other hand, in 2020, poultry imports caught negatively estimated at - 0.5% than in 2019 (+1.8%). Moreover, the price was high during COVID-19 for the tight supply (Short-Term Outlook, 2020).

In Bangladesh, at the onset of coronavirus, the production of broiler dropped down from 90,000 tonnes to 25,000-27,000 tonnes monthly. Even, about 50-60 percent of poultry farms were shuttered throughout the country. Around 32-35 percent of the egg-producing industry shut down their business in the mid of the pandemic. The total loss in the poultry industry could be estimated at nearly 35.51 billion in Bangladeshi Taka until 30 April 2020 (Shawkat, 2020).

In India, 1 million broiler and 0.2-million-layer farmers lost about Rs. 270 billion in the lockdown of COVID-19 (Biswal et al., 2020).

In Myanmar, about 9 percent of broiler farmers were unable to maintain their operations no longer than 3 months in August, which increased up to 31 percent in November from the 2<sup>nd</sup> wave of coronavirus (the end of august). Besides, the layer farms were abolished from 90 percent (early June) to 83 percent (July) that remained until November 2020 (Fang et al., 2021).

Therefore, all of the sectors in animal husbandry had confronted the challenge of COVID-19.

## Consumer

### Change in psychology

The global change in the animal production industry was a consequence of the influence of COVID-19. After the identification of COVID-19, the rumors had been spread over the people that chicken and animal meat also spread the virus, which stimulated the falling down of the requirement for the meat and

chicken. The most influenced countries are the UK, USA, Italy, China, Germany, France, Spain, and India. The tendency of reducing the consumption of poultry and other meats appeared due to the inclined rate of spreading the virus. Moreover, jackfruit was the kind of replacement of mutton and chicken in the period of COVID-19. To evacuate the pandemic and rumor among people, the government of India along with the association of poultry farms arranged a Chicken Show in the state of Uttar Pradesh. Besides, the most prominent industry in animal husbandry, e.g., AZA International, Agri Beef, Dairy-Farmers of America, WH group, Nutri-Bio Solutions, Bayer Animal-Health China, Heforma GmbH, Pilgrim's Pride, New-Hope-Liuhe Co. Ltd. were affected by the COVID-19 (Research and Market, 2020).

The landscape of retaining food had changed its scenario dramatically for the impact of COVID-19. As an example, the chain of supermarkets of "Wegmans-Food-Markets" with one-hundred-three stores in Pennsylvania, New York, Virginia, New Jersey, Maryland, North Carolina, and Massachusetts were affected. Consumers changed their eating patterns. They were conscious to eat more vegetables after the pandemic. Besides, they were interested in taking their meal more at home rather than in restaurants. In statistics, before COVID-19, around 20% of the U.S people were reported to take their 90% meal at home but after COVID-19, 50% of households were eating 90% meals at their home. This kind of behavior primarily caused a challenge for the meat industry (Cyndie, 2020).

### Change in behavior

Lockdown strategy had become a war as there was a hike in the price of food (Ejeromedoghene et al., 2020). COVID-19 had changed the behavior of consumers toward the consumption of meat, milk, and livestock products. Customers were concerned about prioritizing the purchase of power and stable foods and following general safety during buying farm products. Due to the less elasticity and demand of animal products during the pandemic, it caused the intense price of livestock goods rather than other staples, and consumers were inefficient to buy these for losing their jobs and income (FAO, 2020e). The COVID crisis closed down all markets and generated an imbalance situation between human consumption and animal production due to the lower demand, grown prices, and fallen selling rates (Deeh et al., 2020).



In the USA, consumers observed an elevated price of egg and meat during the scenario of the COVID-19 pandemic in March and April 2020. Specifically, the poultry, meat, and fish price index were increased by 4.3 percent sharply and the ground beef price was risen by 4%. The developed price of meats diverted the consumers to eat an alternative protein such as egg, which was the cheapest protein source. They also selected other meat cuts, comparatively cheaper than beef (Robert, 2020). In Africa, the consumers faced income insufficiency due to the closing of all institutions, vending businesses, restaurants, and other jobs opportunity, resulted losing their jobs. On the contrary, milk and meat price were highly costly and customers reduced their consumption of these products as their incomes were sensitive (Mercy, 2020). In European Union, the industry lost the consumer's demand due to the high price of meat cuts with the interruption of catering channels and food services during the COVID-19 crisis (Jane, 2020). In Indonesia, the price of beef was indicated to increase continuously and reached its peak in May. Simultaneously, the chicken price started increasing in June and generated the potentiality to decline the consumption rate of animal products (Sutawi and Hidayati, 2020). In India, a survey on consumers reported that 75.31 percent of people experienced a surge in the price of food at the intensive period of COVID-19 that influenced 92 percent of consumers in changing their consumption behavior (Cariappa et al., 2020). In Myanmar, about 40% of rural households reduced their meat consumption in small portions frequently due to the household income cutback in the COVID-19 onset. (Lambrecht et al., 2020). Additionally, the animal products including pork and chicken seemed higher prices, observed particularly in the north and west part which triggered the consumption patterns (Bart et al., 2020).

### **Security**

The panic characteristics of COVID-19 had a direct effect on the food system, particularly a change in the food demand-supply process and indirect influence on declining food distribution capacity, purchasing capacity, marketing, and taking up healthcare procedures. These imbalance situations had risen the disruption of livestock activities. The overview of the situation had a long-term impact on the livestock section economy by 2021 (Hashem et al., 2020). Moreover, the pandemic situation had led to a food pricing hike that was a danger to food and human

nutrition safety globally. Particularly, children, aged people, and women were the vulnerable groups compromising severely during the panic behavior (Fan et al., 2020).

In the USA, around a 13.6-billion-dollar loss was expected for COVID-19 in the cattle industry. Even, in the calf-cow sector, it was predicted that around 3.7 billion dollars would be lost for a low price. Also, the value loss from breeding stock had been estimated at 4.45 billion dollars. Similarly, the about 5-billion-dollar loss was supposed in the hog industry. Therefore, it was major anxiety for the milk and meat industry (Hashem et al., 2020).

During the pandemic, the livestock industry accounted for a significant loss economically, with the indication in food security in livestock sector-dependent regions. Accordingly, worldwide food security became hampered as the one-third population of the globe was under lockdown (Galanakis, 2020). The worldwide food insecurity during the lockdown situation was a horrible crisis further to the health issues. At the start of 2020, 27 million people from 35 countries were food insecure during their emergencies for the indirect and direct consequences of COVID-19. Global food network became warned of the early famine in April 2020, especially in developing countries e.g., Yemen, South Sudan, northeastern Nigeria, and Somalia (FAO, 2020f; FSNAU-FEWS NET, 2020). In the scenario, it was very urgent to find unconventional solutions and measures to control the impacts of the COVID-19 pandemic on food security globally. The situation had indicated the frailty of the global economy including developed countries, and the increased possible risks in food insecurity.

### **Conclusion**

An analysis of multiple effects on animal husbandry during the COVID-19 situation has been carried out in this paper. We represent a historical overview in animal production areas and food safety for humans universally. On the aspect of COVID-19 ambiance, we have pointed the emergent on making a deal with the sustainability of production systems and food chain in a frame of the worldwide mission.

The pandemic act from the 1<sup>st</sup> quarter of 2020 has emerged an unprecedented condition in primary sectors, with a catastrophic change in the local production of agricultural sectors and their derivatives of foodstuff. It's a rigorous moment in the





sub-sector of the food industry to maintain its sustainability during COVID-19.

In the case of the COVID-19 situation, governments should take essential measures to reduce the virus infection that influences the worldwide food production systems. Firstly, to protect the health of human and ensure their food security, well designed and effective monitoring system can be developed in animal production systems associated with their value chain and viability. Supervision of key indicators can also facilitate in creating a proactive management system that will assist in a speedy recovery. Special arrangements of the safe logistics in infection areas, extended safety networks in society, adequate facilities in credit transfer, innovative management in labor distribution, appropriate mechanization in the farm, and diversified policy for trade management nationally and internationally are required in this circumstance. Along with, safe protocols in farm operations, enough storage facilities for livestock products, digital services in extension activities, innovative marketing systems should be undertaken to mitigate the longer-term effect of COVID-19. Moreover, non-government and private agencies with the coordination of different governments as well as international companies, multinational institutions, and development partners should be active together for the successful termination of the COVID-19 crisis.

Serious consideration and attention are required to divert the situation into a positive power by reviving raw materials and local foods. Though, the capacity of production is unsatisfactory to keep up with population demand, the financial support from the governments with cash empowerment is important nowadays to sustain animal production and food security issues. Alternative strategies should be facilitated in all levels of production centers, human resources, transportation ways, supply chain, processing units, and marketing areas. Online selling, direct purchase from production center, green service should be applied for the benefit of consumers.

**Disclaimer:** None.

**Conflict of Interest:** None.

**Source of Funding:** None.

## References

Abbas J, S Azam and ZA Bhutta, 2021. Molecular,

pharmacological, and biochemical approaches: The latest panacea for emerging viral diseases. *Continental Vet. J.* 1(1): 9-19.

Agrilife Today, 2021. Animal agriculture markets resilient almost a year into COVID-19 pandemic. <https://agrilifetoday.tamu.edu/2021/02/08/animal-agriculture-markets-resilient-almost-a-year-into-covid-19-pandemic/>

Al-Hasan A, Khuntia J and Yim D, 2020. Threat, Coping, and Social Distance Adherence During COVID-19: Cross-Continental Comparison Using an Online Cross-Sectional Survey. *J. Med. Internet Res.* 22: 23019. <https://doi.org/10.2196/23019>

Amjath-Babu TS, Krupnik TJ, Thilsted SH and McDonald AJ, 2020. Key indicators for monitoring food system disruptions caused by the COVID-19 pandemic: Insights from Bangladesh towards effective response. *J. Food Secur.* 12: 761-768. <https://doi.org/10.1007/s12571-020-01083-2>

Ana M, 2020. Special Report: How COVID-19 swept the Brazilian slaughterhouses of JBS, world's top meatpacker. <https://www.reuters.com/article/us-health-coronavirus-jbs-specialreport-idUSKBN25Z1HZ>

Barcaccia G, D'Agostino V, Zotti A and Cozzi B, 2020. Impact of the SARS-CoV-2 on the Italian Agri-Food Sector: An Analysis of the Quarter of Pandemic Lockdown and Clues for a Socio-Economic and Territorial Restart. *Sustainability.* 12: 5651. <https://doi.org/10.3390/su12145651>

Bart M, Than ZO, Derek H, Isabel L and Sophie G, 2020. Monitoring the impacts of COVID-19 in Myanmar. [http://www.themimu.info/sites/themimu.info/files/documents/Policy\\_Note\\_Monitoring\\_the\\_Impact\\_of\\_COVID-19\\_in\\_Myanmar\\_IFPRI\\_Sep2020.pdf](http://www.themimu.info/sites/themimu.info/files/documents/Policy_Note_Monitoring_the_Impact_of_COVID-19_in_Myanmar_IFPRI_Sep2020.pdf)

Beef2Live, 2020. World Beef Production by Country. <https://beef2live.com/story-world-beef-production-country-0-106880>

Biswal J, Vijayalakshmy K and Rahman H, 2020. Impact of COVID-19 and associated lockdown on livestock and poultry sectors in India. *Vet. World,* 13: 1928. <https://doi.org/10.14202/vetworld.2020.1928-1933>

Blanke J, 2020. Economic impact of COVID-19: protecting Africa's food systems from farm to fork.



- Brookings. <https://www.brookings.edu/blog/africa-in-focus/2020/06/19/economic-impact-of-covid-19-protecting-africas-food-systems-from-farm-to-fork/>
- Cariappa AG, Acharya KK, Adhav C and Ramasundaram P, 2020. Pandemic Led Food Price Anomalies and Supply Chain Disruption: Evidence from COVID-19 Incidence in India. Kamlesh Kumar and Adhav, Chaitanya and R, Sendhil and Ramasundaram, P., Pandemic Led Food Price Anomalies and Supply Chain Disruption: Evidence from COVID-19 Incidence in India. <https://dx.doi.org/10.2139/ssrn.3680634>
- Chen S, Yang J, Yang W, Wang C and Bärnighausen T, 2020a. COVID-19 control in China during mass population movements at New Year. *Lancet*. 395: 764-766. [https://doi.org/10.1016/S0140-6736\(20\)30421-9](https://doi.org/10.1016/S0140-6736(20)30421-9)
- Chen S, Brahma S, Mackay J, Cao C and Aliakbarian B, 2020b. The role of smart packaging system in food supply chain. *J. Food Sci.* 85: 517-525. <https://doi.org/10.1111/1750-3841.15046>
- CRS (Congressional Research Service), 2021. Global Economic Effects of COVID-19. <https://fas.org/sgp/crs/row/R46270.pdf>
- Cyndie S, 2020. COVID-19 Continues to Drive the Evolution of the Retail Food Landscape. <https://www.fb.org/news/covid-19-continues-to-drive-the-evolution-of-the-retail-food-landscape>
- Deeh PBD, Kayri V, Orhan C and Sahin K, 2020. Status of Novel Coronavirus Disease 2019 (COVID-19) and Animal Production. *Front. Vet. Sci.* 7. <https://doi.org/10.3389/fvets.2020.586919>
- Ejeromedoghene O, Tesi JN, Uyanga VA, Adebayo AO, Nwosisi MC, Tesi GO and Akinyeye RO, 2020. Food security and safety concerns in animal production and public health issues in Africa: A perspective of COVID-19 pandemic era. *Ethics, Med. Public Health.* 15: 100600. <https://doi.org/10.1016/j.jemep.2020.100600>
- Elleby C, Domínguez IP, Adenauer M and Genovese G, 2020. Impacts of the COVID-19 pandemic on the global agricultural markets. *Environ. Resour. Econ.* 76: 1067-1079. <https://doi.org/10.1007/s10640-020-00473-6>
- Euractiv, 2020. Germany to Relax Coronavirus Border Controls for Farm Workers. <https://www.euractiv.com/section/agriculture-food/news/germany-to-relax-coronavirus-border-controls-for-farm-workers/>
- Fan S, Si W and Zhang Y, 2020. How to prevent a global food and nutrition security crisis under COVID-19? *China Agric. Econ. Rev.* 12: 471-480. <https://doi.org/10.1108/CAER-04-2020-0065>
- Fang P, Belton B, Zhang X and Win HE, 2021. Impacts of COVID-19 on Myanmar's chicken and egg sector, with implications for the sustainable development goals. *Agric. Syst.* 190: 103094. <https://doi.org/10.1016/j.agsy.2021.103094>
- FAO, 2020a. Mitigating the impacts of COVID-19 on the livestock sector. <http://www.fao.org/3/ca8799en/CA8799EN.pdf>
- FAO, 2020b. Migrant workers and the COVID-19 pandemic. <http://www.fao.org/3/ca8559en/CA8559EN.pdf>
- FAO, 2020c. Guidelines to Mitigate the Impact of the COVID-19 Pandemic on Livestock Production and Animal Health. Rome. <https://doi.org/10.4060/ca9177en>
- FAO, 2020d. Dairy Market Review. <http://www.fao.org/3/cb2322en/CB2322EN.pdf>
- FAO, 2020e. COVID-19 and the Impact on Food Security in the Near East and North Africa: How to Respond? <http://www.fao.org/3/ca8778en/CA8778EN.pdf>
- FAO, 2020f. Coronavirus disease 2019 (COVID-19) Addressing the impacts of COVID-19 in food crises. <http://www.fao.org/emergencies/appeals/detail/en/c/1270012/>
- Fortuna G, 2021. Animal feed spike worries EU countries. <https://www.euractiv.com/section/agriculture-food/news/animal-feed-spike-worries-eu-countries/>
- FSNAU-FEWS NET, 2020. FSNAU-FEWS NET Food Security and Nutrition Quarterly Brief with a Focus on the 2020 Jial Impact and Gu Season Early Warning. <https://www.fsnau.org/node/1755>
- Galanakis CM, 2020. The food systems in the era of the coronavirus (COVID-19) pandemic crisis. *Foods.* 9: 523. <https://doi.org/10.3390/foods9040523>
- Gortázar C and de la Fuente J, 2020. COVID-19 is likely to impact animal health. *Prev. Vet. Med.* 180: 105030. <https://doi.org/10.1016/j.prevetmed.2020.105030>
- Hashem NM, González-Bulnes A and Rodríguez-Morales AJ, 2020. Animal welfare and livestock supply chain sustainability under the COVID-19



- outbreak: An overview. *Front. Vet. Sci.* 7: 679. <https://doi.org/10.3389/fvets.2020.582528>
- Hein T, 2020. COVID-19 May Cause Shortage of Labour in NA Pork Sector. *Pig Progress*. <https://www.pigprogress.net/World-of-Pigs1/Articles/2020/3/Covid-19-may-cause-shortage-of-labour-in-NA-pork-sector-563355E/>
- Jalal Uddin MdS and Fazlay MdA, 2020. Impacts of COVID-19 on Agriculture in Bangladesh. [https://www.wocat.net/documents/1042/Impact\\_of\\_Covid\\_in\\_Bangladesh.pdf](https://www.wocat.net/documents/1042/Impact_of_Covid_in_Bangladesh.pdf)
- Jane B, 2020. COVID-19: EU dairy and beef sectors suffering under food service sector closure. <https://www.feednavigator.com/Article/2020/04/08/Food-service-closure-hits-EU-dairy-and-beef-sectors>
- Joseph B and Joseph C, 2021. The Impact of Coronavirus COVID-19 on U.S. Meat and Livestock Markets. <https://www.usda.gov/sites/default/files/documents/covid-impact-livestock-markets.pdf>
- Katharina B, 2021. The Biggest Producers of Beef in the World. <https://www.statista.com/chart/19127/biggest-producers-of-beef/#:~:text=The%20United%20States%20is%20the,beef%20and%20veal%20this%20year.>
- Khalifa SA, Mohamed BS, Elashal MH Du M, Guo Z, Zhao C, Musharraf SG, Boskabady MH, El-Seedi HH, Efferth T and El-Seedi HR, 2020. Comprehensive overview on multiple strategies fighting COVID-19. *Inter. J. Environ. Res. Public Health.* 17: 5813. <https://doi.org/10.3390/ijerph17165813>
- Lambrecht I, Ragasa C, Mahrt K, Aung ZW and Wang M, 2020. Monitoring the impact of COVID-19 in Myanmar: Agricultural production and livelihoods in two irrigation schemes – June 2020 survey round. In: Strategy Support Program Policy Note 20. International Food Policy Research Institute, Washington D.C. <https://doi.org/10.2499/p15738coll2.133915>
- Ledbetter K, 2021. Animal agriculture markets resilient almost a year into COVID-19 pandemic. <https://agrifetoday.tamu.edu/2021/02/08/animal-agriculture-markets-resilient-almost-a-year-into-covid-19-pandemic/>
- Liz E, 2020. COVID-19 And the Dairy Industry: The Road So Far. <https://extension.tennessee.edu/publications/Documents/D106.pdf>
- Maples JG, Thompson JM, Anderson JD and Anderson DP, 2021. Estimating COVID-19 Impacts on the Broiler Industry. *Appl. Econ. Perspect. Policy.* 43: 315-328. <https://doi.org/10.1002/aep.13089>
- Marchant-Forde JN and Boyle LA, 2020. COVID-19 effects on livestock production: A One Welfare issue. *Front. Vet. Sci.* 7: 734. <https://doi.org/10.3389/fvets.2020.585787>
- Mercy C, 2020. COVID-19 & Livestock Market Systems: The impact of C-19 on livestock-based economies in the Horn of Africa. <https://www.mercycorps.org/sites/default/files/2020-08/MC-HoA-COVID-Impact-Livestock-Mrks-Aug-2020.pdf>
- Mottaleb KA, Krupnik TJ and Erenstein O, 2016. Factors associated with small-scale agricultural machinery adoption in Bangladesh: Census findings. *J. Rural Stud.* 46: 155-168. <https://doi.org/10.1016/j.jrurstud.2016.06.012>
- Nandini RC, 2020. Covid-19: The impact on the animal feed industry. <https://www.allaboutfeed.net/animal-feed/raw-materials/covid-19-the-impact-on-the-animal-feed-industry/>
- Olivera-La Rosa A, Chuquichambi EG and Ingram GP, 2020. Keep your (social) distance: Pathogen concerns and social perception in the time of COVID-19. *Pers. Individ. Differ.* 110200. <https://doi.org/10.1016/j.paid.2020.110200>
- Petrikova I, Cole J and Farlow A, 2020. COVID-19, wet markets, and planetary health. *Lancet Planet. Health.* 4: 213-214. <https://www.thelancet.com/planetary-health>
- Poudel PB, Poudel MR, Gautam A, Phuyal S, Tiwari CK, Bashyal N and Bashyal S, 2020. COVID-19 and its Global Impact on Food and Agriculture. *J. Biol. Today's World.* 9: 221. <https://doi.org/10.35248/23223308.20.09.221>
- Ratin, 2020. Eastern Africa grain markets and trade - Price & trade bulletin. Grain watch monthly April & May 2020 Update, pp. 1-6. <https://ratin.net/assets/uploads/files/92738-april-and-may-gw-final-version.pdf>
- Research and Market, 2020. Impact of COVID 19 on the Global Animal Husbandry Market. <https://www.researchandmarkets.com/reports/5013478/impact-of-covid-19-on-the-global-animal-husbandry>
- Robert J, 2020. Another Look at Availability and



- Prices of Food Amid the COVID-19 Pandemic. <https://www.usda.gov/media/blog/2020/05/28/another-look-availability-and-prices-food-amid-covid-19-pandemic>
- Sarah M, 2021. 2021 IPPE: CoBank Livestock Outlook for 2021. <https://www.thepoultrysite.com/articles/2021-ippe-cobank-livestock-outlook-for-2021>
- Seleiman MF, Selim S, Alhammad BA, Alharbi BM and Juliatti FC, 2020. Will novel coronavirus (Covid-19) pandemic impact agriculture, food security and animal sectors? *Biosci. J.* 36. <https://doi.org/10.14393/BJ-v36n4a2020-54560>
- Shawkat A, 2020. Poultry production falls alarmingly. <https://www.tbsnews.net/coronavirus-chronicle/covid-19-bangladesh/poultry-production-falls-alarmingly-80857>
- Short-Term Outlook, 2020. For Eu Agricultural Markets in 2020. [https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/short-term-outlook-spring-2020\\_en.pdf](https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/short-term-outlook-spring-2020_en.pdf)
- Siche R, 2020. What is the impact of COVID-19 disease on agriculture? *Sci. Agropecu.* 11: 3-6. <http://dx.doi.org/10.17268/sci.agropecu.2020.01.00>
- Sutanuka G, 2021. Poultry prices up by more than 50% in a year as animal feed drives up costs. [https://economictimes.indiatimes.com/news/economy/agriculture/poultry-prices-up-by-more-than-50-in-a-year-as-animal-feed-drives-up-costs/articleshow/81971801.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](https://economictimes.indiatimes.com/news/economy/agriculture/poultry-prices-up-by-more-than-50-in-a-year-as-animal-feed-drives-up-costs/articleshow/81971801.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst)
- Sutawi DH and Hidayati, 2020. A. Food security of livestock products in the pandemic of Covid-19 in Indonesia. *Livest. Res. Rural.* 32: 11 <http://www.lrrd.org/lrrd32/11/sutaw32179.html>
- USAID, 2020. COVID-19 in India - Production Update for Rabi Crops. [https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=COVID-19%20in%20India%20-%20Production%20Update%20for%20Rabi%20Crops\\_New%20Delhi\\_India\\_04-28-2020](https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=COVID-19%20in%20India%20-%20Production%20Update%20for%20Rabi%20Crops_New%20Delhi_India_04-28-2020)
- Ustinova E and Aquino C, 2020. Agricultural Prices Stoke Inflation. [https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Agricultural%20Prices%20Stoke%20Inflation\\_Brasilia\\_Brazil\\_11-07-2020](https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Agricultural%20Prices%20Stoke%20Inflation_Brasilia_Brazil_11-07-2020)
- Xie X, Huang L Li J and Zhu H, 2020. Generational differences in perceptions of food health/risk and attitudes toward organic food and game meat: The case of the COVID-19 crisis in China. *Int. J. Environ. Res. Public Health.* 17: 3148. <https://doi.org/10.3390/ijerph17093148>
- Zhang X, 2020. Chinese livestock farms struggle under COVID-19 restrictions, pp. 84-85, In COVID-19 and global food security (eds.), Johan Swinnen and John McDermott. Part Five: Supply chains, Chapter 19. Washington, DC: International Food Policy Research Institute (IFPRI). [https://doi.org/10.2499/p15738coll2.133762\\_19](https://doi.org/10.2499/p15738coll2.133762_19)

### Contribution of Authors

Islam S: Conceived the idea, designed the research, collected data, wrote and edited the first draft  
Rahman MT & Rahman SME: Literature review and helped in manuscript editing  
Khan MRI: Supervised the work and approved final draft of article

