



## Impact of COVID-19 Pandemic on Food Productivity, Security and Supply Chain

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### Article History:

Received 31-08-2023

Received in revised form 03-09-2023

Accepted 18-10-2023

Published online 24-10-2023

### ABSTRACT

COVID-19 pandemic has been catastrophic for almost everything including the global economy. Among many sectors, the food and the agriculture sector were the worst hit following the immediate lockdown and market shutdowns. Though some stability was prevalent from supply side, however, the severe restrictions put in place to curb the spread of pandemic have endangered the supply of agricultural and food articles contemporaneously across borders and from field to fork. The major issues discussed in this paper included, but were not limited to, direct and indirect effects on food and agriculture sector, effect on the fisheries, farm labor accessibility, food security problems and food supply chain issues. While the income declines due to price fall and supplies chain disruptions due to pandemic have escalated the food shortages in several of developing and developed countries. Nevertheless, the global demand for food items has remained more or less unchanged owing to their inelastic demand. The lessons learned from the unforeseen outcomes of the pandemic have left many a lot more prepared and ready for any new waves of the virus.

### Keywords:

COVID-19, Pandemic, Food production, Food Security, Food Supply Chain

### Introduction

The coronavirus disease (COVID-19) created an unusual situation globally (Alam and Khatun, 2021). Early in the year 2020, the unusual nature of coronavirus caused most governments to implement stringent steps in their countries to restrain the virus's spread. The novel coronavirus (SARS-CoV-2) disease impacted economies throughout the world (Okolie & Ogundeji, 2022).

The rapidly spreading COVID-19 was declared a pandemic by the World health organization (WHO) on

March 11, 2020 (WHO 2020). It was the fifth pandemic following influenza viruses; (H1N1) 1918, (H2N2) 1957, (H3N2) 1968 and pandemic Flue (H1N1) 2009, all of the aforementioned pandemics caused a high number of human life loss (Aday & Aday, 2020; Poudel, et. al 2020).

The COVID-19 pandemic triggered an economic recession worldwide and it had a compounding long term effect on the livelihood and income of the common man. Disproportionately impacting individuals who

**Table 1.** Global Flu Pandemic Records

Pandemic	Years	Infecting Agent	Human Death Toll
Spanish Flu	1918-1919	H1N1 Influenza A-Virus	50x10 <sup>6</sup>
Asian Flu	1957-1958	H2N2 Influenza A-Virus	1.1x10 <sup>6</sup>
Hong Kong Flu	1968-1970	H3N2 Influenza A-Virus	1.0x10 <sup>6</sup>
HIV/ AID	1981-to Dec 4 <sup>th</sup> , 2020	Human Immunodeficiency virus	42 x10 <sup>6</sup>
COVID-19	2019 - *As of Jan. 17th, 2021	SARS-CoV-2	2 .04 x10 <sup>6</sup>

Source: (Aday & Aday 2020, Poudel et. al 2020).

were already susceptible to poverty and hunger (Laborde et al., 2020a; Ceballos et al., 2020).

The variation in reported cases of COVID-19, mutated and recurrent outbreaks in different countries proved to be a mix of major problem demanding concerted global action for a long-term effective remedial effort.

Apart from the economics recession, COVID-19 affected human health directly. There were many health-related long-term implications, as hundreds of millions suffered from food and nutrition crises due to food production and its availability. Looking into the two year's (2020/21) trends of food production, processing, availability problems and the resultant price hike; while keeping in perspective the economic meltdown, the experts did highlight a global food emergency.

Earlier, according to the United Nations (UN) estimates 132 million people may go hungry in 2020. This was primarily due to Covid-19, and in addition to 690 million people already in hunger zone (FAO, 2019) in the developing and 3<sup>rd</sup> world countries. One of the major sources of economic viability in these countries is the remittances sent by the labor working abroad, immigrants and expats. It is noted that in the developing countries, the remittances, are a major source of financial activity. However, it was projected that the remittances were likely to drop around 20%. Hence, the pandemic's economic impact could push 71-100 million people into extreme poverty (World Bank 2020). Economic crisis, lock downs, social isolation, job layoffs, reduced purchasing power all these factors had

consequent effect of severe food security and d access crisis. Global economic growth was expected to fall by 5-8% for 2020 (IMF 2020; OECD 2020). Similarly, food and agriculture production were also affected in countries as many countries took serous and stringent steps to contain the virus.

Agricultural activities are primarily season specific and are managed by following a by specific seasonal and market / commercial pattern. Any misappropriation or poorly planned function or delayed action has serious production and financial consequences. The time bound crop and commercial activity are serious concerns in Agri-business. Considering this, the crops and production was feared to be severely affected either by the inability to plant enough; or due to the foreseen second wave of the pandemic. The agricultural sector is mainly dependent on manpower in developing and under developed countries; and the fear of COVID-19; lack of manpower and social distance restriction proved to be some of the detrimental factors in food production. The situation could lead to another wave of profit loss, which was enticed by the unknown magnitude of second wave (FAO, 2020).

Canadian Finance Department had forecasted a nearly 7% economic contraction in 2020 due to COVID-19. However, long term financial ramifications of pandemic on the Canadian food and agriculture sector were effectively avoided (USDA, 2020). Crop productivity on the farm was expected to be obstructed directly or indirectly due to spread, uncertainty and fear of COVID-19.

## Effect of COVID-19 Pandemic on Food-Agricultural Productivity



Author self constructed the chart with corresponding Photos obtained from Bing.

**Figure 1.** Direct and Indirect Implications of COVID-19 on Food & Agriculture Productivity

However, a stagnant agricultural sector was predicted, but it was assessed later that the food and agriculture sector showed some resilience. The magnitude of arrested agricultural produce worldwide; as information gathered later showed more demand and supply related issues rather than production issues.

Yet, several on-farm problems were witnessed in various countries as well (UN, 2020). In North West India wheat and pulse harvesting was disrupted due to the unavailability of locally migrating farm labor (Dev, 2020). The farm labor was not available or could not reach their work due to immediate lockdown and transport/market shutdowns. According to a survey in 18 provinces in India, included persons like farmers, traders, processors, milling owners and agricultural staff; revealed that the government anticipated 50% decrease in cereals, fruits & vegetables and, dry products in 2020 (FAO, 2019).

“The severe restrictions put in place to curb the spread of pandemic really endangered the supply of agricultural and food articles across borders and from field to fork” (Hamid and Mir, 2021). On the other hand it was seen that in the most of the developed countries like US and Canada, the exportable but perishable commodities such as milk, field grown vegetables,

livestock and poultry were dumped or destroyed (Weersink et.al 2020., Bellany and Corkery, 2020), due to same “immediate lockdown and transport/market shutdowns as in the developing and underdeveloped countries. Hence it can be deduced that the food

production, supply and access all stages of the cycle were hit hard by the COVID-19 around the globe” (Hamid and Mir, 2021).

When, COVID-19 hit the Canada it was well before planting season therefore, the farming decisions were not as difficult. Canada was expected to produce over 88 million tons of grains and oilseed in 2020 (Brewin, 2020).

Nonetheless, in Canada the fields under vegetable cultivation in 2020 were reported to be markedly reduced. Particularly asparagus and potatoes were cultivated less due to the lack of harvest labor. Social distancing and shutter down in cafés, bars, entertainment partying in clubs and even small catering in public restaurants, impacted Canadian potato industry gravely. Canadian national restaurant industry association estimated business losses in 2020 to be around 15-35 billion US\$. Food related businesses were closed in March and remained affected until May 2020, severely. The returning phase was slow and gradual because of strict application of health and safety regulations (USDA, 2020).

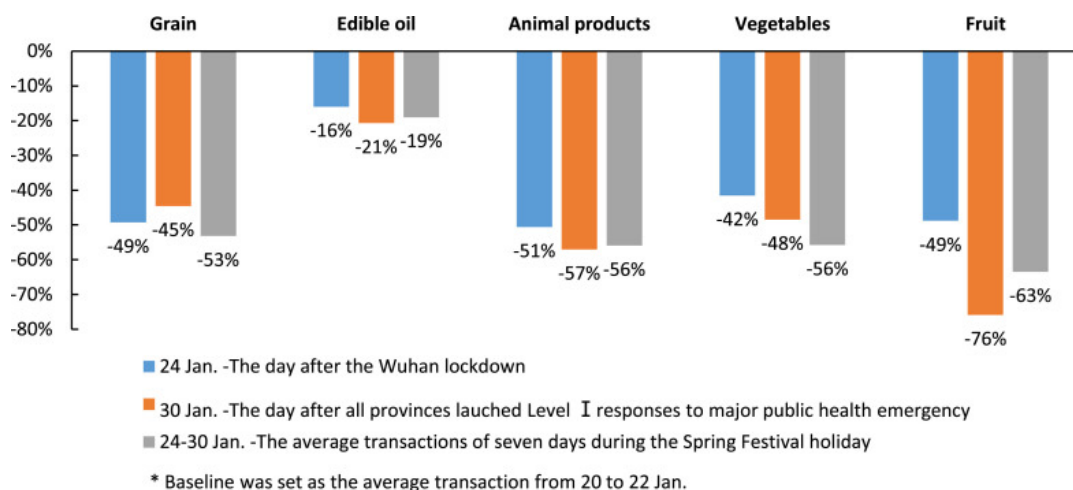
Similarly, lower demand for ethanol affected corn producers same as the barley producers for reduced consumption of beer and liquors on account of strict prohibition on bars, restaurants, hotels and club parties.

Other than that biofuel plants also operated merely at 50-70 % capacity during pandemic for instance in May 2020 Quebec and Ontario saw a 60 % decline in gasoline demand (USDA, 2020).

Cereal production in developed countries has been less labor intensive where production to harvest is more mechanized. However, the border closures, added custom formalities and other logistics issues at both export and import point of shipment made the availability of cereal foods also difficult (Schmidhuber and Ojao, 2020).

In China, COVID-19 hit hard and the developed country had a markedly higher impact on livestock due to limited access to animal feed and farm labor (Zhang,

2020). Chinese Academy of Agricultural Sciences (CAAS) reported that farmers had to destroy over 60% of poultry and duck chicks during the pandemic by burying them. It was primarily because of poor availability of feed and veterinary drugs. The supplies were cut off to stop the virus from spreading (Xin et.al 2020). January 23-30, 2020 when Wuhan was locked down and all other provinces had launched level-I response to major public health emergency, the quantity of grain, edible oil, animal products, vegetables and fruit were enough, but the transactions fell off of the said commodities 16-76 %, perishable commodities were hit the most ( see Fig 1) (Mingzhe and Zohng, 2020).



[Source: Mingzhe and Zohng, 2020].

**Effect on the Fisheries**

The COVID-19 had its effects on the fisheries, but in a different way; it was very complex due to the inability of fishing vessels to operate with COVID-19 safety measures on board. Hence, the supply of specific species was affected. Wild capture of fish and the associated logistics such as processing and transportation were also affected. Similarly, the border closure and reduced demand in restaurants and hotels generated market changes particularly affecting the consumer’s price.

**Farm Labor Accessibility**

Small scale farmers locally migrate as informal and skilled work force both in developing and underdeveloped countries. it is a common seasonal

practice. Lock down restrictions and border closure lead to migration restrictions, hence labor dearth. It was followed by farm owners and crop producers to self-finance their businesses, already quarantine affected industry (Haley et al. 2020). Each year in summer crop season, Canada permits Seasonal Agricultural Work Personals (SAWP) predominantly from Mexico and nearby South American countries. But the pandemic imposed the border closure which brought uncertainty of work force as a result it slowed

down production plans and consequent transportation to US and international market. The exemption was announced later and the actual delayed implementation of the exemptions on farm labor affected the agri-sector negatively (Top-Crop-Manager, 2020). Lately, Canadian government marked US \$65 million to manage the costs of quarantine measures for inbound international travelers, the farm workforce.

### Food Security Problems

In July 2020 the initial analysis of FAO and WFP identified 27 countries that were most likely to confront the pandemic crisis if the virus spread was worsened and they would cross the pre-defined hunger scales. The analysis also suggested that economic consequences will be far reaching for the 14 of these 27 countries than the disease itself (please see Table1). These 27 countries hosted a staggering 212 million chronically food-insecure and 95 million acutely food insecure people. Majority of the countries were in Africa: (i.e. Angola, Nigeria, Chad, Somalia South Sudan), and Middle East (i.e. Yemen, Iran, Iraq, Lebanon and Syria) all faced a severe economic crisis (see Table 2) (WFP, 2020 a).

It was also observed that countries where hunger is closely associated with other natural calamities like drought and pest (i.e., locust outbreak) as in horn of Africa and other parts (such as Syria, Sudan, Somalia, and Afghanistan) of the world where long term wars prevailed; were more vulnerable to the Pandemic (see Table-2). Such factors further accentuate the aftershocks leading to acute food insecurity (FAO, 2020).

Countries that significantly depend on exports of their raw produces such as crops, vegetables, and cattle and dairy, raw materials like cotton or yarn and fuels were also affected as demand from the industrialized and developed countries significantly reduced. Similarly small islands and territories which had their economy solely dependent on tourism saw reduced remittances and a negative trend, unless the COVID prohibition were either relaxed or safety measures were fully achieved.

As the food demand was reduced due to declining income, food producers and food system in general was affected. Almost 35% of the formal employment was affected by the pandemic; as a result, 451 million people lost their jobs (Torero, 2020). Several agencies including the International Food Program acknowledged that numerous operations were slowed down due to pandemic disruption. One of the examples is of school closure, both in underdeveloped and developed countries; it hindered food reaching to children. This caused the 370 million children suffer food shortage. They were compensated by alternatives arrangements such as home rationing, vouchers or cash transfer (WFP, 2020 b). In July 2020, Food prices hike was reported up to 2.6 % in Kenya; 50 % in Venezuela & Guyana (FAO, 2020c). Currency depreciation due to overall global recession and transportation freight hike also increased food prices particularly in countries that relied on food import and low-income people eventually suffered in term of least food and nutrition access.

**Table 2.** Food security implication of the pandemic: countries at risk (14 countries above 4 in rank of under-nourished are tabled out of 48 countries).

Region	Countries	Chronically Food Insecure (Under nourished)	Acutely Food Insecure *(Ipc phase 3 or above)
Central Africa East Africa	Chad	5.6	1
	Ethiopia	21.5	8.1
	Sudan	8.2	6.2
Southern Africa	Angola	7.4	----
	Mozambique	8.3	1.8
	Zambia	8.0	1.2
	Zimbabwe	8.5	1.9
Middle East & North Africa	Iran	4.0	----
	Iraq	11.1	2.5
	Yamen	11.0	15.9

East Asia Pacific	DPR Korea	12.2	----
South Asia	Afghanistan	10.6	10.6
	Bangladesh	24.2	1.3
Latin America and Caribbean	Haiti	5.4	2.3
	Venezuela	6.8	-----

\*IPC (Integrated Food Security Phase Classification of FAO 1= Minimum, 2= Stressed, 3= Crisis, 4= Emergency 5= Famine). [Source: WFP, 2020a]

### Food Supply Chain Issues

Supply chain refers to integrated network including people, organizations, activities and resources. This loop works in such a systematic and timely fashion that connectivity prevails from start to end and vice versa. Starting point in food chain is production site i.e. farm and the terminal point is consumer. In between are some intermediates to complete the harmony loop. Production cycle itself is dependent on several factors and persons involved. After the production of a commodity, its delivery to consumers is like a web that involves producers, consumers, banking and loans, farm inputs or animal feed, harvesting machinery, processing storage, transportation, marketing and retail. As COVID-19 crises escalated the stern measures of lockdown worsen food chain invariably such as;

- Unavailability or delayed commodity at the collection point,
- Demand and supply constraint increased the unit price,
- Disruption based lowering quality of produce,
- Disruptive transportation and fear of shortage, the exporting countries restricted food export etc.

Canada trades billions of dollars' worth in agricultural exports. During COVID-19 pandemic Canadian shipments of field crop commodities were marginally impacted by rail blockades because petroleum industry was contracted, and spare rail cargo was readily available. However, the commodities were piled up in storage at ports. Vancouver seaport, that delivered agricultural commodities to China, was blocked for the ships returning from China to Vancouver. As a result supply was greater than the available space at Canadian deck storage facilities (Top-Crop-Manager, 2020). Delivery of major food commodities in international trades were by-and-large affected due to lock down measures strictly enforced everywhere. Consequently, the shipments were either increased where underdeveloped or developing countries had

stock shortage or decreased where exporting producers were reluctant deeming their own requirement might need replenish the stock should this situation prevailed longer. Some exporting countries-imposed export restrictions on rice and wheat that increased price hike (Laborde et al. 2020), it was an atypical food chain disruption.

### Conclusion:

Agriculture sector in developing and underdeveloped countries is directly connected with the livelihood of people while people affected by the pandemic experienced shortfall of commodities, price hike, disruptive supply particularly of the perishables vegetable, dairy products and fisheries etc. Food safety, security and supply-chain were torn by COVID-19 pandemic. This situation increased the concerns of the global food security monitoring agencies. The pandemic left unprecedented crisis for the underdeveloped and developing countries particularly in Africa and Middle East. There is still a dire need to address wellbeing of the small holdings lest they give up farming and enter an acutely food insecure phases. Developed agricultural countries like USA and Canada were merely affected for grain and crop productivity as they have not had planting season arrived yet while COVID surged. Their sector of perishable crops productivity was merely affected due to lack of foreign farm workers as sanctions were enforced on borders. International food and agriculture agencies will likely enable their work force to mitigate the gravity of identified problems in the food system. Food exporting countries have readdressed their supply chain concerns and are reporting their readiness to perform better should another wave of COVID-19 surge.

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