Standing Committee
for Economic and Commercial Cooperation
of the Organization of Islamic Cooperation (COMCEC)

How to Ensure the Sustainability of Food Supply Chains in Turbulent Times: The Case of COVID 19

COMCEC COORDINATION OFFICE
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List of Abbreviations

AWG: Agriculture Working Group
BSR: Business for Social Responsibility
CH: Cadre Harmonise
COMCEC: The Standing Committee for Economic and Commercial Cooperation of the Organization of the Islamic Cooperation
COVID-19: SARS-CoV-2 virus
FAO: The Food and Agriculture Organization of the United Nations
FLW: Food Loss and Waste
FSC: Food Supply Chain
FSIN: The Food Security Information Network
GFRI: Global Food Research Institute
IDA: International Development Association
IFPRI: The International Food Policy Research Institute
IMF: The International Monetary Fund
IPC: Integrated Phase Classification
IsDB: Islamic Development Bank
ISF: Islamic Solidarity Fund
LIFDCs: Low-Income Food-Deficit Countries
LMICs: Low- And Middle-Income Countries
MENA: Middle East and North Africa
OECD: Organization for Economic Cooperation and Development (OECD),
OIC: Organisation of Islamic Cooperation
PPP: Purchasing power parity
R&D: Research and development
SFSC: Sustainability of Food Supply Chains
SESRIC: Organization of Islamic Cooperation Statistical, Economic and Social Research and Training Center for Islamic Countries
SIDS: Small Island Developing States
SMEs: Small-and-Medium-Sized Enterprises
SSA: Sub-Saharan Africa
SWOT: Strengths, Weaknesses, Opportunities, And Threats
UNESCO: The United Nations Educational, Scientific and Cultural Organization
UNWTO: The United Nations World Tourism Organization
U.S.A.: the United States of America
USD: U.S. Dollar ($)
WB: World Bank
WG: Working Group
WFP: The UN World Food Programme
WHO: World Health Organization

Executive Summary

The Standing Committee for Economic and Commercial Cooperation of the Organization of Islamic Cooperation (COMCEC) has been working for enhancing economic and commercial cooperation among its 57 Member States since 1984. Agriculture Working Group (AWG) with 38 member countries registered (See Annex A) has its own strategic objective: "*Increasing the productivity of agricultural sector and sustaining food security in the COMCEC region*". Recently, as a pertinent platform to address the existing and potential impacts of COVID 19 pandemic on agri-food sector in the OIC member countries 'The COMCEC COVID-19 Agriculture Consultative Meeting' was held on June 30, 2020 in a virtual-only format, with the theme of "The Impacts of COVID-19 on Food Security and Agriculture in the OIC Member Countries'[6] where current and potential future impacts of the pandemic on food security and agricultural policies were discussed, expertise and good practices among the member countries were exchanged, and deliberated on the cooperation opportunities based on the needs and experiences of the member countries (COMCEC Strategy, 2012; COMCEC AWG 2021, FAO, 2020; COMCEC Outlook 2019)

Unfortunately, 2020 has witnessed an unprecedented public health crisis in living memory of mankind, a global pandemic shock-COVID 19- that has affected and still affecting all nations globally. It has shifted from being a global health crisis to a global food crisis shortly with a 'Great Global Lockdown' that has not been experienced before. The impacts of the COVID-19 pandemic on global agricultural and food systems are becoming increasingly apparent.

COVID 19 disrupted the global food system and emphasised its structural inequity – from unequal food distribution to workers in the system going hungry. Despite producing more food by volume than humanity has to date, millions of people remain food insecure. Agriculture is also a major contributor to environmental degradation and climate change. Although, the pandemic is still ongoing and the net effects are still to be calculated this study "*How to Ensure the Sustainability of Food Supply Chains in Turbulent Times: The Case of COVID-19*" will not only highlight the shocking effect of COVID 19 on sustainability of food systems and food supply from farm to fork with all actors in OIC member states but also will be focusing on it as an important global disaster effecting resiliency of food chain and analyzing the link between consumers and producers under the shadow of lockdowns in near future.

The most recent estimate for 2019 shows that prior to the COVID-19 pandemic, almost 690 million people, or 8.9 percent of the global population, were already undernourished. Preliminary projections based on the latest available global economic outlooks, suggest that the COVID-19 pandemic may add an additional 83 to 132 million people to the ranks of the undernourished in 2020.

Five years after the world committed to end hunger, food insecurity and all forms of malnutrition, we are still off track to achieve this objective by 2030. Data tell us that the world is progressing neither towards SDG target 2.1, of ensuring access to safe, nutritious and sufficient food for all people all year round, nor towards target 2.2, of eradicating all forms of malnutrition[8]. Beyond hunger, a growing number of people have had to reduce the quantity and quality of the food they consume. Two billion people, or 25.9 percent of the global population, experienced hunger or did not have regular access to nutritious and sufficient food in 2019.

Overall, these facts are very crucial for populations of OIC member states where rural population still represented more than 50 percent of the total population in 25 OIC member states, where food supply chains are fragile, having scarce health systems to tackle with the pandemic effects with developing logistic systems.

With the extra stimulus triggered by COVID 19, the cost of a healthy diet exceeded the international poverty line (established at USD 1.90 purchasing power parity (PPP) per person per day), making it unaffordable for the poor. The cost also exceeds average food expenditures in most countries in the Global South: around 57 percent or more of the population cannot afford a healthy diet throughout sub-Saharan Africa and Southern Asia where this is critical for most OIC member states. Over the next few decades, together with associated demographic changes, urbanization is expected to add significant challenges to tackling hunger, food insecurity, and malnutrition inn many developing regions of the world especially in OIC member states.

Based on the above mentioned facts, this study is planned to compare the current situation in the OIC countries with the best practices in the world, and lay down key evidence-based policy recommendations on policy coherence, program delivery and coordination capacities to match the increased scope of action required to foster institutional capacity to cope with possible threats to food supply chains and its sustainability and maintain a secure and safe food system in OIC member countries as well as promote possible technical collaboration mechanisms and ooportunities at the OIC level under COVID 19. The study further trgiggered the capacity building efforts that could be realized under the COMCEC umbrella.

At this stage, although it is not possible to undertake a complete and well-informed quantification of the impacts of the COVID-19 pandemic; nonetheless, this study puts a strong effort to provide an assessment of how the pandemic might affect sustainability of food supply chains (SFSCs) in turbulent times within the limitations imposed by the information that is currently available.

The findings of the Study is presented to the 17th Meeting of the COMCEC Agriculture Working Group that is held on October 12, 2021 on virtual bases in Ankara.

Among the countries most vulnerable to food crises, the FAO identified 28 OIC countries with weak food systems. According to the FAO's classification for 2020, 28 OIC countries were among the world's 54 low-income food-deficit countries (LIFDCs)—nations that were net importers of food (basic foodstuff) over the preceding three years and per capita income below the threshold used by World Bank to appraise eligibility for International Development Association's (IDA) assistance. Within this frame even though OIC countries own over quarter of world's agricultural area and produce 20% of world's agricultural value-added products, they have a trade deficit in agriculture with exports meeting only two thirds of the imports. Most of the OIC states are in Sub-Saharan Africa and dry regions of West Asia and Northeastern Africa. The majority of LIFD-classified countries suffer from high undernourishment, intricate political conditions, and low incomes (FAO, 2020).

Food insecurity has always been a global challenge for decades. COVID 19 induced economic shocks, conflicts and food crisis worsened the situation at global level. The effects of this pandemic on the food supply chain (FSC) were investigated at three stages in this report: primary supply, trade and final demand. The continuum covered production, processing, distribution, retailing and consumption.

The report tried to assess the current situation of ensuring the sustainability of food supply chains in turbulent times in OIC member states under the effects of COVID 19 by laying down policy recommendations for a more sustainable, responsible and efficient food supply management system to contribute to food security in OIC; where the burden and unparallel effects of COVID 19 is still going on globally making related governance issues more and more complex.

The report has also contributed to the identification of existing gaps in understanding the role of COVID 19 on sustainability of food supply chains from farm to fork in relation to economic development and food security and safety in OIC members states.

OIC member countries need to strengthen agri-food trade cooperation and knowledge and technology exchange to minimize the impacts of the pandemic on sustainability of food supply chain as already COVID 19 pandemic multifaceted indirect impacts on societies and economies, which could last long after the health emergency is over. These already aggravated existing instabilities and new food crises, or led to new ones with repercussions on food security, nutrition, livelihoods and pushing vulnerable people further into food insecurity globally. Therefore, the *impacts* of the following COVID 19 pathways on sustainability of FSCs in OIC member states aree detailed in depth to increase the member states' resilience and minimizing the impacts of the pandemic:

i) Impacts on food access through reduced household purchasing power

ii) Impacts on availability of food, agricultural production and food supply chains

iii) Impacts on government capacities to protect vulnerable populations

iv) Impacts on political stability

v) Impacts on conflict dynamics

Over the course of the coming year, our food system will be put to the test and to prevent multiple food crises resulting from the *post* impacts of the pandemic; so in order to address above mentioned/discussed dilemma as much as possible and to safeguard people already suffering from acute food insecurity under the COVID 19 in OIC and globally we must ask whether a food system that is already strained is capable of providing for a projected population of 10 billion people by 2050, in the context of a rapidly changing climate.

The report has utilized both primary and secondary research tools and sources to reach its goals. However, there is no one-size-fits-all solution for OIC member states, and policymakers will need to assess the context-specific barriers, manage trade-offs and maximize synergies – such as potential environment gains – to achieve the required transformations even under the effect of COVID 19.

In this respect online surveys conducted and collected from the OIC member countries (Egypt, Indonesia (3), Morocco, Palestine (2), Pakistan (3), Nigeria, Qatar, Turkey, Tunusia, USA) and expert on-line interviews with Nigeria (2 interviews), Pakistan (2 interviews) and USA (3 interviews) have been completed.

The SWOT analysis of the results revealed that in-place systems, capacities, and organizations were mainly defined as strengths. The factor that was mostly defined as a strength was the current state of the agricultural supply chains (80%). This was closely followed by the national economic aids and national institutional capacity among the strengths prioritized by the respondents. Other factors that defined as a strength for the current national food supply chains can be listed as the environmental policy framework, disaster management capacity, national social policy framework and national information system infrastructure. These results may suggest that these countries are open to improvement in terms of the sustainability of the food supply chains but the current situation is not perceived as poor by the respondents.

The factors that were mostly defined as threats were extreme climatic events (droughts, floods, wildfires, hailstorms etc.) and swings in agricultural input prices. These were closely fallowed by the international food prices and price swings, global export bans or restrictions, and the swings in the purchasing power of the consumers among the threats prioritized by the respondents. Interestingly, export bans or restrictions among OIC members were defined as a lesser threat than the global one.

On the other side, global/regional economic and political integration; halal food trade and foreign direct investment during the pandemic, and agricultural labour force were defined as opportunities. These results suggest that there is still a lack of proper preparedness to the climate crisis and an excessive dependency to the export in agricultural inputs in these countries. However, the level of

preparedness to a new crisis such as the COVID-19 pandemic may be gained through strengthening the cooperation in the OIC region and in the halal food market together with increased foreign direct investments and the available agricultural labour force.

These respondents mostly described the current state of food sustainability in their country as acceptable (7 acceptable, 3 good, 2 moderate, 2 critical). About the change in the situation of food sustainability in their country in the last decade, most of them indicated an improvement. As the main reason behind the improvement of food sustainability, the mostly stated reasons were:

- Agricultural supply chain reforms (subsidies, changes in market structure etc.) (10 responses)
- Economic growth and poverty alleviation (9 responses)
- Improved local food markets (9 responses)
- Increase in institutional capacity and good governance (8 responses)
- Improved adaptiveness and resilience of food systems against changing climate and extreme climatic events (7 responses)
- Decrease in food loss and waste (5 responses)
- Decreased negative environmental impacts (3 responses)
- Improved rights and safety of the workers (5 responses)

Among the countries selected for case studies; OIC members were all seriously affected from the pandemic. When compared to the world averages, food security in Nigeria has been hit by the pandemic more harshly. In Nigeria, in the three-year average measurements (from 2017-2019 to 2018-2020) the number of people undernourished increased 40% and 8,4 million people, which equals to the 4.08% of the entire population of the country. In the same period, number of people which are moderately or severely food insecure increased 25,5%, to 23.6 million people; and the severely food insecure people increased 48,3%, to 14 million people.

The COVID-19 pandemic seems to worsen the food security indicators in Pakistan but still the numbers are below the World averages. For instance, in the three-year average measurements (from 2017-2019 to 2018-2020) the number of people undernourished increased 8,1% and 2,4 million people, which equals to the 1.09% of the population of the country. Pakistan is among the countries that systematically exposed to food crises each year over the last four years (WFP, 2021). Even before the pandemic, more than 1.2 million people were in food crisis or worse in the northern Pakistan (IPC, 2020). Although it can not be proved with the available data for Pakistan, diet quality (beyond quantity) may have decreased in the country due to the economic impact of the pandemic. Because people may have more access to grain-based food products rather than more nutritious and perishable products which requires more labour-intensive production such as fruits, vegetables, meat and dairy products.

In terms of the **final demand** and the consumer side, Saudi Arabia does not seem to be affected from the pandemic unlike the prevailing situation in the majority of the World and the numbers are below the World averages. For instance, in the three-year average measurements (from 2017-2019 to 2018-2020) the number of people undernourished did not changed with 1,3 million people, which equals to the 3,74% of the entire population of the country

The steep increase in the U.S.A. in the total unemployment was way above the World and OECD member country averages and it was also seen in low-income, low and middle income, least LDCs countries 2019 to 2020. This high rate in the increase in employment also above the IFPRI 2020 estimates projecting a 35% job loss in the food industry and 21.26% of the jobs at risk at primary production, mainly due to the COVID-19 pandemic (IFPRI, 2020).

On the contrary share of agricultural employment in total unemployment and the share of female employment in the agricultural employment have been on the rise in the country. A reason behind this lower share of agricultural unemployment in the total estimates could be that the agriculture is not a labour-intensive but a more capital- and knowledge-intensive industry in the U.S.A and this makes the whole supply chain more resilient in high-income countries in general. Therefore, it can be suggested that the low agricultural unemployment in the country has not caused a shortage in primary production and the country was not be affected intensively from the domestic supply crisis under COVID 19.

The evaluation and benchmarking of the results led to the following items for the OIC to draw upon:

1. Private industry is leading the sustainability efforts.
2. Public policy on food sustainability adopts the principles of "*reduce, reuse, and recycle*" in every step of the supply chain.
3. Reducing food loss and waste to divert excess food.
4. Real time monitoring of risks across the food supply chain.
5. Robust social safety nets for vulnarable households, women and children.
6. Mitigation efforts to support agriculture sector-insurance funding.
7. R&D has been a cornerstone over the two decades for a sustainable food supply chain.

However, it should also be kept in mind that;

1. OIC can not copy exactly what U.S. does as systems are less developed, less funded and data may be harder to get-reach.
2. Individual OIC members may not have the funds for supporting safety nets.
3. Protecting and maintaining the sustainability of food supply chain is vital for OIC in particular for imports to keep the food security & its pillars.
4. To mitigate all limitations a pan-OIC initiative through a strategic preparadness and response package is needed.

The analysis further revealed that the low income OIC countries are the most susceptible to demand-side transmission of the pandemic. Almost 70% of the OIC countries have intermediate-high to high levels of risks in terms of demand-side transmissions. In contrast, only 10% have a low risk of exposure to the demand side. Overall, economic and income contraction amid the COVID-19 control measures would possibly increase the poor population thereby putting more people under a food-insecure state.

The most vulnerable groups are forced to react with negative coping strategies during COVID-19 such as getting less diverse diets and selling of productive assets – to overcome the income decline. The risk on the demand side also threatens OIC members majorly rely on food imports and fiscally exports of raw commodities (e.g., oil) of which the prices have collapsed during the pandemic. This situation is applicable especially to OIC member states in the MENA region. Food import is threatened due to decreasing revenue from commodity exports, fluctuation of exchange rates, and disruption of the global agri-food chain.

The decrease in the income of the people, made it more difficult to access to the food for daily needs. In order to minimize the negative impacts of the pandemic, The OIC Member Countries kept the agri-food value chain functioning and protected the most vulnerable populations, including the displaced ones by mainly ensuring the sustainability of their food supply chains as much as possible; to minimize the negative impacts of COVID-19. In terms of Intra-OIC cooperation level, the turbulence created by COVID-19 might create an opportunity for the OIC member countries to strengthen their existing potential for cooperation with each other by:

i) Enhancing international cooperation to keep international food trade open,

ii) Forming an OIC Economic Policy Coordination Committee on COVID-19 to have joint concerted efforts,

iii) Debt relief and restructuring for OIC countries with LDC status for funding COVID-19 Response[16].

Compounded by poor market access, low level of agricultural productivity due to limited rural infrastructure and weak policy and institutional framework, the importance of concerted intra-OIC action to leverage on the various opportunities available within the OIC region is vital to ensure the sustainability of food supply chains. In this respect opportunities such as a large 1.5 billion-wide OIC market, existence of 20 largest producers of world major agricultural staple food products, a young and vibrant youthful rural population and a relatively high revenue profile from its 18 middle income fuel exporting member states and halal food market reaching to around 440 bn USD should be utilized effectively as opportunities. However; OIC member states are still heavily exporting from non-OIC members, have population growth (25%) surpassing their GDP growth (10%) and 22 OIC member states exist out of 47 globally as LDC.

As response to negative effects of COVID-19 a Strategic Preparedness and Response Package was launched by Islamic Development Bank (IsDB) to support Health-Food-Development trilogy needs of OIC member countries by Responding, Restoring and Restarting (3Rs). Respond covering short-term (1-3 months) measures has focused on health and food emergence response including social safety nets to sustain and save lives. Restore designed for mid-term (3-12 months) and Restart, long-term (more than 12 months) approach, has involved in building resilience and robust key industries. IsDB allocated US$ 2.3 billion and launched US$ 1.5 bn COVID sustainability Sukuk to implement the program (SESRIC AFS in OIC 2020). Similar programms are still needed to strengthen the resilience of the related OIC members under the effect of the pandemic.

1. Conceptual Framework and Methodology

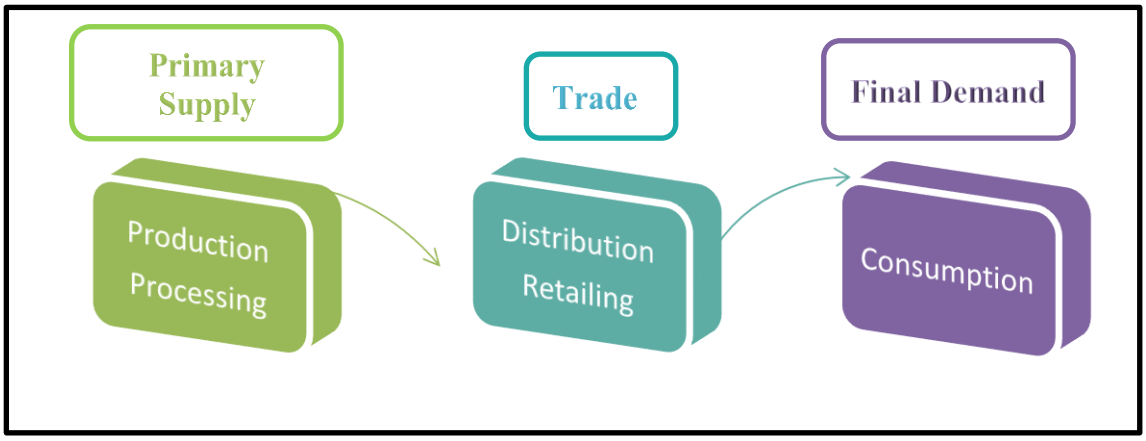
This chapter of the report introduces a conceptual and methodological framework which is presented under three sections, namely the concepts and definitions and the methodologies and data sources. The main purpose of this chapter is to present a guideline for situating the available and gathered information in a context when making the reviews and analysis in the Chapters 2-4.

1.1 Concepts and Definitions

Food insecurity has always been a global challenge for decades. From the beginning of the year 2020, in addition to the pre-existing drivers, extreme weather events and especially COVID-19 induced economic shocks, conflicts and food crisis worsened the situation at global level. This section of this chapter was structured based on the recent study on the effects of COVID-19 pandemic on food and agriculture (Schmidhuber et al., 2020). On this basis, effects of this pandemic on the food supply chain (FSC) were investigated at three stages: primary supply, trade and final demand.

Food supply chain is a summary of the main processes and activities that demonstrate how agricultural outputs become food products and ends up at the tables of customers (Figure 1)

Figure 1 Food Supply Chain



1.1.1 Effects of COVID 19 Pandemic on Food Supply Chain

Primary supply: The primary supply is the first stage to ensure access to food in a country. The effects of COVID-19 pandemic demonstrated itself as change in prices of inputs such as pesticides, fertilizers, seeds, feeds, energy, water, machinery and labour. For instance, due to the prevailing uncertainty in the pandemic conditions, distancing provisions and lockdowns caused labour shortages while energy and metal prices were decreasing at the global level. Overall effect of these provisions paved the way for a supply crisis, export restriction measures started to be taken, and this situation consequently undermined access to food in countries lacking sufficient domestic food production in 2020.

According to the FAO/IFPRI 2020 estimates, there will be a 35% job loss in the food industry, which employed over a billion people were formally employed in the World (IFPRI,2020). According to this data, 21.26% of the jobs at primary production, 60.00% of the jobs in processing, transportation and services, 39.99% of the transportation, 26.42% of the machinery services, 26.38% inputs; and 15.38% of the R&D services are at risk, mainly due to the COVID-19 pandemic. Moreover, female workers are more affected from the job loss especially in food insecure hotspots.

In general, agriculture is a labour-intensive in lower income countries and a capital-intensive industry in high-income countries. It may be suggested that if quarantine restrictions and illness itself have caused any considerable decline in labour supply in agriculture, this may lead to a decrease in primary agricultural supply as a consequence, especially for labour-intensive products such as fruits and vegetables. Moreover, while agricultural production in low-income countries is more dependent on raw materials, it is the intermediate inputs that are being dependent on in higher income countries.

Trade: In the same way as the changes in the input prices and the decrease in unemployment in logistics due to export restriction measures, the pandemic also caused price swings in agricultural and food products due to the supply crisis. During the pandemic, the whole World faced an unprecedented situation, namely a supply shortage followed by a demand shortage, and this situation catastrophically effected the food security mostly in underdeveloped World (Schmidhuber et al., 2020). In the same manner, economic shocks became a more important driver of food crisis in 2020 (FSIN, 2021).

Final demand: Not only the increase in the food prices but also decrease in purchasing power of the people caused by economic recession and unemployment negatively affected food security both at country and global level.

1.1.2 Sustainability of Food Supply Chain

The supply chain sustainability was defined by UN Global Compact as "the management of environmental, social and economic impacts and the encouragement of good governance practices, throughout the lifecycles of goods and services" (United Nations Global Compact and BSR, 2015). Another term, sustainable food value chains, was defined by FAO, as "the full range of farms and firms and their successive coordinated value-adding activities that produce particular raw agricultural materials and transform them into particular food products that are sold to final consumers and disposed of after use, in a manner that is profitable throughout, has broad-based benefits for society, and does not permanently deplete natural resources" (FAO, 2014).

From these concepts, it can be deduced that sustainability is a general concept that encompasses three main pillars, namely environment, society and economy. Therefore, when we are dealing with the sustainability of the food supply chain, it's essential to consider economic, social and environmental viability of the whole supply chain at primary production, trade and final demand level. More specifically, integration of environmentally sound practices in terms of waste management, climate change and extreme weather events; integration of social responsibility to the management of supply chains, supporting the most vulnerable and already disadvantaged population (children, women, elderly, poor, disabled, and immune supressed people) in accessing financial resources; and lastly integration of value addition in terms of economic viability of the supply chain should be the main tasks to consider when it comes to ensuring sustainability of the whole food supply chain. However, since a quantitative assessment of the whole supply chain could not be realised in the context of this report, it was preferred to make a general assessment through secondary research materials.

1.2 Methodology and Data Sources

In this report, both primary and secondary research tools and sources were used to reach its goals.

1.2.1 Primary Research

Expert Survey

A survey for the food security experts was formulated to provide data and information to be used throughout the report. This semi-structured interview is composed of 25 detailed questions

addressing both the effects of COVID 19 pandemic on the food supply chain and the pillars of food supply chain sustainability. The survey was conducted online due to COVID-19 restrictions. The questions were sent to the respondents on August 27, 2021 via e-mail and 15 responses from 9 member countries and the U.S.A. were received until September 22th, 2021. The details of the survey questions and the profile of respondents can be found in the Appendix section. The survey consists of 4 parts. First part summaries information about the experts (country, organization, area of expertise etc.). Second part focuses on the the status of food supply chain in the expert's country. The third part addresses the effects of COVID 19 pandemic on the national food supply chain and the situation regarding OIC region. And the fourth part seeks the answers to the questions regarding the solution of the problems and recommendations. Survey results were statistically analysed and results were summarized at the end of the Chapter 3.

Expert Interview

An expert interview was formulated in order to provide data and information for the Chapter 4. The interviews were conducted online due to the pandemic conditions with 7 experts from the four countries selected for case studies in September 2021. (2 experts from Nigeria, 2 experts form Pakistan, 3 experts from the U.S.A.). This semi-structured interview is composed of 10 detailed questions addressing specific information on the effects of COVID 19 in the case-study countries regarding the national food supply chain issues. The details of the interview questions and the profile of interviewees can be found in the Appendix.

SWOT Analysis

As an explanatory research study, a SWOT analysis was conducted based on the survey and interview results and review of secondary research data. Strengths and weaknesses of the current situation of food supply chains in OIC countries were listed as well as opportunities and threats in the face of the current pandemic situation.

1.2.2 Secondary Research

A number of secondary sources were used, including:

- Previous OIC studies: COMCEC's Agriculture Working Group (AWG) Analytical Reports, Outlook Reports, Food Security in OIC Member Countries Reports as well as COMCEC COVID 19 Agriculture Consultative Meeting Report and outcomes.

- Trade and sector reports: In order to guarantee the trustworthiness and consistency of this report, related information was gathered from the reports published by UN-based international organizations and respected institutions such as the International Food Policy Research Institute (IFPRI), the Organization for Economic Cooperation and Development (OECD), OIC Organization of Islamic Cooperation Statistical, Economic and Social Research and Training Center for Islamic Countries (SESRIC), Food and Agricultural Organization (FAO), Global Food Research Institute (GFRI), World Health Oorganization (WHO), Islamic Development Bank (IsDB), World Bank (WB).

- Academic articles, research papers and press publications: Information was gathered from the Web of Science Quartile 1 and 2 scale international refereed journals, books, book chapters, online journals and websites.

- Government data: Data was collected from various government publications and websites, including those of ministries and official agriculture and food security organizations primarily releasing COVID 19 data.

1.2.3 The Methodology of the Case Studies

Four country case studies, three OIC member countries and one non-OIC country, were selected to provide insights into the effects of COVID 19 on sustainability of food supply chain. The OIC countries covered were Nigeria, Pakistan and Saudi Arabia (S. Arabia). The non-OIC country was selected as United States of America (U.S.A.). USA was selected for its leading role in food supply chain management as well as efforts related to coordinate COVID 19 with food supply chain as well as releasing recent data.

These four countries were investigated in the same context as the expert survey and interview were structured. The indicators were selected to reflect the effects of COVID 19 pandemic on food supply chain at primary production, trade and final demand stages. Both online interviews, expert surveys and secondary research tools were used to collect data in order to analyse the effects of the pandemic on the food supply chain in the OIC and non-OIC case studies within the timeframe of the study.

1.2.4 Advantages and Limitations

Due to the limited time spared for the preparation of this report, in-depth qualitative analyses were performed based on the results of literature research, expert interviews and the expert survey data in order to understand the effects of COVID 19 pandemic on food supply chains in OIC countries and in the world.

Since the survey and the interviews conducted online, it's not expected to be any interviewer-interviwee bias in the data collection stage. On the other hand, the views, opinions and judgements cannot be generalized. Therefore, the answers for these interviews were not analysed in the same way as the survey results.

It's important to point out that a quantitative assessment of the whole food supply chain in terms of economic, social and environmental sustainability could not be realised in this report because a single source of measurable data on this matter does not exist. Instead, making a general assessment through secondary research materials and tools was preferred in the context of this study.

2. Global Overview of Sustainability of Food Supply Chains

COVID 19 has severely disrupted our lives, jeopardized the well-being of billions of people, and caused a (still-going-on) global food crisis in the last two years. The world's economy and its effects on global food security has been dramatic. It is forecasted that the global economy will shrink by more than 5%- the deepest recession ever seen since the Second World War. It is also estimated that, the number of people living in extreme poverty in developing countries could increase by up to 150 million if no interventions are taken immediately. The World is "not only facing a global health pandemic but also a global humanitarian catastrophe," and that, without action, COVID 19 could lead to "multiple famines of biblical proportions". (FAO 2020a, b)

The predictions are all pessimistic, mainly due to COVID 19 being unpredictable and highly transmissible, including by people who are asymptomatic but infected making it difficult to control. The virus to spread with remarkable speed through today's highly inter and intra connected World. The dilemma started when China officially recognized the first death from COVID 19, on January 9, 2020 and by early March 2020 more than 100 countries were reporting cases where the current situation is as follows (as of September 22, 2021) (Table 1). It is almost 22 months right now and over this period, the virus epicenter has shifted from China to Europe and the United States, and now many poor countries and regions including Africa, Latin America, and South Asia are facing rapidly rising infection rates and deaths, where "no one and no where is immune". (https://www.worldometers.info/coronavirus/)

Table 1 Worldwide Distribution of COVID 19 Cases (as of September 22, 2021)

Country, Other	Total Cases	Total Deaths	Total Recovered
World	230,331,480	4,723,020	207,037,316
Asia	74,481,302	1,103,412	70,558,753
Europe	57,875,090	1,207,438	53,020,682

https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases
https://www.worldometers.info/coronavirus/

The need to change daily routines essential to livelihoods, and the constant disruption of connections at local, regional, and global levels make COVID 19 shock different from economic and climate shocks. In fact, COVID 19 is a health crisis with multiple and widespread impacts on food, social systems, and economic development. The more complex nature of food, health, and economic systems is triggering the potential of COVID 19 to aggravate poverty and disrupt food systems.

The pandemic has knocked out the world economy. The spread of the novel coronavirus debilitates people's ability to harvest and buy and sell food, food systems are under threat as never before. However, the food supply chain continued to move from where it is produced to where it is needed, logistical delays notwithstanding. Countries have shown restraint, too, as most of them didn't jump to restrict food exports. The number of pandemic- related export restrictions has decreased from 18 to 7%, representing less than 1% of the share of global food trade.

Sustainability of food supply chains (SFCs) is greatly affected by the lockdowns that have triggered a steep recession. The World Bank projects the global economy will shrink 5.2% this year. The IMF's latest projection is –4.9%. The OECD is forecasting a 7.6% contraction, and a very slow recovery of 2.8% in 2021. In both rich and poor countries public debt is soaring and is expected to exceed the post-World War II peak. It is estimated that a 5 to 10% drop in GDP growth would mean an additional 38.2

to 80.3 million people in poor countries that rely on food imports falling into the hunger trap. This means the number of hungry people would jump by between 74 and 120 million. (IFPRI, 2020)

Hunger and malnutrition were significant global problems even before COVID 19. The demand collapsed for food due to lack of income and disruptions to SFCs important vulnerabilities leading to a global food crisis. The results are; more than 2 billion people didn't have regular access to safe, nutritious, and sufficient food in 2020. 35% of them went to sleep on empty stomachs; including 135 million people who were on the edge of starvation.

The effects of COVID 19 are even more pronounced in Africa and South of the Sahara and small island developing states (SIDS). The virus has shuttered tourism, leaving SIDS such as Fiji, the Maldives, and Mauritius scrambling for economic survival. The World Bank expects to see a sharp 20% drop in global remittances. Africa is bracing for the worst. The epic oil price crash has led to a global financial bust. For the continent's exporters, such as Nigeria, Chad, Libya, and Algeria, it has wiped out their principal source of revenue. A catastrophic locust outbreak in East Africa was — pre-pandemic — projected to force 25 million people in Ethiopia, Kenya, Somalia, Sudan, and Uganda to go hungry. Africa and South of the Sahara faces its first recession in 25 years and is especially vulnerable to the impact of COVID 19.

Food systems, which directly employ over a billion people, are about to lose more than 451 million jobs or 35% of formal employment, according to an unpublished FAO/IFPRI estimate. The jobs most at risk are in food processing, services, and distribution, disproportionately affecting female workers especially in food insecure hotspots (Table 2). (IFPRI, 2020)

Table 2 Formal Jobs at Risk in Food systems

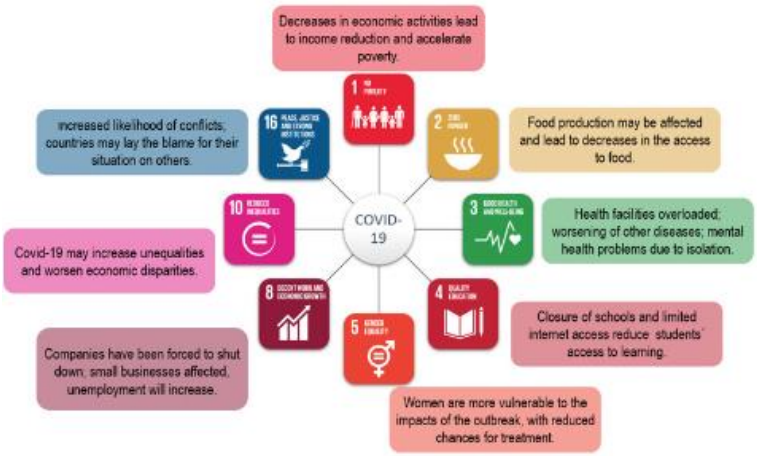
Where in value chain	Jobs (million)	Livelihoods (million)
Primary production	716,77	2,023,80
Food processing	200,73	484,54
Food services	168,97	339,44
Distribution services	96,34	241,48
Transportation services	41,61	101,05
Machinery	6,51	13,18
Inputs	4,89	11,06
R & D	0,13	0,29
Total	1,280,93	3,214,84
Total at risk due to COVID 19	451,64	1,090,89

https://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/133762/filename/133971.pdf

2.1. Primary Impacts of COVID 19 on the Sustainable Development Goals (SDGs)

COVID-19 posed threats to UN Sustainable Development Goals (SDGs), endangering their implementation set to be reached by 2030. Such impacts are already negative to developing nations, which do not have the capacity or the resources to cope with the many economic and social challenges inflicted COVID 19, a few potential impacts of COVID 19 on the SDGs are summarized in Figure 2.

Figure 2 Main Impacts of COVID 19 on the Sustainable Development Goals (SDGs)



https://www.mdpi.com/2071-1050/12/13/5343

The impacts of COVID 19 are not only limited to SDG 1 (No poverty) and SDG 2 (Zero hunger) but also it has a significant psychological impact, which is undoubtedly amplified by embedded socio-economic inequalities and uncertainty of the future. COVID-19 caused millions of people around the world without income security, no unemployment insurance or sick pay and often with very limited savings, whose living conditions are worsened. The lockdowns (global and national) prevented people from going to work, and this still persists for an unknown length of time, but potentially the rest of 2021.

SDG 3 is under threat as healthcare systems of most developing countries are ill-equipped to cope with an array of public health problems, due to lack of funding, equipment and qualified personnel. Mental- and mental related health problems are also likely to be overlooked, since the isolation of social distancing may mask or lead to an increase in the percentage of sufferers. The current pandemic not only depressed the economy (and consequently the scope of SDG 8 (Decent work and economic growth) but also increased the likelihood of conflicts (within and across borders) and therefore jeopardizes the goal of global peace and justice (SDG 16- Peace, justice and strong institutions).

The pandemic will therefore harm education in all spheres (SDG 4- Quality education), driving up the need for childcare, and causing higher economic costs, increased pressure on schools and a rise of dropout rates. More than 130 countries have implemented nationwide closures of schools and universities, impacting over 80% of the world's student population (i.e., schools and universities). Many educational institutions are attempting to maintain programs through online education. However, equity is a major constraint on access to distance learning. In developing countries, many students do not have access to the internet, or do not possess personal computers or tablets, or a safe and supportive learning environment appropriate for e-learning (UNESCO, 2020).

Gender equality (SDG 5) tends to get more uneven with the impoverishment of nations. Although numerous women are making essential contributions as leaders and frontline responders during the COVID 19 pandemic, they are also more affected by the health, economic and social impacts of the outbreak. Some impacts are expected for SDG 5 such as exacerbated burdens of unpaid care work for women and girls, rise of domestic violence due to heightened tensions in the household, decline in women's economic empowerment, exclusion from leadership roles and interrupted access to sexual and reproductive health. Similarly, inequalities in income and wealth are severe and can be expected to widen globally with the pandemic (SDG 10); those not dependent on employment will be marginally affected, while those dependent on low income will probably fall into poverty. The wide range of

resources available in the rich world will not fully reach the poor, who will be even more affected by the forthcoming economic crisis, especially in Africa. The pandemic also highlights the link between clean water and health, especially because a large percentage of the global population does not have access to proper sanitation and drinking water (SDG 6) (Leal et al, 2020; UN, 2020; Gilbert et al, 2020).

Overall, almost all of the SDGs were affected where SFCs are not immune from the direct and indirect effects. The near future may deem a re-structuring of SDGs and their permanent effects on the SFCs through reaching the 2030 goals.

2.2. Potential Impact Channels of COVID 19 on Sustainability of Food Supply Chains

The pandemic will also impact access to nutritious foods and overall diet quality through social and economic channels and disruptions in sustainability of food systems besides directly threatening people's health and well-being through viral infection. Some potential impact channels of pandemic on SFCs include the following (FAO, 2020).

- Women, children, immune suppressed and persons with disabilities will likely be much more affected, given that they are already disadvantaged in accessing economic and financial resources. The economic fallout may reduce purchasing power for sufficient, safe and nutritious foods. In addition, restrictions in personal movement may decrease access to food even for those who have the economic means to obtain it.

- The economic impact of the pandemic may have more negative impacts on diet quality than on quantity, as grain supplies do not appear to be at risk. This is because their production is less labor-intensive and they can be stored for longer periods. Demand for staple foods has traditionally been less sensitive to price change than that of fruits, vegetables, meat and dairy products.

- Suppression measures like physical distancing requirements and restrictions on movement are affecting the production and transportation of high-value, labor intensive, perishable and nutritious foods, such as fruits and vegetables, meat, milk and other dairy products. Fresh produce, in particular, often requires many people to work in close proximity to cultivate, harvest and process. In addition, these perishable foods need to be moved quickly from farm to consumers, which makes them more vulnerable to travel restrictions and market shutdowns in turbulent times.

- Closure of informal markets may exacerbate the increasing inaccessibility of nutritious foods. In addition to their social and cultural importance, informal markets (bazaars etc.) support healthy, nutritious diets as well as livelihoods of poorer population groups. The fresh foods sold in supermarkets and formal markets are often less affordable or inaccessible to urban poor groups.

- Highly processed, packaged foods that tend to be high in fats, sugars and/or salt are often less expensive than fresh and nutritious foods, especially in high- and upper-middle-income countries. These products may be consumed in higher amounts leading to lower diet quality as the lower price and the longer shelf life, coupled with limited access to fresh and nutritious foods, makes them preferable at a great extent.

Today, immuno-depressed and malnourished people worldwide are suffering disproportionally the lethal consequences of pandemic where it is felt more in OIC members states. In all these cases, the human toll comes with huge economic costs, including lost incomes and soaring public debt. The rebuilding of economies after the crisis offers a unique opportunity to transform the global FSCs and make it more resilient to future shocks, turbulences, thus ensuring sustainability for all.

To reach this goal three broad shifts in the food system are suggested in recent literatüre (WB, 2021):

• *Resilient food supply chains*. To lower the risks of food insecurity, malnutrition, food price fluctuations and simultaneously create jobs; efficient and effective food supply chains are essential. Rural transformation to empower small producers and retailers and mainstream them in the food systems economy can help build resilient food supply chains.

• *Healthy diets.* Curbing the overconsumption of animal and highly-processed food in wealthier countries and improving access to good nutrition in poorer ones can improve well-being and land use efficiency, make healthy food more affordable globally, and also slash carbon emissions. Agricultural subsidies should be retargeted towards healthy foods, taxing unhealthy foods, and aligning procurement practices, education programs and healthcare systems toward better diets. In turn, this can reduce healthcare costs globally, reduce inequality, and help us weather the next pandemic/crises with healthier individuals and cease the current negative effects of this pandemic on food systems.

• *Regenerative farming*. A shift toward sustainable and regenerative land and ocean farming connected to strong local and regional food systems can heal our soils, air and water, boosting economic resilience and local jobs. It can be attained by promoting sustainable farming, facilitating market access and leveling the financial and regulatory playing field for smaller, sustainable farmers relative to large intensive farmers.

Though current food insecurity is by and large *not* driven by food shortages, supply disruptions and inflation affecting key agricultural inputs such as fertilizers and seeds, or prolonged labor shortages due to lockdowns and travel restrictions could diminish next season's crop. If farmers are experiencing acute hunger, they may also prioritize consuming seeds as food today over planting seeds for tomorrow, raising the threat of food shortages later on. These are only some of the unfolding and indirect effects of COVID 19 on food chain sustainability where this study reveal.

In this respect significant actions including; the emergency food assistance, the protection of the basic consumption needs of the vulnerable populations, scaling up nutritional support, promotion of e-commerce for agriculture, providing productivity, enhancing safety nets, reducing post-harvest losses and improving food stocks along the value chain, removing artificial constraints to domestic trade throughout the food chain in order to link the smallholder farmers to the market, making necessary adjustments in trade and tax policies should be taken immediately.

2.3. The Turbulent Times-ever: Global Food Crises and COVID 19

The pre-pandemic has added more burden to the countries already tackling with food crises of many types. 39 countries/ territories have systematically appeared in food crises each year over the last five years. Of these, 19 have qualified as a major food crisis each year. (Table 3). The era partly covers the COVID-19 but does not reflect the post COVID-19 effects.

Table 3 Food Crises in 2017-2021: Frequency of Inclusion

5 Years	39 Countries; Afghanistan, Bangladesh, Burkina Faso, Brundi, Cameroon, Chad, Comgo, Ethiopia, Gambia, Guinea, Iraq, Kenya, Liberia, Libya, Malawi, Mali, Mozambique, Niger, Nigeria, Senegal, Sierra Lione, Somalia, Sudan, Syria, Uganda, Yemen, Zambia, Zimbabwe
4 Years	10 Countries; Angola, Cote d'Ivorie, Djibuti, Namivia, Pakistan, Palestine, Tanzania, Ukraine
3 Years	3 Countries; Cabo Verde, Lebanon (Refugees), Turkey (*Temporary protected irregular migrants)*
2Years	5 Countries; Colombia (Refugees), Ecuador (Migrants), Jordan (Refugees), Nepal, South Africa
Once	8 Countries; Congo, Egypt (Refugees), Peru (Migrants), Rwanda, Sri Lanka, Togo, Venezuela

Number of Food Crises and Major Food Crises in Last Five Years

	2016	2017	2018	2019	2020
Food Crises	48	51	53	55	55
Major Food Crises	25	32	33	35	34

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The pandemic and related containment measures have exacerbated pre-existing drivers of fragility, put fire under the inequalities and exposed structural vulnerabilities of local and global food systems and their sustainability, hitting the most economically vulnerable households particularly hard.

The IPC or the *Cadre Harmonise* (CH) technical descriptions and policy response objectives are shown in Table 4 where Africa remained the continent most affected by food crises, accounting for 63 percent of the global total number of people in Crisis or worse (Phase 3 or above) or equivalent, up from 54 percent in 2019.

Table 4 Acute food insecurity phase description and response objectives

Phase	Phase description and priority response objective
Phase 1 **None/Minimal**	Households are able to meet essential food and non-food needs without engaging in atypical and unsustainable strategies to access food and income. **Action required to build resilience and for disaster risk reduction.**
Phase 2 **Stressed**	Households have minimally adequate food consumption but are unable to afford some essential non-food expenditures without engaging in stress-coping strategies. **Action required for disaster risk reduction and to protect livelihoods.**
Phase 3 **Crisis**	Households either: • Have food consumption gaps that are reflected by high or above-usual acute malnutrition; *or* • Are marginally able to meet minimum food needs but only by depleting essential livelihood assets or through crisis-coping strategies. **URGENT ACTION required to protect livelihoods and reduce food consumption gaps.**
Phase 4 **Emergency**	Households either: • Have large food consumption gaps which are reflected in very high acute malnutrition and excess mortality; *or* • Are able to mitigate large food consumption gaps but only by employing emergency livelihood strategies and asset liquidation. **URGENT ACTION required to save lives and livelihoods.**
Phase 5 **Catastrophe/Famine**	Households have an extreme lack of food and/or other basic needs even after full employment of coping strategies. Starvation, death, destitution and extremely critical acute malnutrition levels are evident. (For Famine classification, area needs to have extreme critical levels of acute malnutrition and mortality.) Famine and Famine Likely classifications are equally severe, the only difference is the amount of reliable evidence available to support the statement. **URGENT ACTION required to revert/prevent widespread death and total collapse of livelihoods.**

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The number of people in Crisis or worse (Phase 3 or above) or equivalent in Central and Southern Africa was the highest on the continent at 40.2 million, up from 32.2 million in 2019. This increase is partly explained by the economic impact of COVID-19 and protracted conflict in the Democratic Republic of the Congo. In East Africa, 32.9 million people were in Crisis or worse (Phase 3 or above), 75 percent of them in the Sudan, Ethiopia and South Sudan. In West Africa and the Sahel, 24.8 million people were in Crisis or worse (Phase 3 or above) or equivalent – almost double the number of 2019

largely due to intensifying conflict, mass displacement and the economic impact of COVID-19 (Table 5).

Table 5 Numbers of People in Phase 3 or above by region in 2020

Region	Million
Central America and Haiti	11,8
Africa	97,9
Eastern Europe	0,6
Middle East	29,4
South Asia	15,6

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In the 10 worst food crises, over 103 million people were in Crisis or worse (Phase 3 or above) or equivalent, representing 66 percent of the total number (Table 6). (GRFC, 2021).

Table 6 10 Major Food crises with Highest Number of people in Phase 3 or above

% Of Population in Phase 3 and above	Number of people (million) Phase 3 and above
Congo 33%	21,8
Yemen 45%	13,5
Afghanistan 42%	13,2
Sudan 21%	9,6
Nigeria 9%	9,2
Ethiopia 16%	8,6
Zimbabwe 45%	4,3

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Nine of these 10 crises – Yemen, the Democratic Republic of the Congo, Afghanistan, Ethiopia, the Sudan, Syria, Nigeria, South Sudan and Haiti – were also among the 10 food crises with the highest numbers of people in Crisis or worse (Phase 3 or above) in 2019. Unfirtunately, children were among the ones hit terribly by COVID-19 as seen below (Table 7).

Table 7 Wasting and Stunting prevelance in Children under 5 years in the 10 worst food crises of 2020

Country	Wasting %	Stunting %
Yemen	16,4	46,4
Sudan	16,3	38,20
South Sudan	15,8	15,6
Syria	11,5	27,9
Ethiopia	6,8	36,8
Congo	6,5	36,8
Afghanistan	5,1	36,6
Zimbabwe	2,9	23,5

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Despite movement restrictions and the closure of international borders due to the pandemic, millions of people were internally displaced or sought refuge abroad in 2020, mainly due to conflict or, to a lesser extent, weather extremes. Out of the world's 46 million people internally displaced, nearly 30 million were during the eight worst global food crises. The four countries with the highest number of people in Crisis or worse (Phase 3 or above) – the Democratic Republic of the Congo, Yemen, Afghanistan and the Syria – were among the world's five countries with the highest number of internally displaced people (GRFC 2021, UNHCR 2021) (Table 8).

Table 8 Numbers of IDPs and refugees/asylum seekers in the 10 worst food crises in 2020

Country	IDPs (million people)	Refugees (million people)
Syria	6,5	0,5
Congo	5,25	0,6
Yemen	4,0	0,3
Ethiopia	3,25	0,8
Afghanistan	2,8	0,2
Nigeria	2,5	0,2
Sudan	2,4	1,25
South Sudan	1,5	0,3

https://data2.unhcr.org/en/situations/rbehagl

2.4. Major Drivers of Recent Global Food Crises under the Shadow of COVID-19

In 2020, conflict/insecurity, weather extremes, and economic shocks, including COVID-19-related economic effects constituted the three primary drivers of acute food insecurity. A total of 155 million people in 55 different countries and territories were affected (Table 9).(GRFC, 2021)

Table 9 Number of people in Crisis or worse (Phase 3 or above) or equivalent by key driver in 2020

Number of Countries	Conflict/Insecurity in 15 Countries	Weather Extremes in 17 Countries	Economic Shocks in 23 Countries
(Millions of people)	15.7	40,5	99,1

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Economic shocks were a more significant driver of food crises in 2020 as the indirect impact of COVID-19 exacerbated fragilities where over 40 million people were in Crisis or worse (Phase 3 or above) in 17 countries in 2020, up from around 24 million people in 8 countries in 2019. The socioeconomic impact of COVID-19 added further hardship in some of the worst food crises, such as Haiti, the Sudan and Zimbabwe, in which economic shocks had already been identified as the main driver in 2019.

Malnutrition was a critical issue in these food-crisis countries and particularly in those affected by protracted conflict and displacement, which disrupt the access of nutritionally vulnerable women and children to adequate food, essential services, and a safe and healthy environment even before COVID-19. Of the 10 countries with the highest prevalence of wasting, eight (Yemen, South Sudan, the Sudan, the Niger, Somalia, Chad, northern Nigeria, and Burkina Faso) are affected by protracted conflict. COVID-19 has also turned pre-existing nutrition crises – driven by poverty, conflict, natural disasters and weather extremes – into nutrition disasters. Strategies to reduce transmission of COVID-19 virus upset the production, transport, access and availability of nutritious, fresh and affordable foods, and reduced incomes, forcing millions of vulnerable families to rely on processed foods and nutrient-poor staples (Table 10).

Table 10 Estimated disruption to coverage of nutrition services nationally due to COVID-19 in the 10 worst food crises

Treatment of Child Wasting

< 10 % Drop	Afghanistan	Nigeria	Sudan
10-24 % Drop	South Sudan	Zimbabwe	
25-49 % Drop	Syrian Arab Rep.	Yemen	

Early Detection of Child Wasting

< 10 % Drop	Afghanistan	Ethiopia	
10-24 % Drop	Sudan	Syria	Yemen
25-49 % Drop	Zimbabwe		

Vitamin A Supplementation

< 10 % Drop	Syria	Nigeria	Sudan
25-49 % Drop	South Sudan	Zimbabwe	Yemen
50-74 % Drop	Nigeria		

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The forecast for food crises in 2021 reveals that over 142 million people in 40 out of the 55 countries/ territories are to be in Crisis or worse (Phase 3 or above) or equivalent in 2021. Through mid-2021, around 155 000 people will likely face Catastrophe (IPC Phase 5) in South Sudan (108 000) and Yemen (47 000). As COVID-19 pandemic is still not under control, many households will face reduced incomes associated with limited labour wage opportunities and delays in payment of government employee salaries. The economic consequences seem to be more severe as the end of 2021. In net food-importing countries, weakening currencies will continue to push up food prices and further curtail purchasing power. Overall, a worrying outlook for the worst food crises in 2021 over 97 million people will be in Crisis or worse (Phase 3 or above) in eight out of the 10 worst 2020 food crises (Table 11)

Table 11 Numbers of people forecast to be in Crises or worse (Phase 3 or above) in 2021

Country	Millions of People
Congo	27,3
Yemen	16,1
Afghanistan	13,2
Ethiopia	12,9
Nigeria	12,8
Haiti	4,4
Zimbabwe	3,4

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A major deterioration is forecasted for in Nigeria where 12.8 million people are expected to be in Crisis or worse (Phase 3 or above) during the lean season in June– August 2021– an increase of 21 percent from the 2020 peak. The Nigerian economy is forecast to face its worst recession since the 1980s and staple food prices are expected to remain high, particularly in conflict- affected areas.

2.5. Regional Overview of Food Crises under COVID-19

2.5.1. Central and Southern Africa

Around 8.5 million children under 5 were expected to suffer from wasting in 2020 and into 2021, with approximately 2.3 million of them requiring life-saving treatment for severe wasting. This represents a 25 percent increase compared with the beginning of 2020 in part attributable to the effects of COVID-19 related restrictions (Table 12). (GRFC, 2021)

Table 12 Estimated Disruption to coverage of Vitamin A supplementation nationally due to COVİD 19

< 10 % Drop	Zambia		
10-24 % Drop	Angola	Eswatini	
25-49 % Drop	Lesotho	Madagascar	Zimbabwe
50 – 74 % Drop	Malawi	Mozambique	Congo

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Conflict and climate shocks are the main determinants of acute food insecurity in this region. In 2020, the adverse economic effects of COVID-19 restrictions contributed to a sharp rise in the number of people in Crisis or worse (Phase 3 or above) in the region.

2.5.2. East Africa

With the onset of the COVID-19 pandemic in 2020, it was estimated that wasting across the region could increase by up to 25 percent. Generally, across the region, there were fewer admissions for the treatment of severe wasting in 2020 compared to 2019. Varied trends were recorded from country to country, with lower admissions noted in Burundi, Kenya, South Sudan and Uganda, versus higher admissions noted in Ethiopia and Rwanda, and largely unchanged in Somalia. While the COVID-19 pandemic is likely to have had an impact on wasting service delivery (Table 13).

Table 13 Estimated Disruption to coverage of treatment of child wasting services nationally due to COVID-19

< 10 % Drop	Sudan	
10-24 % Drop	South Sudan	Uganda
25-49 % Drop	Kenya	

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The compounding impacts of climatic shocks, conflict and insecurity, adverse macroeconomic shocks, desert locust invasion and the COVID-19 pandemic, on top of protracted food insecurity from past shocks, will likely continue to drive acute food insecurity in the region in 2021 (Headey et al, 2020).

2.5.3. West Africa

Across West Africa, mass displacement coupled with the socioeconomic impact of COVID-19 sharply reduced coverage of basic social services, particularly nutrition services, leading to extremely high numbers of wasted children in 2020.

The numbers of wasted children were particularly high in the Sahel countries. Before the COVID-19 pandemic, 4.5 million cases of wasting were expected in 2020 across Burkina Faso, Chad, Mali, Mauritania, the Niger and Senegal driven by poor maternal nutrition and infant feeding practices, high

levels of childhood illnesses and water-borne diseases, fragile health systems, poor access to clean water and sanitation and chronic poverty (Table 14).

Table 14 Estimated disruption to coverage of early detection of child wasting services nationally due to COVID-19

< 10 % Drop	Cameroon	Chad
10-24 % Drop	Guinea	
25-49 % Drop	Senegal	
50 – 74 % Drop	Libya	

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In 2020, multiple drivers of acute food insecurity and malnutrition – conflict and mass displacements, COVID-19-related market disruptions, high food prices and falling income as well as destructive floods – occurred simultaneously in an already fragile environment, driving up the aggregate number of people in Crisis or worse (Phase 3 or above) or equivalent. The already grave situation in northern Nigeria deteriorated dramatically with the number of people in Crisis or worse (Phase 3 or above) increasing from a peak of 5 million in June–August 2019 to 9.2 million in October–December 2020, largely due to intensifying conflict, the crippling economic impacts of falling oil revenues and COVID-19, as well as devastating floods. A World Bank report estimated that the COVID-19 shock would push about 5 million more Nigerians into poverty in 2020. In 2020, the situation in Adamawa, Borno and Yobe was worse than during the 2018 and 2019 lean seasons with 3.4 million people in Crisis or worse (Phase 3 or above), 1.8 million of them in Borno state (GEP, 2021).

2.5.4. Middle East and South Asia

Conflict has precipitated a devastating economic decline in many countries of the region, notably for Yemen and the Syria and its refugee populations. COVID-19 containment measures have further exacerbated the decline. Three of the world's worst 10 food crises – Yemen, Afghanistan and the Syria – were in the Middle East and South Asia in 2020.

In 2020, the escalating conflict and economic decline, plus the overwhelming impact of the COVID-19 pandemic and funding shortfalls exacerbated these drivers and threatened to drive increases in acute malnutrition (UNICEF, October 2020). Wasting levels among children under the age of 5 years were the highest ever recorded in southern districts of Yemen in 2020 with more than 0.5 million cases (Table 15).

Table 15 Estimated disruption to coverage of early detection of child wasting services nationally due to COVID-19

< 10 % Drop	Lebanon	
10-24 % Drop	Palestine	Yemen

https://www.wfp.org/publications/global-report-food-crises-2021

In Pakistan's Khyber Pakhtunkhwa region bordering Afghanistan, more than 1.2 million people were in Crisis or worse (Phase 3 or above), representing 25 percent of the inhabitants of this remote area, according to a pre- COVID-19 analysis in March. Continued conflict, displacement and deep economic crises across the three worst food crises in South Asia and the Middle East will keep driving alarming numbers of acutely food-insecure people in 2021.

2.6. Possible Silver Linings of COVID-19 on Food Supply Chain (FSC) Crises

Food supply chains must keep moving to protect the health of all supply chain workers. Economic recovery cannot come at the expense of health, as seen in meat processing plants in the United States and Germany, and wholesale markets in Mexico, Peru, and Brazil. *Health is a precondition for economic recovery; and food is a precondition for health*. Similarly, there is a need to increase testing capacity at ports to allow vessel crews to disembark without the need to self-quarantine and minimize disruption to maritime transportation.

It is equally critical that smallholder farmers and micro, small, and medium-sized enterprises (MSMEs) keep operating. In poorer countries, these play a crucial role in supplying food to poor consumers. Supply chain disruptions have hit MSMEs hard, and they need access to finance to stay afloat during the drawn-out period between recession and an upturn in a U-shaped recovery. Central banks or international financial institutions should provide warranties, so that banks can help MSMEs with highly concessional emergency loans, business continuity grants, and moratoriums on loan repayments, as well as short-term stimulus packages that support sales, cash flow, and working capital. Banks should set lending targets for smallholder producers and engage in inclusive agricultural investment.

If small enterprises in agricultural value chains are shut down, the problems of food access and food availability could intersect, creating a nightmare scenario to the world which is already ill-equipped to handle. Finally, countries have to accelerate intraregional trade. Exports can mitigate losses in revenues and imports can improve food availability and stabilize local food prices. In both exporting and importing countries, access to various markets can boost producers' productivity and income.

For Africa, trade within the continent is especially important, because the region can create demand to compensate the weak demand from Europe. African countries should develop food safety standards across the value chain and ramp up access to infrastructure. The first is vital, as it would reduce nontariff trade barriers and prevent governments from imposing blanket import restrictions.

COVID-19 has amplified the voices of antiglobalization. It is setting off calls for food self-sufficiency as well. It's theretically correct but practically impossible currently as no country has all the natural resources to produce the food it needs in the variety it needs. 'Facilitating global trade, but not promoting self-sufficiency, is the key to boost food security'.

COVID-19 has also given us some opportunity areas to make investments that will lay the foundation to reset food systems and whose returns will accrue far into the future; such as (IFPRI, 2020):

- First, food systems solutions to ensure the right kind of food gets to those most vulnerable are possible. During COVID-19, the bureaucratic, financial, logistical, and technological reasons that always seemed to make actions impossible or improbable have fallen away. This shows, at its heart, that it is a political choice of whether to act or not. When there is a will, change is possible.

- Second, concerted, creative, and cross-sectoral intervention is needed to get food systems working for better diets. It's not something that can simply be left to happen without a clear plan. Important as government is in these interventions, innovation also needs to involve communities, businesses, and partnerships. Creative thinking is needed to find the right solution from the diversity of possible inno- vations; this is not the time to fall back into pre-held assumptions about how food systems ought to work. Solutions can come in the form of hard regulation, for example, as well as business-driven solutions, through local markets as well as global ones.

- Third, is a huge opportunity to build evidence for the way forward. COVID-19 has provided a real-life innovation lab, a testing ground for big ideas. What can we learn from this to redesign food systems? Experimenting our way to the future can and should be a way forward. A next step should be to assess what can be learned about what works (and what does not) and which innovations show most promise in effecting food systems change at different levels.

The evidence shows that lockdowns around the world have had a profound impact on the markets, transport, and labor supply needed to produce, distribute, and sell nutritious foods. With reports of vegetables rotting in the fields and milk being thrown away while people go without, a clear mismatch has emerged between supply and demand.

COVID-19 has disrupted food systems everywhere. But it has also provided an unprecedented opportunity for innovation, a space in time when immediate needs have spurred responses never seen before, a base on which to redesign food systems for the better. The above silver linings may prevent millions of people from facing outright starvation (IFPRI, 2020).

3. Overview of the Impact of COVID-19 on Sustainability of Food Supply Chains (FSCs) in OIC Member States

As of October 2nd, 2021, there are 34.3 million confirmed cases, 0.6 million fatalities and only 0.28 million people are fully vaccinated in OIC member countries and the first COVID-19 cases were reported on 25 January 2020 by Malaysia with 3 cases.

At the national level, the OIC Member States have mobilized their resources to tackle the devastating consequences of the COVID-19 pandemic on health, economy, trade, tourism and social life by taking immediate and decisive preventive, treatment and sensitization measures. The measures taken at the national level will not suffice to match the global scale and complexity of the crisis as detailed above. To truly be able to face this global crisis, the response must come to effective grips with the unique nature and scale of the outbreak of this pandemic, as the situation demands greater coordinated and joint efforts amongst the member countries. This is, in fact, in line with the objectives of the OIC Charter that calls for *cooperation and coordination among Member States in humanitarian emergencies*.

The OIC has deployed tremendous efforts to intensify joint Islamic action and solidarity in confronting the pandemic since the beginning of the turbulent times: i) the convening of the Health Steering Committee meeting on April 9, 2020, ii) the Second Fiqh Medical Symposium of the International Islamic Fiqh Academy on April 16, 2020, iii) the Executive Committee meeting at the level of Foreign Ministers, held on April 22, 2020, and finally iv) COVID-19 Agriculture Consultative Meeting held on June 30th, 2020.

In addition; the OIC's institutions and financing organs have adopted rapid response initiatives by allocating financial resources to Member States to contain the effects of the coronavirus pandemic and its economic and social impacts, notably the launching by the IsDB Group of a US$ 2.3 billion strategic preparedness and response program to the benefit of many Member States, and ISF's US$ 1 million emergency assistance fund to help Member States, especially to Least Developed Countries (LDCs).

Almost all of the OIC member countries reported confirmed cases of COVID-19, as they are not immune to the waves of socio-economic shocks caused by the pandemic. Like many other countries around the world, the OIC member countries have started to witness the adverse and disproportionate collective

effects of the virus on their economies and societies. While it is important to highlight the heterogeneity of the member countries concerning their socio- economic development and response to the pandemic, it is also salient to bear in mind that OIC countries are categorized as "developing countries", and 21 of them are even classified as "LDCs".

Although it is excessively difficult to measure the real economic impacts of pandemic on, in a rapidly changing environment-i.e., the level of production, employment, consumer spending, international trade, food security and learning- in OIC member states a close review of the recent literature revealed the following data to attention.

The pandemic substantially impacted all aspects of lives in OIC member states. It is estimated that more than 25 million increases in the number of unemployed people. This would correspond to around 0.7% increase in global unemployment rates under current levels of labour force participation rate. If the rate of unemployment increases at the same rate in OIC countries and reaches 7.4% (from 6.7%), the total number of unemployed persons would increase from its previously estimated level of 47.7 million to 53.3 million in 2020 (Table 16). If unemployment rates would further increase to 7.7% (by 1%), this number would exceed 55 million people. This would result in huge policy challenges for OIC governments in accommodating an additional 8 million unemployed people and tackling the socio-economic problems of affected populations during the post-crisis period (SESRIC 2020).

Table 16 Possible Changes in Unemployed Persons in OIC Member States (Million)

2017	2018	2019	2020 (Scenario 1)	2020 (Scenario 2)	2020 (Scenario 3
44	46	47,1	47,7	53,3	55,4

https://www.sesric.org/files/article/724.pdf

International tourism is one of the main economic activities and an important source of foreign exchange earnings, economic growth and employment in many countries. Around 10% of the world's GDP is generated in this sector. Tourism sector creates 1 in every 4 new jobs across the globe. In 2019, international tourism accounted for 8% of total GDP of OIC countries and provided jobs for more than 45 million people (WTC 2021).

Tourism sector has direct and indirect linkages with 185-supply side activities in the economy, COVID-19 shock affected a chain of economic activities from transportation to hoteliers including agriculture. According to UNWTO, globally around 80% of all tourism businesses are small-and-medium-sized enterprises (SMEs) that have limited sources to survive in case of an economic shock due to the outbreak. The outbreak is further expected to weaken intra-OIC tourism activities as well in 2021. Intra-OIC tourist arrivals are projected to be recorded at 68.2 million in scenario 1 and 59.7 million in scenario 2. Those figures are significantly lower compared to the baseline projection of 85.3 million intra-OIC tourist arrivals in 2020 (Table 17) (OECD 2020; ILO 2021; WTO 2020).

Table 17 The Potential Impacts of COVID-19 on International Tourism in OIC Countries in 2020

	All Tourist Activities (Millions)	All Tourism Receipts (Billion USD)	Intra-OIC Tourist Arrivals (Millions)	Intra-OIC Tourism Receipts (Billion USD)
Baseline (No COVID-19)	154,2	192,8	85,3	71,5
Scenario 1 (20% contraction due to COVID-19)	123,3	154,2	68,2	57,2
Scenario 2 (30% contraction due to COVID-19)	107,9	135,0	59,7	50,1

https://www.sesric.org/files/article/724.pdf

The airline companies in many OIC countries also canceled their international flights starting from March 2020 due to the travel restrictions, lockdown measures and curfew. During April 2020, the magnitude of reduction in those OIC countries' seat capacities ranged between 64% (S. Arabia) and 89% (Turkey). Like air transportation, marine transportation companies also have difficult times due to pandemic. The reduction in international trade and output volume reduced the global demand for oil and raw materials.

Overall, it is a combination of various factors such as the availability of efficient public mechanisms, financial resources and crisis-response preparedness that determine how and to which extent each OIC member country can successfully respond(ed) and recover(ed) from the Impact of COVID-19 on Sustainability of Food Supply Chains (FSCs) (SESRIC 2020).

The areas mentioned above certainly affected agriculture in most of the OIC member countries, where it is the leading sectors in terms of its contribution to income, employment, and trade. In 2019, OIC agricultural gross domestic production (GDP) reached 1720 billion US Dollars with a share of 35 percent in the world's agricultural production. Furthermore, the number of people employed in the agricultural sector in the OIC member countries reached 223 million in 2019, which accounts for 26 percent of world's agricultural employment. Agricultural commodity trade of the 57 OIC member countries has increased considerably in the period from 1990 to 2017 and reached 356 billion US Dollars, the export/import ratio is around 65% where most of the OIC member countries still have trade deficits in agriculture (COMCEC 2019).

In the face of a global viral pandemic, science on resilient, healthy, and sustainable food systems has never been more critical. As the COVID-19 pandemic spreads, social and economic relief measures—including fiscal stimulus and expansion of social safety nets—are crucial to prevent poverty and hunger from rising dramatically in OIC countries. Without substantial emergency relief, 140 million people could fall into extreme poverty, potentially increasing hunger and malnutrition for millions. The world's most vulnerable, including women, children, smallholder farmers, and the urban poor, are the hardest hit (Table 18).

Table 18 Impact of COVID-19 global economic crises on extreme poverty

	World		Africa South of Sahara		South Asia	
	Total Population	**Rural Population**	**Total Population**	**Rural Population**	**Total Population**	**Rural Population**
Additional Number of poor (Millions)	145	85	80	38	42	38
Relative Increase in the number of poor (%)	20%	15%	23%	15%	15%	14%

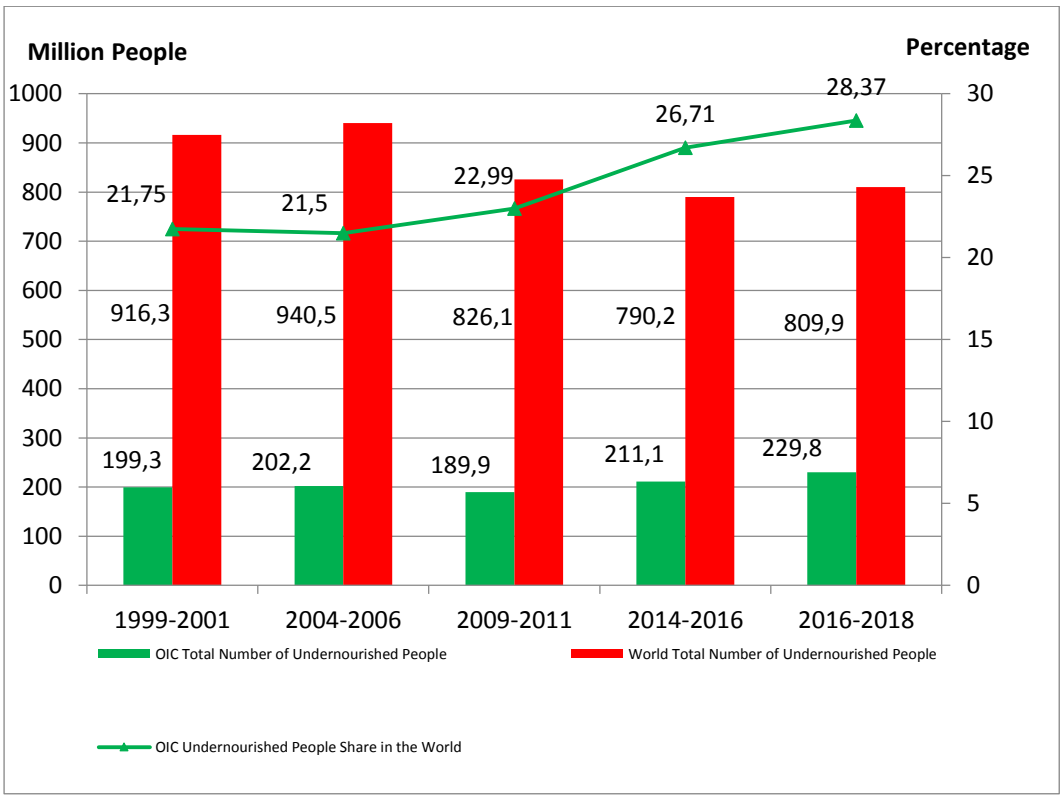
https://www.ifpri.org/blog/poverty-and-food-insecurity-could-grow-dramatically-COVID-19-spreads

The World Bank report on global poverty indicates that even though Sub-Saharan Africa (SSA) has so far been hit relatively less by the outbreak, projections suggest that it will be the region hit hardest concerning increased extreme poverty. Twenty-three million of the people pushed into poverty worldwide are forecasted to be in the SSA region in 2020, with many of them being OIC member countries (Lakner et al, 2020).

Fifteen OIC countries had higher proportions of their population below the international poverty line in 2018. These countries will require particular attention as the social issues will be even further aggravated by the socio-economic impacts of COVID-19, pushing millions of people in the OIC countries into poverty and extreme poverty categories, which will have severe social implications (SESRIC 2020).

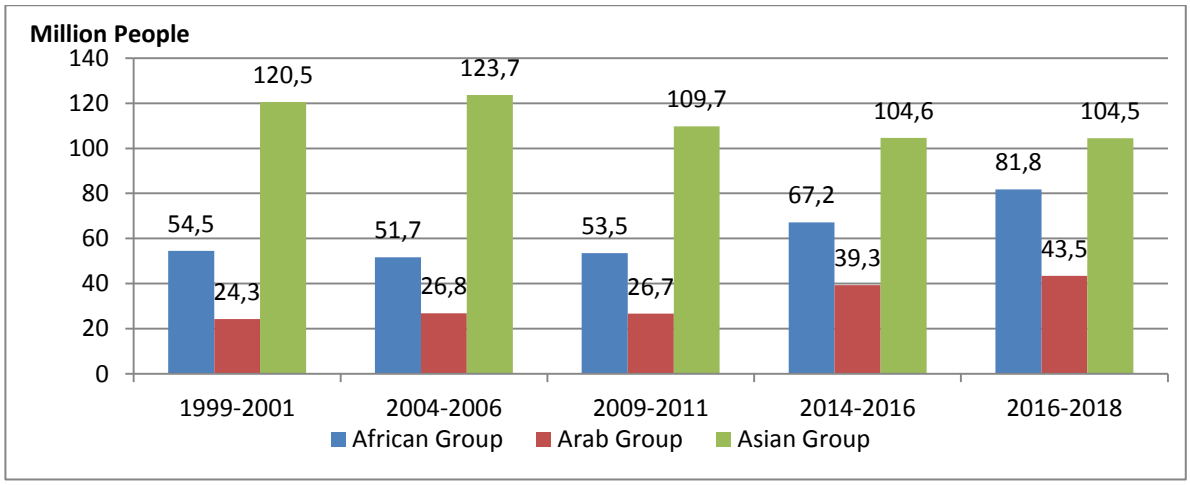
Figure 3 and 4 below displays that as of 2016-2018, 229.8 million people are expected to be undernourished in the OIC member countries which accounts for 28.37 percent of undernourished people in the World.

Figure 3 Undernourished People in the OIC and its Share in the World



https://sbb.gov.tr/wp-content/uploads/2019/10/Agriculture_Outlook_2019_October.pdf

Figure 4 Undernourished People in the OIC by Sub-Regions



https://sbb.gov.tr/wp-content/uploads/2019/10/Agriculture_Outlook_2019_October.pdf

Food insecurity has already become one of the biggest problems in many OIC countries. The latest FAO data pointed out that on average 47.9% of the total population in OIC countries suffer food insecurity problems, quite higher than the world average of 25.4%. To make matters worse, several OIC countries in East Africa, are currently fighting their way to control the decade's worst desert locust swarms' outbreak, which threatens food security in the region. The occurrence of the pandemic could further amplify the deterioration of food security, if not handled with correct policy measures (FAOSTAT 2021).

To prevent worsening of food crisis, OIC countries need to assess and take appropriate actions to save guard the access to food, keep global food supply chains alive, and mitigate the pandemic's impacts across the agri-food systems. Moreover, special attention must be put to the vulnerable population as the impacts of the pandemic hit the hardest on the poorest and most vulnerable groups, including the displaced. The shock on the food supply-chain increased food prices which makes food more difficult to attain. Poor households also often do not have enough savings and lack of access to credit, risking themselves deeper to poverty (Cullen et. al, 2020).

Developing economies as most OIC member states are wastly hurt by the economic fallout caused by their own social distancing measures and by increased morbidity affecting the labor supply for farming and other business activity.

The economic fallout led to a decline of their aggregate GDP of 3.6%, but economies in Africa south of the Sahara, Southeast Asia and Latin America were hit much harder due to their relatively high dependence on trade and primary commodity exports.

Economies in Africa to be hit hardest (almost a 9% decline) but agri-food sectors may be spared and expand, as the collapse in export earnings and loss of capacity to import food push up domestic production. Lower labor demand in urban service sectors may push workers to return to agriculture, also contributing to greater domestic food production. With more workers in the sector, however, individual incomes would remain low.

Without social and economic mitigation measures such as fiscal stimulus and expansion of social safety nets, the impact on poverty would be devastating. In addition to the 20% global increase in extreme poverty noted above, the scenario indicates urban and rural populations in Africa south of the Sahara would suffer most, as 80 million more people would join the ranks of the poor, a 23% increase. The number of poor in South Asia would increase by 15% or 42 million (Table 19). As these estimates refer to the extreme poor, i.e., those who typically lack sufficient means to buy enough food, a commensurate rise in the number of food-insecure people is expected.

Table 19 COVID-19 Global Economic Recession % Change from Base Year Values*

	Real GDP	Household Consumption	Expert of Goods	Agrifood real value added	Agrifood exports
World	- 5.0	- 1.0	- 20.9	- 1.8	- 24.8
Developed Countries	- 6.2	- 0.1	- 23.5	- 3.1	- 23.8
Developing Countries	- 3.6	- 2.5	- 18.0	+ 0.1	- 30.5
Africa South of Sahara	- 8.9	- 3.2	- 35.2	+ 3.9	- 20.6
South Asia	- 5.0	- 3.7	- 27.1	- 2.0	- 30.7
Southeast Asia	- 7.0	- 4.2	- 27.7	- 2.8	- 31.9
Latin America	- 5.9	- 4.4	- 30.8	- 3.9	- 28.5

https://www.ifpri.org/blog/poverty-and-food-insecurity-could-grow-dramatically-COVID-19-spreads

** April 2020 IFPRI Global Reference Scenario*

The global response to the COVID-19 must be swift and science-based, harnessing knowledge for emergency response, recovery, and resilience that can be based on four research pillars: (1) Sustainable Food Systems; (2) One Health (recognizing the linkages between human, animal, and environmental health); (3) Inclusive public programs for food security and agriculture; and (4) Policies and investments for crisis response, economic recovery, and improved future resilience.

OIC member states should be **Building back better** – not returning to business as usual following the COVID-19 outbreak –to transform food systems to reduce poverty, improve food, agriculture and nutrition security, and improve the quality of natural resources and ecosystem services, in line with global goals on sustainable development and climate change.

Based on these facts it is extremely important to analyze the impacts of COVID-19 on agriculture and food security among the OIC Member States whom already facing serious challenges in terms of food security, malnutrition and hunger. Although the pandemic has posed serious challenges for the agriculture sector and sustainability of food systems, it could even be turned into an opportunity for restructuring and transformation in a way to enhance the crisis preparedness and resilience of the agriculture sector in the face of future challenges. The following sections of the report attempt to detail this possible transformation for OIC member states.

3.1. Impacts of COVID-19 on Food Security and Agriculture in OIC

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 to ensure an active and healthy life. The primary risks to food security are not only at the country level: as the global COVID-19 crisis unfolds, disrupts the domestic food supply chains, trigger other shocks affecting food production, and loss of incomes and remittances that are creating strong tensions and food insecurity risks in many OIC countries.

The impacts of the COVID-19 pandemic on OIC agricultural and food systems are becoming increasingly apparent such as (SESRIC AFS in OIC, 2020);

- All countries affected by COVID-19 implement social distancing measures covering at least 40-50% of the population for at least 2 and 3 months.
- International and even national travel is essentially shut down.
- Only essential work i.e., food production and distribution are allowed.
- On average one-third of skilled workers were only able to continue to work efficiently.
- The containment measures as well as restrictions on travel caused bottlenecks and delays in international exports leveraging freight costs up to 3%.
- Although food and agriculture sectors are identified as essential and given priority in most countries, supply disruptions are increased leading to high levels of Food Loss and Waste (FLW) as well as post-harvest losses (5% and up).
- Even the most optimistic scenarios (including economic stimulus packages, national and international helps) cannot perturbate the negative effects in the developing countries (Fifteen OIC countries had higher proportions of their population below the international poverty line in 2018).

The contours of these impacts are shaped by changes in macroeconomic environments, energy and credit markets, and importantly, input prices and prices in agricultural factor markets. Some of these shifts resemble those of the last global crisis – the Great Recession – and the lessons learnt can help to target policy responses in addressing the challenges of the severe ongoing economic emergency which should be inherent to OIC member states. Not to detract from the global scale of the human tragedy from COVID-19, a leading indicator of the economic impact of the virus is also that of GDP growth (FAO, 2020).

COVID-19 disrupted the global food system and emphasized its structural inequity – from unequal food distribution to workers in the system going hungry. Experts are calling for a reimagining of the way we produce and distribute the food so that everyone can access to the quality food. Despite producing more food by volume than humanity has to date, millions of people remain food insecure. Agriculture is also a major contributor to environmental degradation and climate change. Although, the pandemic is still ongoing and the net effects are still to be calculated; efforts to ensure the sustainability of food supply chains (SFCs) under shocking effect of COVID-19 in OIC member states are becoming more and more difficult.

A focus on COVID-19 as an important global disaster effecting resiliency of food chain and analyzing the link between consumers and producers under the shadow of lockdowns in near future is needed. This may be formulated under the new agenda of 'post-COVID-19 effects on agriculture and food systems in OIC'. COVID-19 has put an unforeseen pressure on food supply systems and food sustainability mostly due to the policies and actions taken by governments mainly to control and minimize the effects and spread of the outbreak nationally and internationally with global restrictions on travel, trade, tourism, imports, exports and transportation. These are also the areas where COMCEC Working Groups (WGs) are working where '*WGs aim at producing and disseminating knowledge, and sharing experience and good practices. They also provide a suitable platform for creating a common understanding and approximating policies among the Member Countries to overcome their common development problems. The WGs are established for the cooperation areas defined in the COMCEC Strategy*'. As a result, food security and safety are severely affected highlighting the importance of a free and foreseen international trade system to enable an undisrupted food supply (COMCEC AWG 2021; Horizon 2020).

Last year's FAO SOFI 2020 report stressed that prior to the COVID-19 pandemic, almost 690 million people, or 8.9% of the global population, were already undernourished. Preliminary projections based on the latest available global economic outlooks, suggested that the COVID-19 pandemic may add an additional 83 to 132 million people to the ranks of the undernourished in 2020[19]. This estimate was based on new data on population, food supply and more importantly, new household survey data that enabled the revision of the inequality of food consumption for 13 countries. It is unfortunate that only after five years after the world committed to end hunger, food insecurity and all forms of malnutrition; we are still off track to achieve this objective by 2030 (Table 20). Data tell us that the world is progressing neither towards SDG target 2.1, of ensuring access to safe, nutritious and sufficient food for all people all year round, nor towards target 2.2, of eradicating all forms of malnutrition (SOFI 2020).

This year, FAO SOFI 2021 report estimated that between 720 and 811 million people in the world faced hunger in 2020 – as many as 161 million more than in 2019. Nearly 2.37 billion people did not have access to adequate food in 2020 – an increase of 320 million people in just one year. No region of the world has been spared and immune. The high cost of healthy diets and persistently high levels of poverty and income inequality continue to keep healthy diets out of reach for around 3 billion people in every region of the world. Moreover, new analysis in this report shows that the increase in the unaffordability of healthy diets is associated with higher levels of moderate or severe food insecurity (SOFI 2021).

Table 20 The Effect of COVID-19 on Hunger in the World: Number of Undernourished People

Years/(Millions)	2019 (base year)	2020	2021	2030
Scenario 1	687,8	778,3	721,7	860,3
Scenario 2	687,8	798,4	739,5	879,0
Scenario 3	687,8	827,9	765,5	909,0
Pre-COVID-19 Scenario	687,8	695,7	704,3	841,4

FAO 2021, The State of Food Security and Nutrition in the World, http://www.fao.org/publications/sofi/2021/en/

Beyond hunger, a growing number of people have had to reduce the quantity and quality of the food they consume. Two billion people, or 25.9 percent of the global population, experienced hunger or did not have regular access to nutritious and sufficient food in 2019. Additionally, food supply disruptions and the lack of income due to the loss of livelihoods and remittances as a result of COVID-19 means that households across the globe are facing increased difficulties to access nutritious foods and are only making it even more difficult for the poorer and vulnerable populations to have access to healthy diets. This jeopardizes the access to the food by the poorest even though food is available and eventually the nutritional status of the most vulnerable population groups is likely to deteriorate further due to the health and socio-economic impacts of COVID-19. Overall, these facts are very crucial for populations of OIC member states where rural population still represented more than 50 percent of the total population in 25 OIC member states, where food supply chains are fragile, having scarce health systems to tackle with the COVID-19 effects with developing logistic systems.

With the extra stimulus triggered by COVID-19, the cost of a healthy diet exceeded the international poverty line (established at USD 1.90 purchasing power parity (PPP) per person per day), making it unaffordable for the poor. The cost also exceeds average food expenditures in most countries in the Global South: around 57 percent or more of the population cannot afford a healthy diet throughout sub-Saharan Africa and Southern Asia where this is critical for most OIC member states. Over the next few decades, together with associated demographic changes, urbanization is expected to add significant challenges to tackling hunger, food insecurity, and malnutrition especially in OIC member states (COMCEC 2019).

3.2. Distrupting Effects of COVID-19 on Sustainability of FSCs in Developing Countries

COVID-19 is spreading through the developing world. Many low- and middle-income countries are continuing to report growing numbers of cases (as the time this report is prepared September-October 2021) and imposing rigorous lockdown regulations impacting all aspects of the economy. The evidence suggests that the impacts will be felt widely, but unevenly. Farm operations may be spared the worst, while SMEs in urban areas will face significant problems. Governments will have to develop policies to respond to these varied impacts to avoid supply chain disruptions, higher food prices, and severe economic fallout for millions of employees.

The review of the most recent and available literature reveals the following updated snapchat information about the current status of FSCs in developing countries (Table 21) (Reardon et al, 2020):

- Most urban and rural consumers now depend on markets, in contrast to 30 to 40 years ago when a large share of rural populations lived “off the grid” in subsistence agriculture.

- Consumers purchase 80% of all food consumed in Africa and Asia, and thus FSCs provide 80% of all the food consumed.
- Modern FSCs (dominated by large processing firms and supermarkets, capital-intensive, with relatively low labour-intensity of operations) constitute roughly 30-50% of the food systems in China, Latin America, and Southeast Asia, and 20% of the food systems in Africa and South Asia.
- Transitional FSCs (stretching from rural to urban areas, fragmented and dominated by thousands of labour-intensive SMEs) dominate food systems, constituting 50-80% of the food economies of developing Asia and Africa.

Table 21 The prevalence of Food Supply Chains (FSC) in the Food Economy

	Traditional FSC	Transitional FSC	Modern FSC
Approximate Prevalence in Africa and South Asia as share of food economy	10,5 %	70,0 %	20 %
Approximate Prevalence in Africa and South Asia as share of food economy	5 %	50 %	45 %
Main enterprise type	Home microenterprise	SMEs, wet markets	Supermarkets, large processors
Length	Short, local	Long, rural-urban	Long, rural-urban, international
Use of arrangements	No contracts, no standards	No contracts, public standards	Emerging contracts, private standards
Technology	Labour-intensive	Lobour-intensive	Capital-intensive

https://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/133762/filename/133971.pdf

Although the devastating effects of COVID-19 on the SFSCs are still going on and data collection, gathering and analysis methods and strategies are still being developed supplying great academic input to the literature in this field; as of the date of preparation of this report hypothesis listed below are among the most relevant , up-to-date and accurate (to the knowledge of the Authors) summarizing the effects of COVID-19 on FSCs in especially developing countries i.e. OIC (IFPRI, 2020):

1. *Direct impacts will be strongly felt post-farm***.** Namely, in the "midstream" (e.g., wholesale, logistics, and processing) and "downstream," in food-service enterprises.

2. *Dense urban and rural peri-urban areas are likely to be hit largely***.** Given the properties of the novel coronavirus, which is transmitted most easily via human contact, greater population densities tend to facilitate its spread.

3. *Downstream segments of retail and food service will be affected strongly***.** These downstream firms are mostly informal-sector SMEs, and are thus labour-intensive with high densities of workers in small spaces. They have little control over the hygiene practices of their product suppliers or their customers' habits.

4. *Retail and food service firms in modern FSCs face fewer problems***.** They are far less vulnerable to mandatory business closures, and also face a lower risk of clients and employees contracting the disease. The least affected are likely to be supermarket chains. Their stores can enforce the flow of

entering customers and social distancing measures. Supermarkets and fast-food chains also have more control over the food safety and hygienic practices of their FSCs, as they typically vertically coordinate with contracts and private standards (Swinnen F. and Maertens M. 2007).

5. *Direct impacts on farm populations and farm production will be much smaller than on the FSC downstream and midstream***.** This is because most small farmers in developing countries rely on family labour. The farm sector, however, will be affected indirectly by COVID-19 through the disruption of input supply chains, and of consumer demand due to lost income and other economic impacts of the pandemic.

6. *Food price increases due to COVID-19 is likely due to food shortages***.** Restrictions on FSC logistics will increase transaction costs and thus consumer prices. Speculative hoarding may occur and trigger price increases. Higher food prices are, in turn, likely to signal impending shortages. These effects can compound each other in a vicious cycle likely to cause social unrest.

7. *Economic hardship will proceed COVID-19 responses***.** Enforcing social distancing and limits on internal and external logistics in FSCs will transform health-risk problems into income and employment risks and political risks.

3.3. The impact of COVID-19 on FSCs, Sustainability, Livelihoods and Food Security in OIC Member States

Many OIC countries are already struggling with food insecurity and the occurrence of COVID-19 pandemic could further amplify the problem, if not handled with correct measures. To make matters worse, some OIC countries are experiencing multiple threats to food security such as internal conflicts, pest/locust swarms in Eastern Africa, extreme weathers such as drought and heat wave, and displaced population. These threats plus COVID-19 show that the pressure to the food insecurity in OIC region is very severe and need immediate attention (FSIN 2020).

To prevent worsening food crisis, countries need to assess and take appropriate actions to save guard the access to food, keep global food supply chains alive, and mitigate the pandemic's impacts across the agri-food systems. Moreover, special attention must be paid to the vulnerable population as the impacts of the pandemic hit the hardest on the poorest and most vulnerable groups, including the displaced. The shock on the food supply-chain increased food prices which makes food more difficult to attain. Poor households also often do not have enough savings and lack of access to credit, risking themselves deeper to poverty (Cullen, M.T. 2020).

The impacts of the COVID-19 could be directly on the food supply chains and sustainability as well as indirectly through the impact of other economic sectors. The degree of impacts will also depend on the severity of the epidemic in the OIC region as well as the level of measures taken by the governments to handle the crisis. The method of analysis reported by (Schmidhuber et al., 2020) has seemed to gained respect, citation and scientific popularity where both demand and supply sides of food and agriculture products owing to COVID-19 shocks on logistics and trade are analyzed and detailed for OIC member states as follows.

3.3.1. Food Supply

COVID19 posed a great risk on the supply side disturbing the production of food and agriculture products. The impacts are due to shocks in intermediate inputs (fertilizer, etc.), fixed capital (machines, etc.), and labour. It may come not only from stringent government efforts to contain the spread of the coronavirus; but also, from the direct implications of vastly spreading infections among

the population. The developed countries appear to be more exposed to disruptions, reflecting their highly integrated and capital-intensive agricultural systems. They depend on the supplies provided by mainly developing countries (most OIC member states). Therefore, the disruption in the supply will affect the developed countries, Europe, and Central Asia the most as seen in Table 22. For instance, a 33.42% decline in exports was noticed for cereals excluding rice, 28.28% for rice, 45.48 % in the case of meat and poultry products, and 69.85% concerning oil meals from India during March 2020.

Table 22 Comparison of the overall supply exposure of developing nations to developed nations

Share of levels of overall exposure (% of population)	High Exposure	Intermediate High Exposure	Intermediate Low Exposure	Low Exposure	Total
Arab States	15	15	35	35	100
East Asia and the Pasific	0	10	80	10	100
Europe and Central Asia	30	20	45	5	100
Latin America and the Caribbean	25	25	40	10	100
South Asia	0	25	55	20	100
Sub-Saharan Africa	10	10	50	30	100
Developed World	30	30	30	10	100

Adopted from https://doi.org/10.1016/j.crsust.2020.100014 and [99]https://doi.org/10.4060/ca8430en

By contrast, most developing regions appear less susceptible to supply shocks, reflecting their limited reliance on intermediate inputs and fixed capital. However, most farming systems in these regions are highly labour-intensive, and a widespread outbreak of COVID-19 would expose their agricultural production to possible labour shortages. This could not only compromise every step in the production process, but, given their high degree of subsistence farming, also jeopardize their food security. These outcomes possibly hold true for most OIC member states as they are developing countries. Developing countries including India, Indonesia, Ethiopia, Kenya, Mozambique, Rwanda, and Tanzania recorded food price increments of 3.8, 2.5, 3.4, 4.2, 10.5, 19.5, and 12.3%; respectively according to the Global Alliance for Improved Nutrition due to a shortage in production and import/ export sources (GAIN 2020).

Food supply has a direct effect on ensuring SDG goals; no poverty (SDG 1), and zero hunger (SDG 2). Developing countries have to safeguard their vulnerable sections like wage earners, landless laborers, malnourished sections of the society including women and children against the pandemic to be on track of achieving the SDGs (Workie et al., 2020).

Efforts to contain COVID-19 which usually restricts the movement of people and closure of businesses could have devastating impacts on the availability and affordability of various production factors in the agriculture sector. For example, disruption on the supply of pesticides or fertilizers, veterinary medicines, and other inputs could incite low availability and/or high prices of the agriculture inputs which influence yields and crop production. For instance, farmers in Pakistan are hindered to buy fertilizers due to the shutdown of fertilizer dealers, leaving disturbance on crop production. In other cases, efforts to fight desert locust outbreak in East African Countries (some of which are OIC members) are disturbed by the delay in pesticide supply due to the significant decline in global air freight. The disruption of agricultural production can also happen when people working in agriculture

become ill or constrained by restrictions on movement or activity. They will be prevented from working and even from going out from their own land or accessing markets to sell produce, buy food, or get seeds and supplies in case of lockdowns (SESRIC AFS in OIC 2020).

3.3.2. Food Demand

The demand side transmissions of COVID-19 are through disturbance on consumption. The population who suffers a loss of income is susceptible to not be able to afford food for their daily needs. This situation is amplified by a possible higher price of food due to supply disruption. At the individual country level, countries that have a high dependency on foreign food supply could have a higher risk. People in South Asia, the Middle East, and sub-Saharan Africa are particularly exposed (Table 23). These countries rely to a high extent on imported food and their low-income strata spend a large share of their overall expenditures on food. Where both risk factors coincide, e.g., for low-income consumers in the food-import dependent MENA region, the exposure to an adverse demand shock can be particularly high. Such a demand-side shock could come from high food prices, disrupted food imports, low revenues from hydrocarbon exports, or a longer slump in GDP growth.

Table 23 Comparison of the overall demand exposure of developing nations to developed nations

Share of levels of overall exposure (% of population)	High Exposure	Intermediate High Exposure	Intermediate Low Exposure	Low Exposure	Total
Arab States	45	5	30	20	100
East Asia and the Pasific	5	40	30	25	100
Europe and Central Asia	35	15	45	5	100
Latin America	5	20	55	20	100
South Asia	35	40	25	0	100
Sub-Saharan Africa	60	20	15	5	100
Developed World	0	3	27	70	100

Schmidhuber, J. Pound, J., and Qiao, B. (2020). COVID-19: Channels of transmission to food and agriculture. Rome, FAO. https://doi.org/10.4060/ca8430en

COVID- 19 resulted in a shock on the food demand by depleting the purchasing power and economic accessibility leading to a widespread loss of jobs and income for workers of the informal sector. Shock to international trade and currency exchange fluctuation could hamper the food stock, rising the local prices, and threatening the food security of the country. In Sudan for instance, amid the fight to control COVID- 19 outbreak, the prices of various staple foods have increased to record highs in March following a further devaluation of the country's currency (FAOSTAT 2021).

The country's food security risks may differ depending on the degree of exposure on both production and consumption. The developing countries, in general, have a higher risk in terms of demand-side exposure meaning the consumption side is the more vulnerable channel of transmissions of the COVID-19 impacts, rather than the production side. This is also true for many OIC countries. How *individual* countries are exposed to the various risk factors is summarized in Table 24 providing a synopsis of country-specific risks, covering the six channels of transmission enabling quantification and benchmarking (Schmidhuber et al., 2020).

In contrast, although with overall lower risks, some countries in OIC are also likely to face disruptions from the supply side, given the high integration to the global food chain and capital-intensive agriculture systems. Disruptions on the supply of inputs following shocks on trade and logistics could contract agriculture production in the short term. During the outbreak of COVID- 19, blockages to transport routes are particularly obstructive for fresh food supply chains and may also result in increased levels of FLW (FAO, 2020). In the medium and long-term, the confidence in global value chains may be eroded due to the effect of COVID-19 particularly in the trade of agricultural products. In some cases, disruptions and delays in the agricultural trade may lead to a breakdown of regional and global value chains that could further reduce the global agricultural trade volume substantially.

Table 24 Food Demand and Supply Exposure to COVID-19 (L=Low, IL= Intermediate Low, H=High, IH=Intermediate High)

Country	Share of Intermediate Inputs	Consumption of Fixed Capital per Worker	Gross Output per Worker	Share of Agricultural Exports	Overall Supply Exposure	Share of Food Expenses	Share of Agricultural Imports	Overall Demand Exposure
Afghanistan	L	IL	H	H	IH		H	
Albania	IL	IL	IH	IL	IL	H	IH	H
Algeria	L	L	IH	L	L	H	IH	H
Azerbaijan	IH	IH	IH	L	IL	H	IH	H
Bahrain	IL	IH	IL	L	L	L	IL	L
Bangladesh	IL	L	H	L	L	H	IH	H
Benin	IL	L	H	H	IH	H	H	H
Brunei	H	H	L	L	IL	IL	IL	IL
Burkina Faso	L	L	H	H	IL	H	IL	IH
Cameroon	L	L	H	H	IL	H	IH	H
Chad	L	L	H	L	L	H	IH	H
Comoros	L	L	H	H	IL	H	H	H
Côte d'Ivoire	L	IL	IH	H	IL	H	IH	H
Djibouti	H	L	H	IH	H	IH	H	H
Egypt	L	IL	IL	IH	L	IH	H	H
Gabon	IH	IH	IH	L	IL	IL	H	IH
Gambia	L	L	H	H	IL	IH	H	H
Guinea	L	L	H	L	L	H	H	H
Guinea-Bissau	IL	IL	H	H	H	H	H	H
Guyana	IL	IH	IL	IH	IL		IL	
Indonesia	IL	IL	IH	IH	IL	H	IL	IH
Iran	IH	IH	IL	IL	IL			
Iraq	IL	IH	IL	L	L	IH	H	H
Jordan	H	IH	IL	IH	H	IL	H	IH
Kazakhstan	IH	IH	IL	IL	IL	IL	IL	IL
Kuwait	IL	IH	L	L	L	IL	IH	IL
Kyrgyzstan	H	IL	IH	IL	IH	IH	IL	IL
Lebanon	L	H	L	H	IL		IH	
Libya	IL	H	IH	L	IL		H	
Malaysia	IH	IH	IL	IL	IL	IL	L	L
Maldives	IH	IL	IH	IH	IH	IH	IH	IH
Mali	L	L	IH	IH	L	H	IH	H
Mauritania	L	L	H	IH	IL	H	H	H
Morocco	IH	IL	IH	IH	IH	IH	IL	IL
Mozambique	L	L	H	IL	L	H	IH	H
Niger	L	L	H	H	IL	IH	H	H
Nigeria	IL	L	IH	L	L	IH	IL	IL
Oman	IL	IL	IH	L	L	IL	IL	IL
Pakistan	L	IL	IH	IH	IL	H	IH	H
Palestine	IH	IL	IL	H	IH	IH	H	H
Qatar	IH	H	L	L	IL	L	L	L
Saudi Arabia	L	IH	L	L	L	L	IH	IL
Senegal	L	L	H	IH	IL	H	H	H
Sierra Leone	L	L	H	IH	IL	IH	H	H
Somalia	L	L	H	H	IL		H	
Sudan	L	L	IH	H	IL	H	H	H
Suriname	IL	IH	IL	IL	IL	IH	IH	IH
Syria	IL	IH	IH	H	H		H	
Tajikistan	L	IL	H	IL	IL	H	IH	H
Togo	L	L	H	IL	L	IH	L	IL
Tunisia	IL	IH	IL	IL	IL	IL	IL	IL
Turkey	IH	IH	IL	IL	IL	IL	L	L
Turkmenistan	IL	IL	IH	L	L		IL	
Uganda	IL	L	H	H	IH	IH	IH	IH
United Arab Emirates	IH	IH	IL	L	IL	L	L	L
Uzbekistan	IL	IL	IH	IH	IL		IL	
Yemen	IH	IL	IH	IH	IH	IH	H	H

From a food security perspective, the quarantine measures (mobility restrictions, along with the loss of income and a general economic downturn) might even amplify the negative effect of agri-food trade restrictions particularly in the LDCs. Most LDCs are net food-importing developing countries; hence, their food security could be threatened, especially when export restrictions are imposed by major suppliers. Moreover, LDCs are more vulnerable to sharp increases in the price of staple crops as they have a limited capacity to produce these crops domestically (RURAL 2021, WTO 2020).

A capital-intensive agriculture system is also threatened by disruptions in credit markets, which tend to be more volatile during the crisis. Moreover, the agriculture sector in countries with labour-intensive production systems, are also exposed to labour shortages. Experience from the Ebola outbreak, for example, has shown us that the restrictions on the movement led to labour shortages at harvest time and thus giving a negative impact on agriculture productivity. This will further leave an unintended effect on food security especially in countries where subsistence farming systems predominate.

3.4. How to Respond to the Shocks and Food Security Problems in OIC Member States in the Wake of COVID-19: A closer Look

Food insecurity short-term outlook for 2019 reveals that unfortunately, most of the countries affected by food insecurity are among the OIC member countries even without the effects of COVID-19 is encountered. Among these; Yemen, Afghanistan, Ethiopia, the Syria, Sudan and Nigeria are expected to remain among the world's most food insecure countries in 2019. Large segments of populations in most of these countries risk falling into Emergency (Phase 4) levels of acute food insecurity (COMCEC Outlook 2019).

Despite stable global food prices, numerous countries are experiencing varying levels of food price inflation at the retail level due to measures taken to combat the spread of COVID-19 which in turn affected the agricultural production and food security. On the other hand, approximately one in nine people suffer from hunger or are undernourished, and the number is starting to grow again. Most of these people live in Low- and Middle-Income Countries (LMICs), where approximately 13 percent of the population is undernourished. In the last 25 years, while the number of undernourished people in the World has fallen gradually, it remained almost the same in the OIC member countries. Around 200 million (approximately 25% of all undernourished people in the world) of the world food insecure individuals still live in OIC member countries. At the sub- regional level, despite higher proportion of undernourishment in the African Group around 100 million of those live-in members of OIC Asian Group countries[16]. Nearly 2 billion people constituting quarter of the world population live in OIC member countries. Half of this population live in rural areas with agriculture being their main economic activity. More than 113 million people across 53 countries experienced acute hunger requiring urgent food, nutrition and livelihoods assistance (Phase 3 or above) in 2018 (WB 2021).

The OIC is home to a substantial proportion of the world's food-insecure population, with an average of 98 million severely food-insecure people in 2015-2017. This amounts to 14.3% of the global average for the same period and is notably higher than the average of 85.9 million for 2014-2016. Sierra Leone ranked the worst affected amongst OIC countries, with 70.6 % average prevalence of severe food insecurity in its population for 2015-2017, followed by Guinea (39.9%) and Niger (37.2%). Among the countries most vulnerable to food crises, the FAO identified 28 OIC countries with weak food systems. According to the FAO's classification for 2016, 28 OIC countries were among the world's 54 low-income food-deficit countries (LIFDCs)—nations that were net importers of food (basic foodstuff) over the preceding three years and per capita income below the threshold used by World Bank to appraise eligibility for International Development Association's (IDA) assistance. Within this frame even though

OIC countries own over quarter of world's agricultural area and produce 20% of world's agricultural value-added products, they have a trade deficit in agriculture with exports meeting only two thirds of the imports. Most of the OIC states are in Sub-Saharan Africa and dry regions of West Asia and Northeastern Africa. The majority of LIFDC-classified countries suffer from high undernourishment, intricate political conditions, and low incomes[19]. The majority of undernourished people in Africa are found in the sub-Saharan subregion, which shows an increase of about 32 million undernourished people since 2015. Hunger has been on the rise throughout sub-Saharan Africa since 2014, though the increase has been especially significant in the Eastern and the Western subregions, as well as in Middle Africa where it has reached 29.8 percent of the total population in 2019.

COVID19 has decreased both demand and supply of food and agriculture products owing to shocks on logistics and trade. The degree of impacts depends on the severity of the epidemic in the region as well as the level of measures taken by the governments to handle the crisis. The impacts hit the hardest on the poorest and most vulnerable groups, including the displaced. COVID-19 impacts the food security and agriculture in the OIC member countries seriously by creating multiple threats in many domains (i.e., pest, conflict, extreme weather) were already pressuring the agriculture and food security. COVID19 could double the number of food-insecure population(s), mostly through the disturbance on the consumption side.

In general, there are 2 channels of impacts; on supply side and on demand side both creating disturbance on consumption of agri-food products. Countries with highest and lowest demand exposure and most susceptible OIC countries overall are depicted in Tables 25, 26 and 27, respectively (SESRIC 2020; Schmidhuber et al., 2020).

Table 25 OIC Countries with Highest Demand Exposure

Country Name	Share of Food Expenses	Share of Agri Import	Overall Demand Exposure	Severe Food Insecurity Prevalence (%)
Sierra Leone	Int. High	High	High	68,6
Yemen	Int. High	High	High	56,3
Guinea	High	High	High	41,7
Niger	Int. High	High	High	41,0
Mozambique	High	Int. High	High	40,8
Cameroon	High	Int. High	High	39,9
Palestine	Int. High	High	High	34,5
Gambia	Int. High	High	High	28,6
Cote d'Ivorie	High	Int. High	High	28,0
Sudan	High	High	High	14,6

Table 26 OIC Countries with Highest Supply Exposure

Country Name	Share of Intermediate Inputs	Consumption of Fixed Capital/ Worker	Gross Output/ Worker	Share of Agri Export	Overall Supply Exposure	Severe Food Insecurity Prevalence (%)
Guinea	Int. Low	Int. Low	High	High	High	5,4
Syria	Int. Low	Int. High	Int. High	High	High	36,1
Djiboti	High	Low	High	Int. High	High	0,0
Jordan	High	Int. High	Int. Low	Int. High	High	0,0
Afghanistan	Low	Int. Low	High	High	Int. High	31,8
Uganda	Int. Low	Low	High	High	Int. High	3,5
Benin	Int. Low	Low	High	High	Int. High	0,0
Palestine	Int. High	Int. Low	Int. Low	High	Int. High	34,5
Yemen	Int. High	Int. Low	Int. High	Int. High	Int. High	56,3
Maldives	Int. High	Int. Low	Int. High	Int. High	Int. High	0,0

https://www.sesric.org/files/article/748.pdf

The low income OIC countries are the most susceptible to demand-side transmission of the pandemic. Almost 70% of the OIC countries have intermediate-high to high levels of risks in terms of demand-side transmissions. In contrast, only 10% have a low risk of exposure to the demand side. Overall, economic and income contraction amid the COVID-19 control measures would possibly increase the poor population thereby putting more people under a food-insecure state.

Table 27 Overall Exposure of OIC Countries

Share of levels of overall exposure (%)	High Exposure	Intermediate High Exposure	Intermediate Low Exposure	Low Exposure	Total
Overall Demand Exposure	54,2	14,6	20,8	10,4	100
Overall Supply Exposure	7,0	14,0	52,6	26,3	100

https://www.sesric.org/files/article/748.pdf

The most vulnerable groups are forced to react with negative coping strategies during COVID-19 such as getting less diverse diets and selling of productive assets – to overcome the income decline. The risk on the demand side also threatens OIC members majorly rely on food imports and fiscally exports of raw commodities (e.g., oil) of which the prices have collapsed during the pandemic. This situation is applicable especially to OIC member states in the MENA region. Food import is threatened due to decreasing revenue from commodity exports, fluctuation of exchange rates, and disruption of the global agri-food chain (FAOSTAT, 2021).

The decrease in the income of the people, made it more difficult to access to the food for daily needs. In order to minimize the negative impacts of the pandemic, the OIC Member Countries kept the agri-food value chain functioning and protected the most vulnerable populations, including the displaced ones by mainly ensuring the sustainability of their food supply chains as much as possible; to minimize the negative impacts of COVID-19. In terms of Intra-OIC cooperation level, the turbulence created by COVID-19 might create an opportunity for the OIC member countries to strengthen their existing potential for cooperation with each other by: i) enhancing international cooperation to keep international food trade open, ii) forming an OIC Economic Policy Coordination Committee on COVID-19 to have joint concerted efforts, iii) debt relief and restructuring for OIC countries with LDC status for funding COVID-19 Response (SESRIC 2020; SESRIC AFS in OIC 2020) .
Compounded by poor market access, low level of agricultural productivity due to limited rural infrastructure and weak policy and institutional framework, the importance of concerted intra-OIC action to leverage on the various opportunities available within the OIC region is vital to ensure the sustainability of food supply chains. In this respect opportunities such as a large 1.5 billion-wide OIC market, existence of 20 largest producers of world major agricultural staple food products, a young and vibrant youthful rural population and a relatively high revenue profile from its 18 middle income fuel exporting member states and halal food market reaching to around 440 bn USD should be utilized effectively as opportunities. However; OIC member states are still heavily exporting from non-OIC members, have population growth (25%) surpassing their GDP growth (10%) and 22 OIC member states exist out of 47 globally as LDC.

Tracing the impacts of COVID-19, a sharp decline in local food production between 2.6-7%, initial export restrictions by some countries and the logistical problems arising from the lockdown measures have disrupted access to food supplies and disturbed the continuity of the food supply chain. In this regard, measures were taken to appeal member states against food export restrictions, including financial interventions by relevant OIC funding agencies, such as Islamic Solidarity Fund (ISF), and the various subsidiaries of the Islamic Development Bank Group (IsDB) or national responses ranging from palliatives and bailout funds to the private sector to address job losses and national campaigns against food loss and waste (FLW).

On the medium-term measures, promoting application of scientific methods towards increasing food production and nutrition security in the member states such as promoting agricultural biodiversity, water use efficiency for food and agriculture and the implementation of such programmes as OIC programme on development of strategic commodities, the creation of a regional food security reserve, and leveraging the COMCEC project funding mechanism, among others should be taken into action (IOFS 2020; IsDB 2020).

3.5 Survey Results

This survey was composed of 25 detailed questions addressing both the effects of COVID-19 pandemic on the food supply chain and the pillars of food supply chain sustainability. The survey was conducted online due to COVID-19 restrictions. The questions were sent to the respondents on August 27, 2021 via e-mail and 15 responses from 9 member countries and the U.S.A. were received until September 23rd, 2021.

The survey consisted of 4 parts. First part summaries information about the experts (country, organization, etc.). A total of 15 surveys have been received (Egypt, Indonesia (2), Morocco, Palestine (2), Pakistan (3), Nigeria, Qatar, Turkey, Tunisia, USA). Majority of the respodents were governmental officials (9 governmental officials, 4 academicians, 1 from private sector and 1 from a non-governmental organization).

Second part focused on the status of food supply chain in the expert's country and this part was sectioned at three levels: effects on the primary production, on trade, and on the final demand. In terms of the primary production, only the experts from Qatar, Pakistan and the U.S.A. defined the structure of the agricultural production as capital-intensive, whereas the responses from Egypt and Nigeria defined it as labour and capital intensive and the rest mentioned it as labour-intensive. According to the majority of the results, the input prices of pesticides, fertilizers and seeds have either increased during the pandemic (8 increase, 5 unchanged, 1 decrease). Likewise, input prices of machinery and power have ether increased or stayed the same during the pandemic (6 increase, 6 unchanged, 2 decrease). Probably due to the lockdowns and other restrictive measures, availability of agricultural workers mostly decreased when compared to the pre-pandemic conditions (9 decrease, 4 decrease, 2 unchanged). The availability of the food mostly unchanged or increased (6 decrease, 4 increase, 5 unchanged) as a consequence of the change in the agricultural inputs mentioned above.

On the trade side, the data demonstrated that food availability seems to be more affected from price swings (4 increased, 5 unchanged, 5 decreased) rather than the export bans or restrictions (1 increased, 5 unchanged, 8 decreased).

In terms of the final demand, three questions were asked: how purchasing power of the consumers, access to food and food insecurity and malnutrition have changed due to the pandemic. According to the results, there is a widespread agreement that all these indicators were substantially detoriated during the pandemic. For instance, except Pakistan (positively affected) and Egypt (not affected), all the replies were indicating a decrease in the purchasing power (13 decreased). Likewise, access to food (80%) (3 not affected, 12 decreased), and food insecurity and malnutrition were substantially affected (64%) (5 not affected, 9 decreased) due to the pandemic.

The third part addresses the effects of COVID-19 pandemic on the national food supply chain and the situation regarding OIC region. The vast majority of the respondents from the OIC members indicated that there is a formal food sustainability strategy (sustainability of food supply chains in terms of environment, social and economic perspectives) in their country (10 available, 3 not available, 1 no answer). On the food sustainability policies and programs in their country, 9 respondents indicated an effective implementation whereas 3 stated just the opposite and 2 did not provide any answer. In the same manner, 9 respondents indicated that there is a national information system in place to track food supply chains while 4 stated just the opposite and 2 did not reply the question. When it comes to the widespread application of environmentally sound practices along the supply chain (in the stages of production, process, trade and distribution), 8 stated that there are examples of this applications whereas 4 stated just the opposite and 2 did not reply the question. Likewise, about the widespread application of social responsibility practices such as providing decent jobs, inclusive value chains, social investments etc., 7 indicated that there are applications in place, 4 stated just the opposite and 3 did not provide an answer.

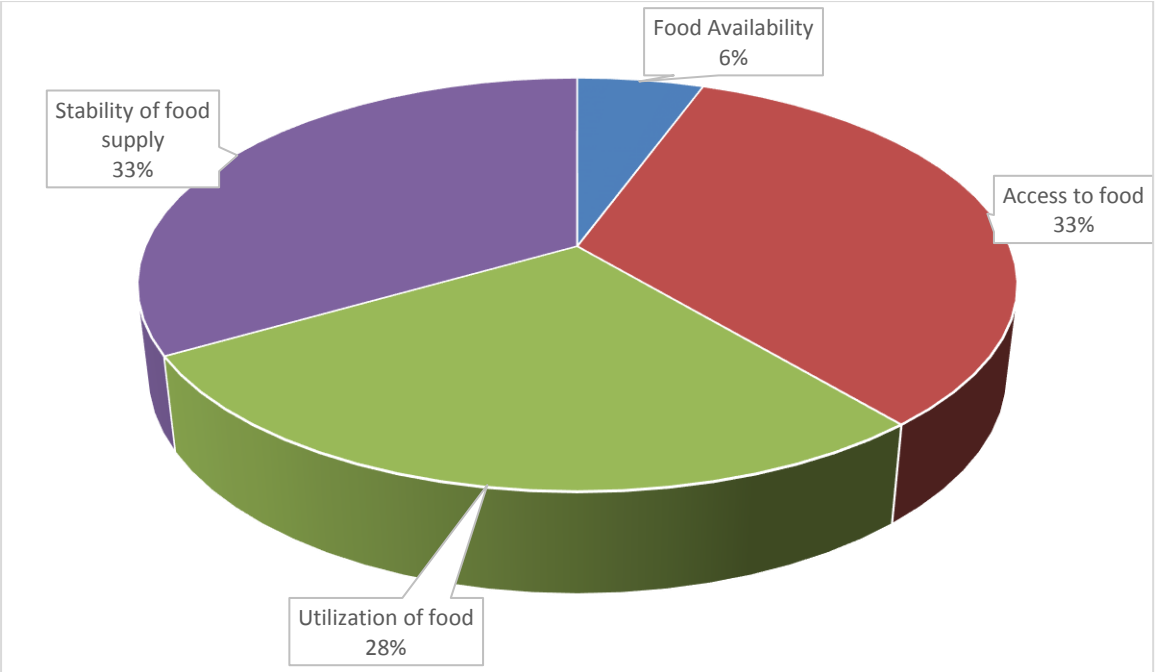
These respondents mostly described the current state of food sustainability in their country as acceptable (7 acceptable, 3 good, 2 moderate, 2 critical). About the change in the situation of food sustainability in their country in the last decade, most of them indicated an improvement (9 improved, 4 not changed, 1 don't know).

The mostly stated reasons behind the improvement of food sustainability were:

- Agricultural supply chain reforms (subsidies, changes in market structure etc.) (10 responses)
- Economic growth and poverty alleviation (9 responses)
- Improved local food markets (9 responses)
- Increase in institutional capacity and good governance (8 responses)
- Improved adaptiveness and resilience of food systems against changing climate and extreme climatic events (7 responses)
- Decrease in food loss and waste (5 responses)
- Decreased negative environmental impacts (3 responses)
- Improved rights and safety of the workers (5 responses)

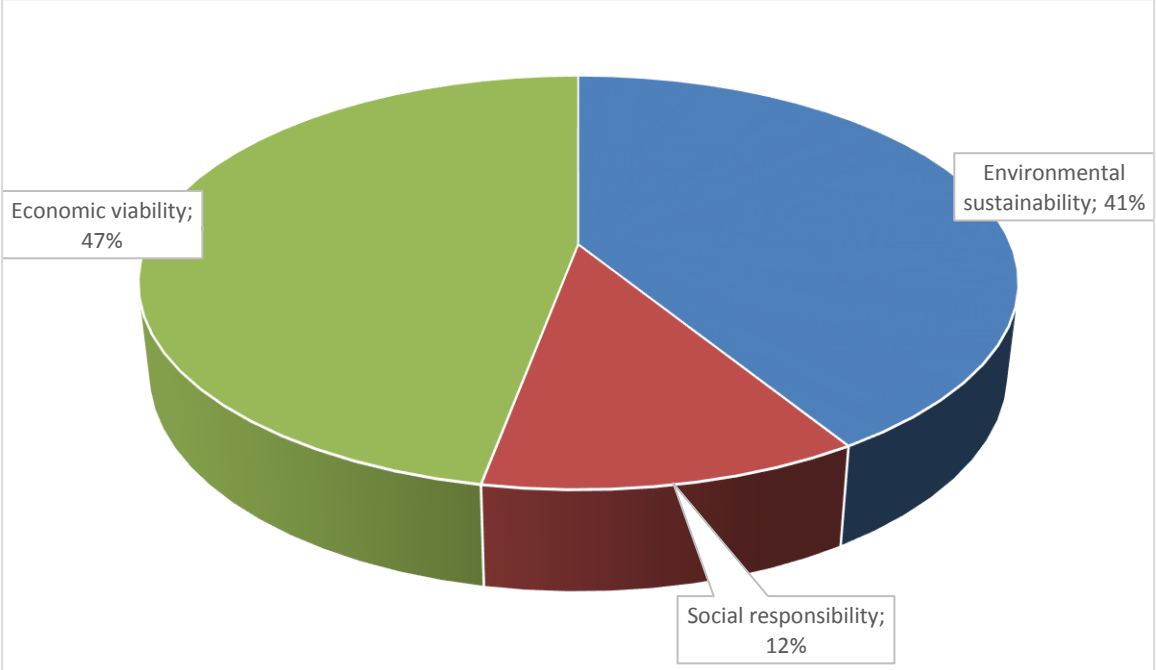
The fourth part seeked the answers to the questions regarding the solution of the problems and recommendations. According to the respondents, both access, utilization and stability of the food pose an important challenge among the food security pillars in their country while availability of the food was not mentioned as a serious threat (Figure 5).

Figure 5 Food security pillars posing the most important challenge



On the food sustainability, it appears that economic viability and environmental sustainability are perceived as the important challenges while social responsibility is not considered as important as the others (Figure 6).

Figure 6 Food sustainabiblity pillars posing the most important challenge



3.6. Interview Results

Semi-structured interviews with Nigeria (2 interviews), Pakistan (2 interviews) and USA (3 interviews) have been completed. Unfortunately, we couldn't reach any experts from S. Arabia despite all the efforts of communication. With the interviews conducted, we had the chance to gain more insight into the more specific effects of the pandemic on the supply chain and its sustainability.

In terms of the food security and malnutrition, malnutrition has been increasing especially in rural areas of Nigeria due to low purchasing power. All four pillars of food security pose a risk to the country. The pandemic slightly increased food insecurity in the country mainly due to the decrease in the purchasing power. Farmers and all agricultural activities were kept exempt from the lockdown measures with a government directive. In addition, food donations to the vulnerable groups continued from private organizations, philantrophists and the other governments during the pandemic. Therefore, it can be deduced from the interviews that food supply was not considerably affected in Nigeria under the adverse pandemic conditions.

In the USA, although only 10% of the households' face food insecurity (Feeding America, 2021), utilization and access to the food-still- pose the most important challenge. The consumers encountered with empty shelves in the food markets at the beginning of the pandemic. According to the experts, the pandemic has changed some eating preferences in the country such as eating more at home rather than away from home. Also, as a highly concentrated market, the meat industry has been considerably affected from the pandemic through distruptions in the labour market.

According to the experts interviewed, the pandemic did not affect the agricultural sector substantially in Pakistan. The main problem in the country has been exporting especially perishable foods such as vegetables. Due to the pandemic, the middle-man has disappeared and in fact the farmers earned more money due to the demand for an active short food supply chain.

With regard to ensuring sustainability, Nigerian experts provided information on the availability of the incentives to climate smart agriculture and small holder farmers. However, they pointed out that the Nigerian national sustainability policy in-place is not effectively implemented. On the contrary, In the USA, as a benchmark example- private industry is leading the sustainability efforts such as the incentives offered to the suppliers and consumers by large companies to support environmentally and socially responsible practices. Public policy on food sustainability adopts the principles of "*reduce, reuse, and recycle*" in every step of the supply chain. However, the experts indicated that perspective of sustainability is reductionist and does not essentially focus on providing adequate food (in terms of nutritional content) when addressing consumption of natural resources, social rights or economic viability. As a related topic, reducing food loss and waste via raising awareness, providing incentives to public and private sectors, and leveraging new and existing partnerships to divert excess food. On this matter, the effects of the pandemic on the sustainability efforts are unknown according to the experts interviewed in all three OIC member countries.

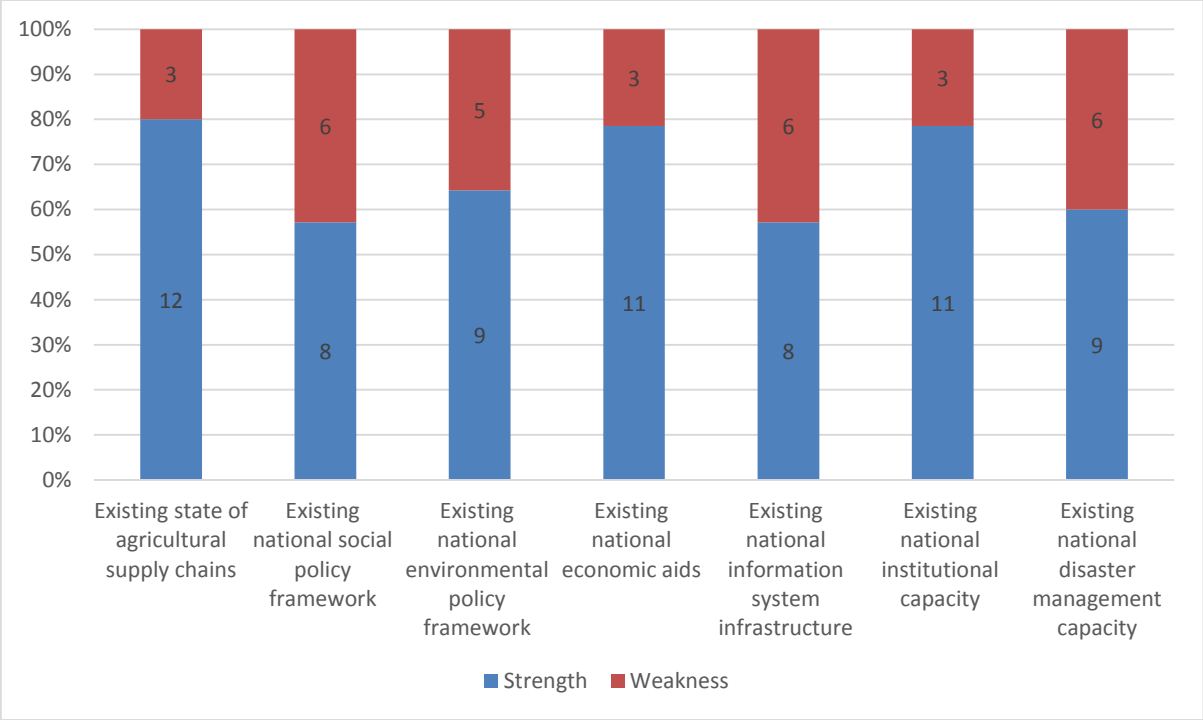
When it comes to the management of the food supply chains, the main problem seems to be lack of economic resources to implement good practices in agriculture and develop value chains in the OIC countries. On the other hand, use of digital services has started to be integrated in the decision-making process in the food supply chain management. But the core problem seems to be about the decrease in the know-how due to having two different agencies (i.e. FDA and USDA) regulating food simultaneously and losing some of the experienced personnel (especially the ones making economical projections in generating policy).

With regard to the structure of the agricultural production, it seems that it is more *labour-intensive* in the OIC countries due to the limited mechanization as opposed to USA where the structure is *capital-intensive* but for some products, it can be labour-intensive depending on the production requirements. The agricultural sector both faced labour and capital restriction in the production and logistics during the pandemic. The majority of the experts interviewed denoted that the input and final product prices increased during the pandemic and the purchasing power of the consumers decreased simultaneously. Almost all the experts interviewed mainly stated problems with the export of especially perishable products such as fruits and vegetables.

3.7. SWOT Analysis Results

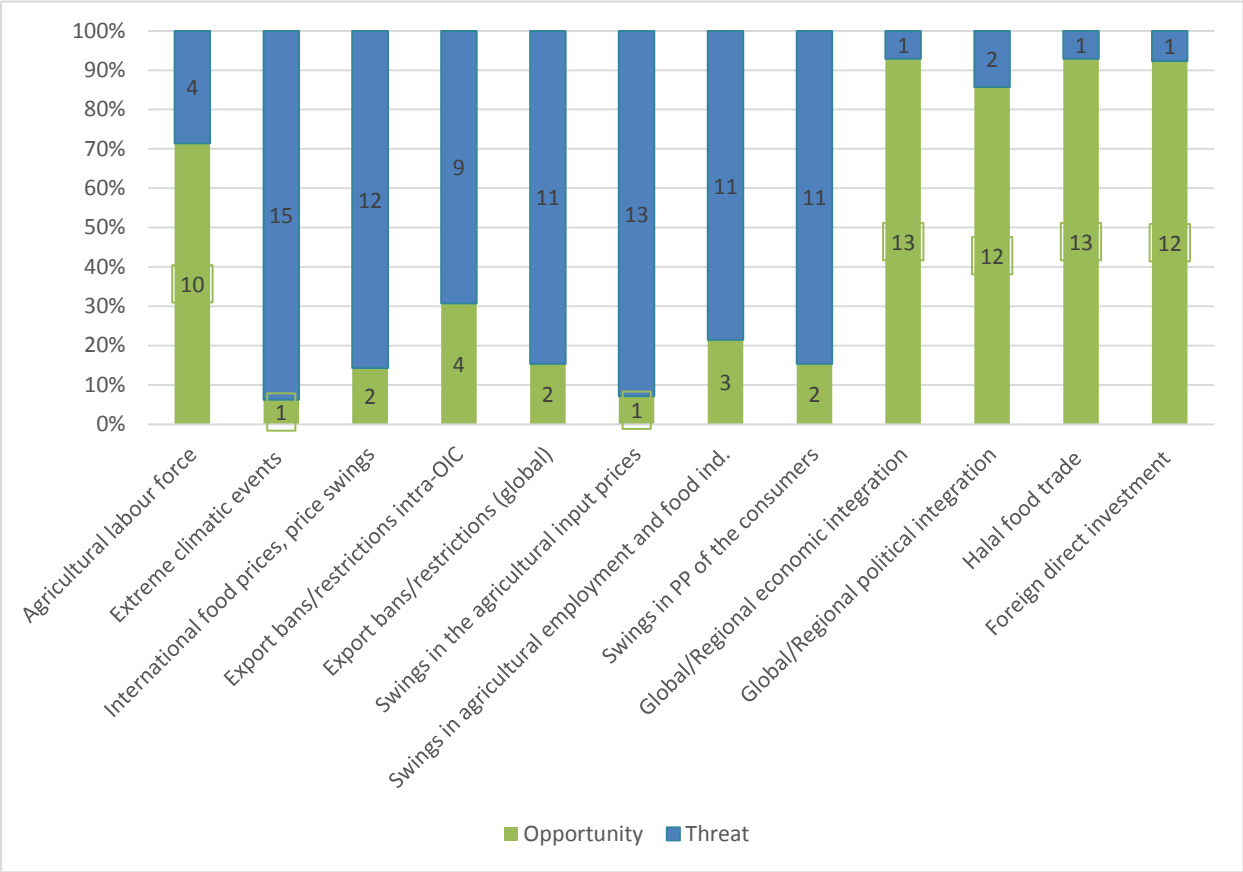
Based on the survey SWOT analysis, in-place systems, capacities, and organizations were mainly defined as strengths (Figure 7). The factor that was mostly defined as a strength was the current state of the agricultural supply chains (80%). This was closely followed by the national economic aids and national institutional capacity among the strengths prioritized by the respondents. Other factors that defined as a strength for the current national food supply chains can be listed as the environmental policy framework, disaster management capacity, national social policy framework and national information system infrastructure. These results may suggest that these countries are open to improvement in terms of the sustainability of the food supply chains but the current situation is not perceived as poor by the respondents.

Figure 7 Strengths and weaknesses for sustainability of the national food supply chains in OIC countries



The SWOT analysis performed further revealed the opportunities and threats regarding the food supply chains in OIC countries in the face of the current pandemic situation (Figure 8). The factors that were mostly defined as threats were extreme climatic events (droughts, floods, wildfires, hailstorms etc.) and swings in agricultural input prices. These were closely followed by the international food prices and price swings, global export bans or restrictions, and the swings in the purchasing power of the consumers. Interestingly, export bans or restrictions among the OIC members were defined as a lesser threat than the global one. Understandably, swings in employment in agricultural and food industry were also defined as a threat by the majority of the respondents. On the other side, global/regional economic and political integration; halal food trade and foreign direct investment during the pandemic, and agricultural labour force were defined as opportunities. These results suggest that there is lack of proper preparedness to the climate crisis and an excessive dependency to the export in agricultural inputs in these countries. However, the level of preparedness to a new crisis such as the COVID-19 pandemic may be gained through strengthening the cooperation in the OIC region and in the halal food market together with increased foreign direct investments and the available agricultural labour force. In addition to these factors listed, land and water confiscation by the occupation was added as a threat to the list by one member country (Palestine).

Figure 8 Opportunities and threats for sustainability of the national food supply chains in OIC countries



4 In-depth Assessment of the Effects of COVID-19 on Food Supply Chain in Selected Countries

4.1 Nigeria

4.1.1 Background

Federal Republic of Nigeria is a member of the African group of OIC countries. It is situated in the western coast of Africa. The country has a population of 206,1 million, 52% living in urban areas (WB, 2021). It's the most populous country in Africa. The climate is both arid and tropical, characterized by rainy and dry seasons. The ratio of agricultural area (hectares) per rural population is 0.70 and arable land area (hectares) per rural population is 0.35 in 2019 (SESRIC, 2021).

Nigeria has a 2097 US$ GDP per capita (current US$) (WB, 2021). Since Africa is facing an oil price crash, Nigeria was also affected as an exporter. Nigeria is among the countries that systematically exposed to food crises each year over the last five years (WFP, 2021). 9 % of total population in Nigeria suffer from a major food crisis in 2020. Among the OIC member states Nigeria ranks 1st in terms of arable land area, cereals, maize, primary fruits and vegetables in terms of area harvested and sorghum production, (SESRIC, 2021).

As explained in the methodology section of the Chapter 1, the effects of COVID-19 on the national food supply chains of the countries selected for case study were investigated at three stages: primary production, trade and final demand.

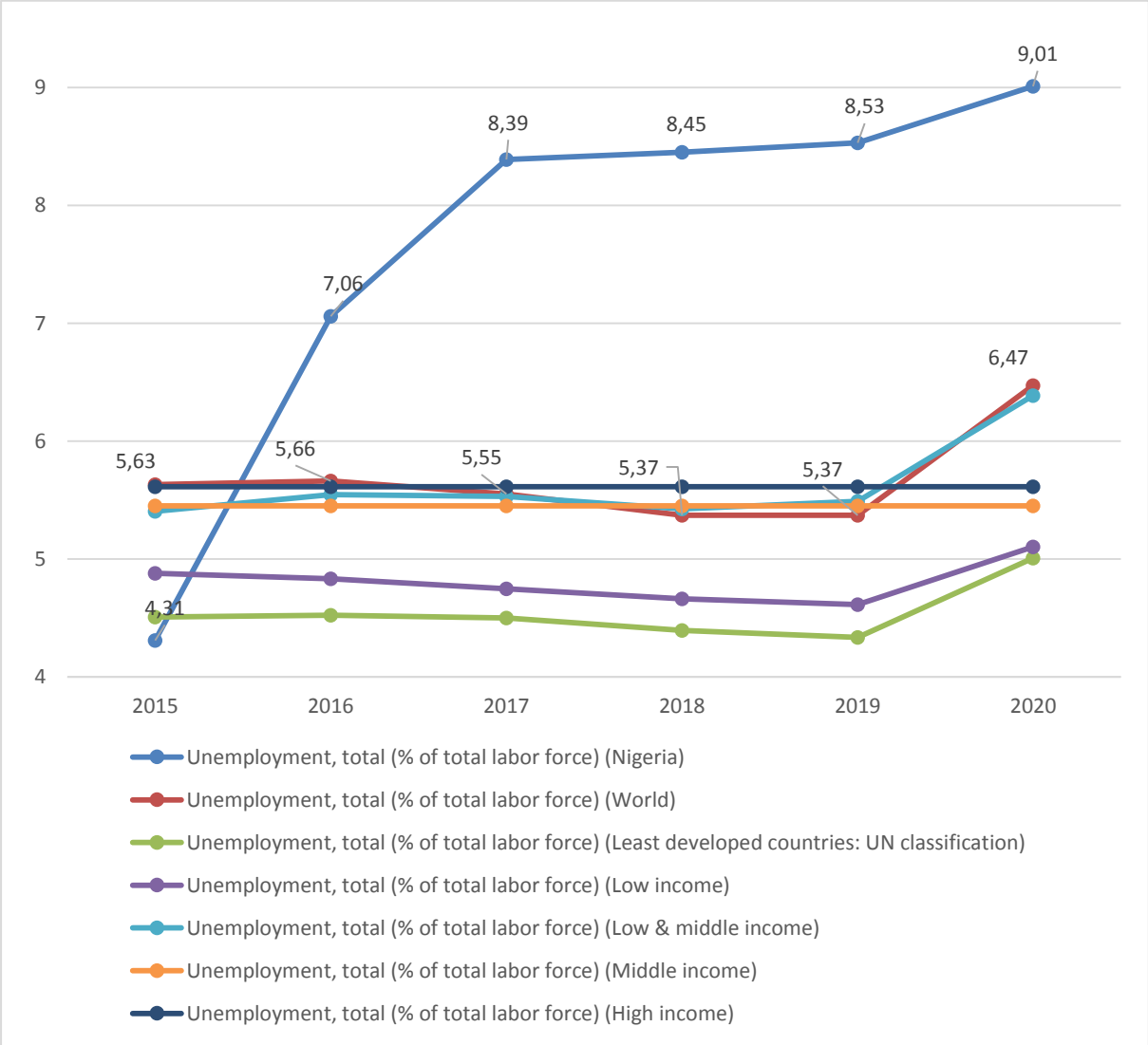
4.1.2 Food Supply Chain under COVID-19 Pandemic

The primary supply is the first stage of food supply chain and is an essential to ensure access to food. In the context of this report, the primary supply was used as a term encompassing primary production and processing. The key indicators to determine the effects of the pandemic on the primary supply can be listed as the price changes in inputs (such as pesticides, fertilizers, seeds, energy, water, machinery, labour etc.) and labour shortages due to the distancing provisions, lockdowns and export restrictions. Also, price and production amount comparisons between grains vs more labour intensive, perishable foods (such as fruits, vegetables, meat and dairy) may be in indicator about situation of the primary production. Based on the available data, the indicators below were analysed in Nigeria.

Not only in the agri-food industry, effect of the pandemic on the total labour market can be seen clearly in the World except for middle- and high-income countries. For instance, the average total unemployment estimates were stable before the pandemic, however, it increased 20.48 % (5.37% to 6.47%) from 2019 to 2020. After the pandemic started, the same steep increase as the World averages in the total unemployment was also seen in low-income, low and middle income, LDCs and in Nigeria from 2019 to 2020 (Figure 9). The only difference in Nigeria was that the total unemployment numbers were already in a slight increasing trend before the pandemic and the pandemic accelerated the increase from 8,53 in 2019 to 9,01 in 2020. The measures taken such as keeping farmers and the workers in all agricultural activities exempt from the lockdown measures with a governmental directive or busing workers to plants and increasing the number of shifts in large chicken processors did not prevent the steep increase in the unemployment (IFPRI, 2020).

According to the IFPRI 2020 estimates, there will be a 35% job loss in the food industry and 21.26% of the jobs at primary production are at risk, mainly due to the COVID-19 pandemic (IFPRI, 2020). In Nigeria, agriculture is a labour-intensive industry. Therefore, it can be suggested that a decline in the total employment in the country may has caused a labour shortage in primary production. Moreover, since agricultural production in low-income countries are more dependent on raw materials, the labour shortage, together with the price swings in other inputs, may have caused a supply crisis in Nigeria.

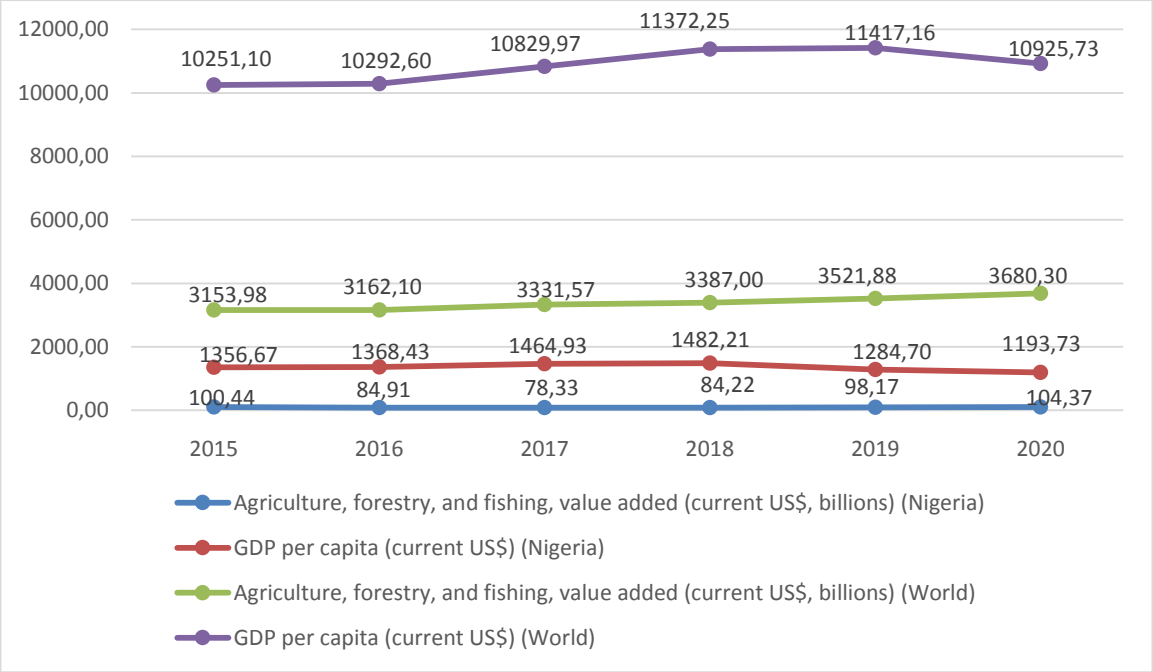
Figure 9 The Comparison of Unemployment in Nigeria and the World



https://www.ifpri.org/program/2020-vision

When it comes to the economic indicators, the same trends can be seen in value added agriculture (current US$) and GDP per capita (current US$) before and after the pandemic. In the 2019-2020 period, the value-added agriculture (current US$, billions) increased in 4.52% in the World and 6.12% in Nigeria, and GDP per capita (current US$) decreased 4.31% in the World and 7.09% in Nigeria (Figure 10). In this report, the annual calculations were used but, for instance, it was estimated that agri-food GDP declined 18% during the five-week lockdown in Nigeria (IFPRI, 2020).

Figure 10 Economic indicators in the Nigeria and in the World



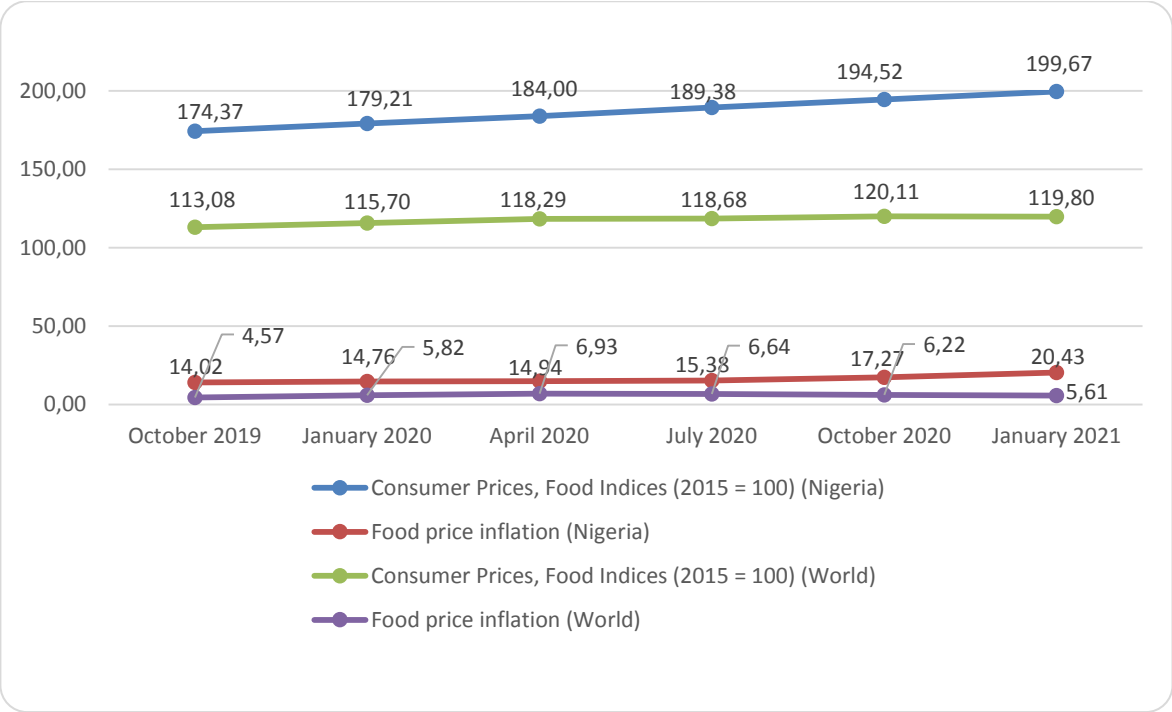
https://www.ifpri.org/program/2020-vision

Trade is the second stage of food supply chain. In the context of this report, trade was used as a term encompassing distribution and retailing. Due to the supply crisis in the primary production, unemployment in logistics industry and the export restrictions, the pandemic also caused price swings in agricultural and food products. The key indicators to determine the effects of the pandemic on food trade can be listed as the share of agriculture in total trade (import and export), unemployment in agricultural logistics industry, time spent in import and export in the borders, swings in consumer prices and food price inflation. Based on the available data, the indicators below were analysed in Nigeria.

It can be seen from the Figure 11 that there's a net ongoing upward trend in the consumer prices in the recent years but since the pandemic started, the increase rate appears to be slightly more when compared to the pre-pandemic era. For instance, the consumer food prices increased 14,0% from October 2018 to October 2019 while the increase was 17,3% from October 2019 to October 2020. Although there seems to be a steep increase in the food price inflation after the pandemic started, probably due to the pandemic conditions, the big fluctuations even in the pre-pandemic era seems to be the nature of the country specific conditions.

The same ongoing upward trend in the consumer price due to the pandemic in Nigeria is very similar to the estimates at the global level. According to the FAO estimates, the consumer food prices increased 4,57% from October 2018 to October 2019 while the increase is 6,21% from October 2019 to October 2020. But in terms of the food price inflation data, the situation at the global level is very different from Nigeria. While there has been an ongoing upward trend and big fluctuations in the food price inflation in Nigeria, there appeared an increase in line with the progress of the pandemic and then a slight decrease with the year 2021 at global level.

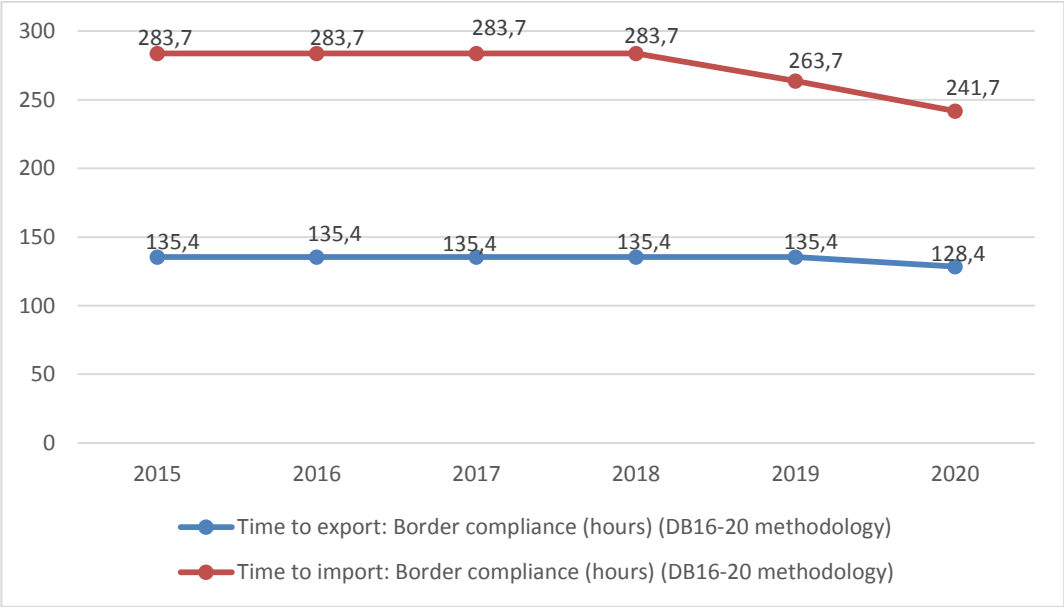
Figure 11 Consumer prices and food price inflation in Nigeria and in the World



https://www.ifpri.org/program/2020-vision

In terms of the time spent in the border compliance, it appears that the time spent for export was shortened in 2020 due to the COVID-19 since it was constant before the pandemic started. However, it can be seen that there was a downward trend the time spent for imports before the pandemic started and it continued to get down after the pandemic started (Figure 12). This my suggest that there may has been an increase in the demands for the products imported to and exported from Nigeria during the pandemic.

Figure 12 Time spent during the import and export in Nigeria

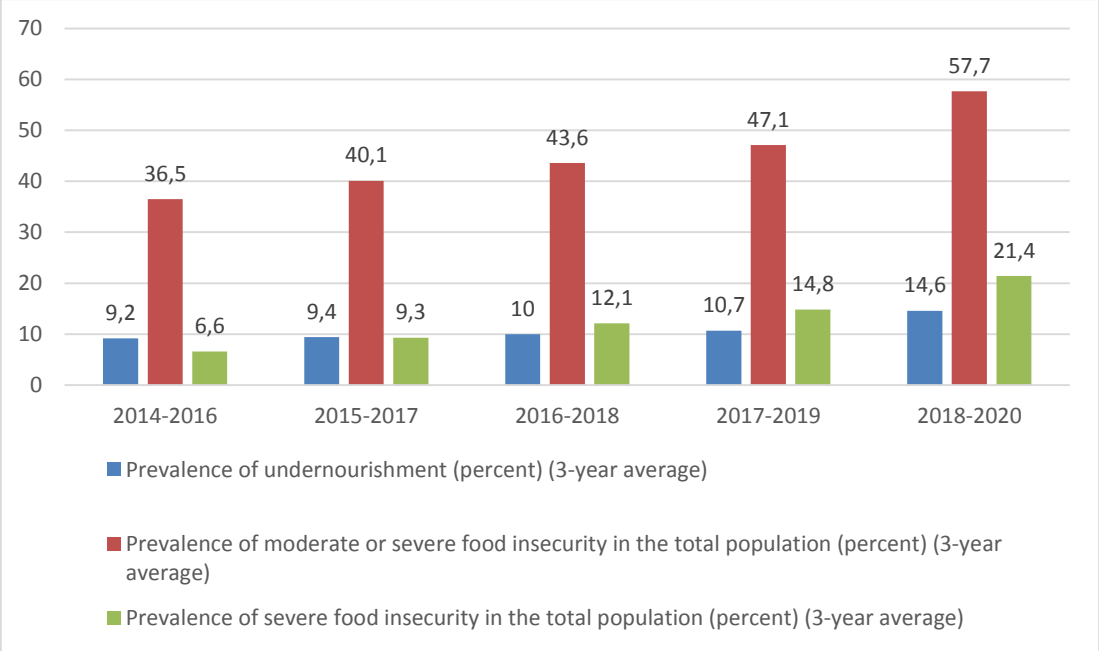


Final demand is the third and the last stage of food supply chain. In the context of this report, final demand was used as a term encompassing consumption. The supply crisis together with the decreased purchasing power of the consumers caused by economic recession and unemployment negatively affected final demand and caused a decline in access to food and food security. The key indicators to determine the effects of the pandemic on final demand are the food security indicators such as prevalence of food insecurity, undernourishment, share of food expenditures per capita, people living under the poverty line, and purchasing power. Based on the available data, the indicators below were analysed in Nigeria.

Before the pandemic, the number of undernourished people in the World was unchanged for five years in the World and it stayed almost the same in the OIC member countries. However, effects of the pandemic on the World can be seen clearly since the prevalence of undernourishment and moderate or severe food insecurity increased by 18,1% and 15,5%, respectively from 2019 to 2020 (FAOSTAT, 2021). From 2019 to 2020, nearly one in three people in the world (2.37 billion) did not have access to adequate food in 2020 with an increase of 320 million people in just one year (FAO, IFAD, UNICEF, WFP and WHO, 2021).

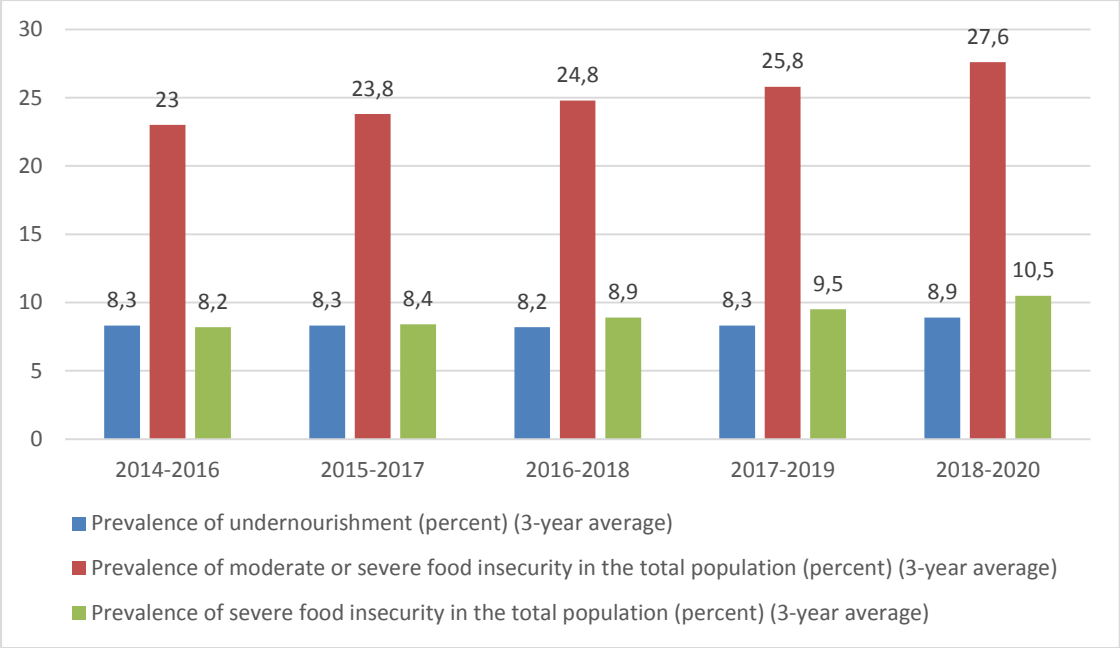
When compared to the world averages, food security in Nigeria has been hit by the pandemic more harshly. In Nigeria, in the three-year average measurements (from 2017-2019 to 2018-2020) the number of people undernourished increased to 40% and 8,4 million people, which equals to the 4.08% of the entire population of the country. In the same period, number of people which are moderately or severely food insecure increased to 25,5%, 23.6 million people; and the severely food insecure people increased to 48,3%, 14 million people (Figure 13). Food donations to the vulnerable groups continued from private organiztions, philanthropists and the other governments during the pandemic. Like other OIC member countries, it can be stated that availability of the food was not decreased, however, utilization and access to the food has become more and more difficult due to the decrease in the purchasing power. Access to the food seems to be more affected from price swings rather than the export bans or restrictions. Hence, it can be deduced from both the surveys, interviews and the available data that food supply was not considerably affected but food insecurity and malnutrition increased in Nigeria especially in rural areas under the adverse pandemic conditions.

Figure 13 Food security indicators in Nigeria



The COVID-19 pandemic seems to worsen on the food security indicators in the World. For instance, from the year 2019 to 2020, the number of people undernourished increased 18,1% with 117,7 million people. In the same period, number of people which are moderately or severely food insecure increased 15,5%, 318.3 million people; and the severely food insecure people increased 18,9%, 147,7 million people (FAOSTAT, 2021) (Figure 14).

Figure 14 Food security indicators in the World



4.2. Pakistan

4.2.1 Background

Republic of Pakistan is a member of the Asian group of OIC countries. It is situated in the Southern Asia. The country has a population of 220,9 million, 37% living in urban areas (WB, 2021). The climate is mostly arid, characterized by hot summers cold winters and low annual rainfall. Pakistan has a 1194 US$ GDP per capita (current US$) (WB, 2021). The ratio of agricultural area (hectares) per rural population is 0.27 and arable land area (hectares) per rural population is 0.22 in 2019 (SESRIC, 2021). Also, Pakistan ranks 1st in cotton production, fertilizers in agricultural use, meat and wheat production among the OIC members (SESRIC, 2021).

4.2.2 Food Supply Chain under COVID-19 Pandemic in Pakistan

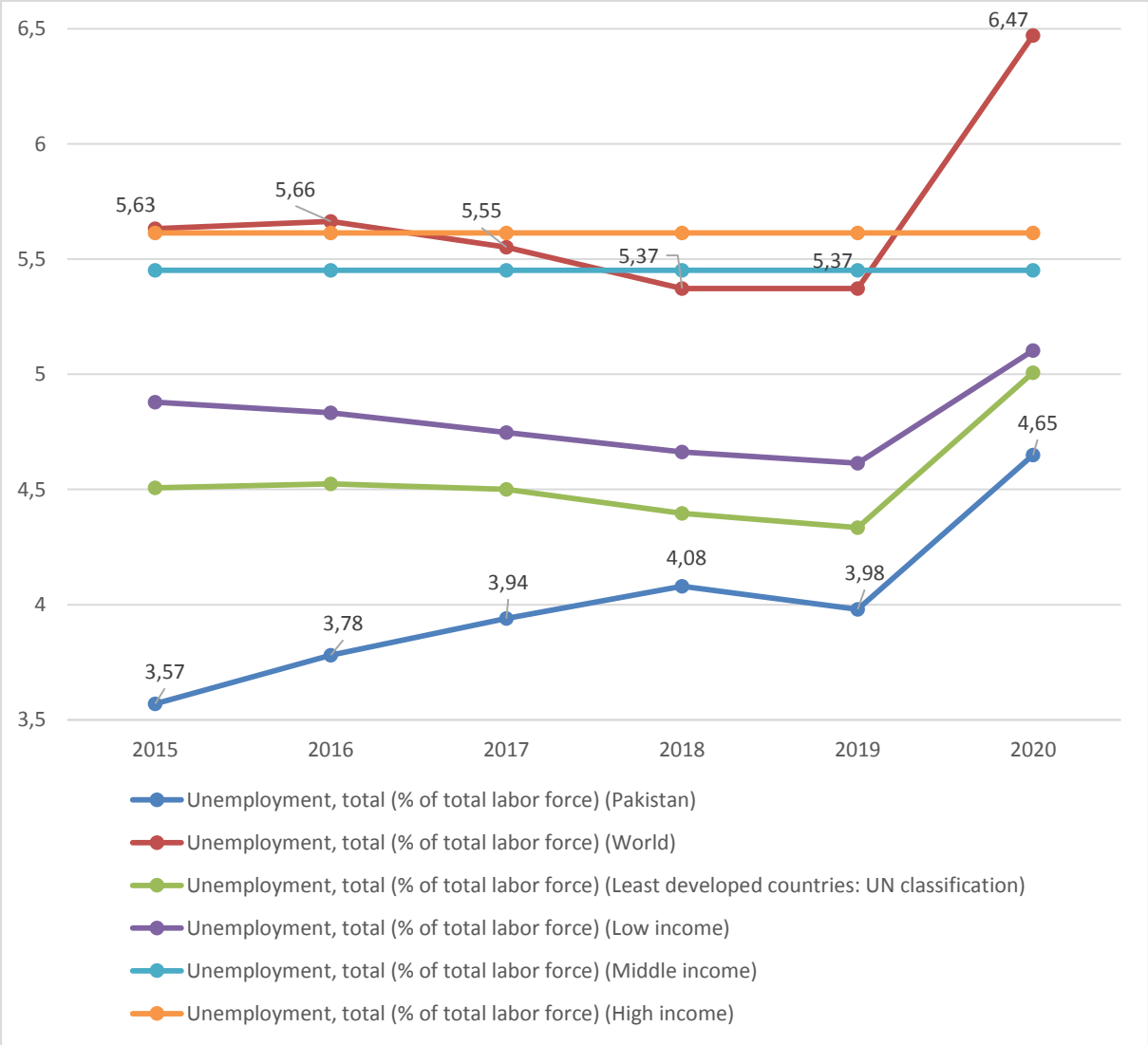
Based on the available data, the indicators below were analysed in Pakistan in order to evaluate the effects of the pandemic on the primary production in Pakistan.

Not only in the agri-food industry, effect of the pandemic on the total labour market can be seen clearly in the World except for middle- and high-income countries. For instance, the average total unemployment estimates were stable before the pandemic, however, it increased 20.48% (5.37% to 6.47%) from 2019 to 2020 in the World. After the pandemic started, the same steep increase as the World averages in the total unemployment was also seen in low-income, low & middle income, LDCs and in Pakistan from 2019 to 2020 (Figure 15). The only difference in Pakistan was that the total

unemployment numbers were already increasing before the pandemic (except for 2019) but the pandemic accelerated the increase from 3,98 in 2019 to 4,65 in 2020 (16,83% increase).

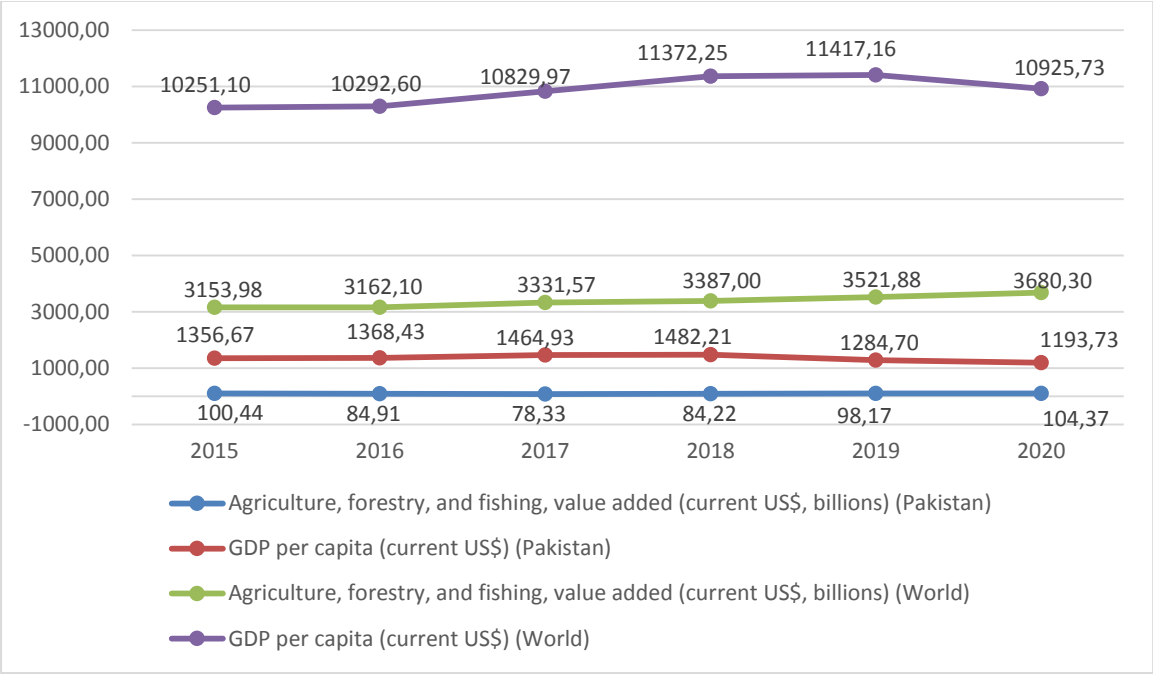
According to the IFPRI 2020 estimates, there will be a 35% job loss in the food industry and 21.26% of the jobs at primary production are at risk, mainly due to the COVID-19 pandemic (IFPRI, 2020). In Pakistan, agriculture is a labour-intensive industry, too. Therefore, it can be suggested that the decline in the total employment in the country has caused a labour shortage in primary production. For instance, it can be deduced from the survey and interview results that, the input prices (pesticides, fertilizers, seeds, machinery and power) have increased in Pakistan and at the same time agricultural labour force declined during the pandemic when compared to the pre-pandemic conditions. Moreover, since agricultural production in low-income countries are more dependent on raw materials, the labour shortage, together with the price swings in other inputs, may have caused a supply crisis in Pakistan.

Figure 15 Unemployment in Pakistan and in the World



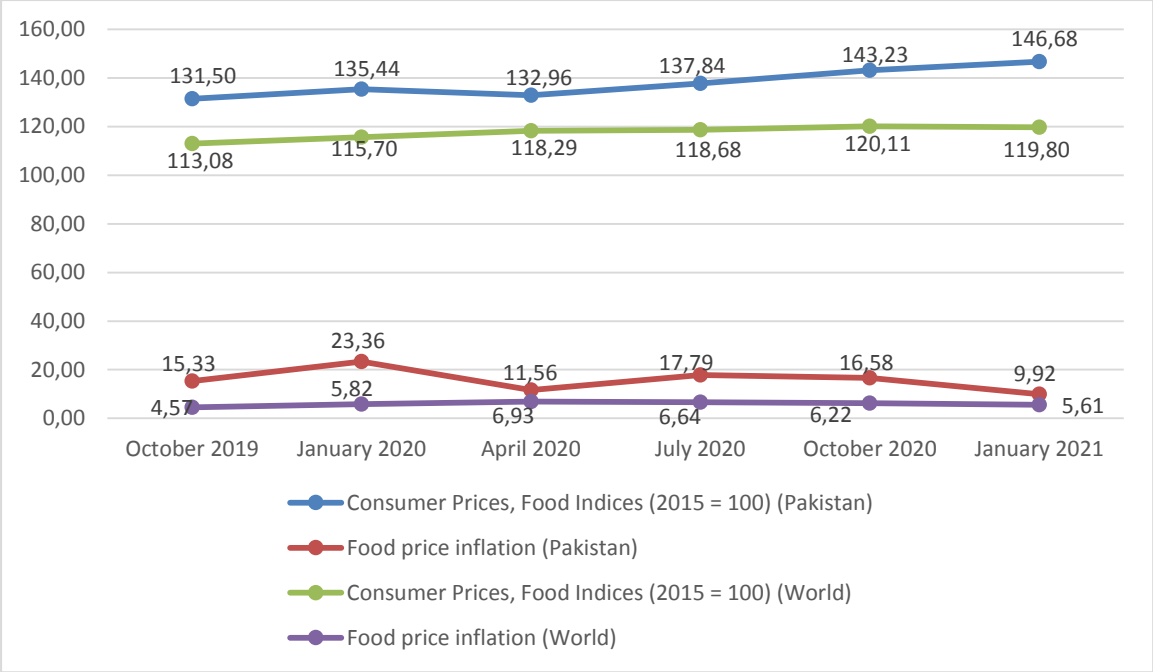
When it comes to the economic indicators, the same trends can be seen in value added agriculture (current US$) before and after the pandemic. In the 2019-2020 period, the value-added agriculture (current US$, billions) increased in 4.52% in the World and 6.32% in Pakistan (Figure 16). There was and continuous upward trend in GDP per capita (current US$) in the World until the pandemic and after the pandemic started it decreased 4.31% in 2020. In terms of GDP per capita, there were an upward trend until 2019, however, it decreased 13.36% in 2019 and 7.09% in 2020 in Pakistan.

Figure 16 Economic indicators in Pakistan and in the World



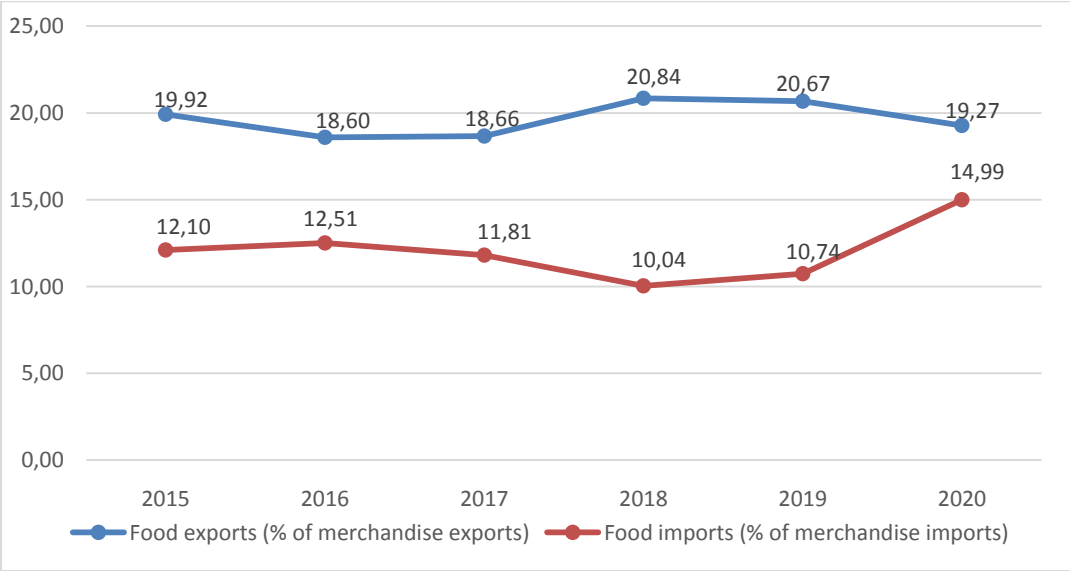
On the **trade** side, it can be seen from the Figure 17 that the consumer prices have been in an upward trend both in the World and in Pakistan, except for April 2020 in Pakistan and for January 2021 in the World. With the effect of the pandemic, the consumer prices increased 2.41% rise in Pakistan while it dropped 0.26% in the World in one-year period. When it comes to the food price inflation, firstly a rise at the first half of the year 2020 and then a slight continuous drop was seen in the World trend while the food price inflation increased and then decreased dramatically at the first half of 2020 and then went back to the pre-pandemic levels and even lower in Pakistan. But, still, both the consumer prices and the food inflation has been much higher than the World averages in Pakistan during the pandemic. This picture may suggest that the food security in Pakistan has been affected by the pandemic more adversely than the World average.

Figure 17 Consumer prices and food price inflation in Pakistan and in the World



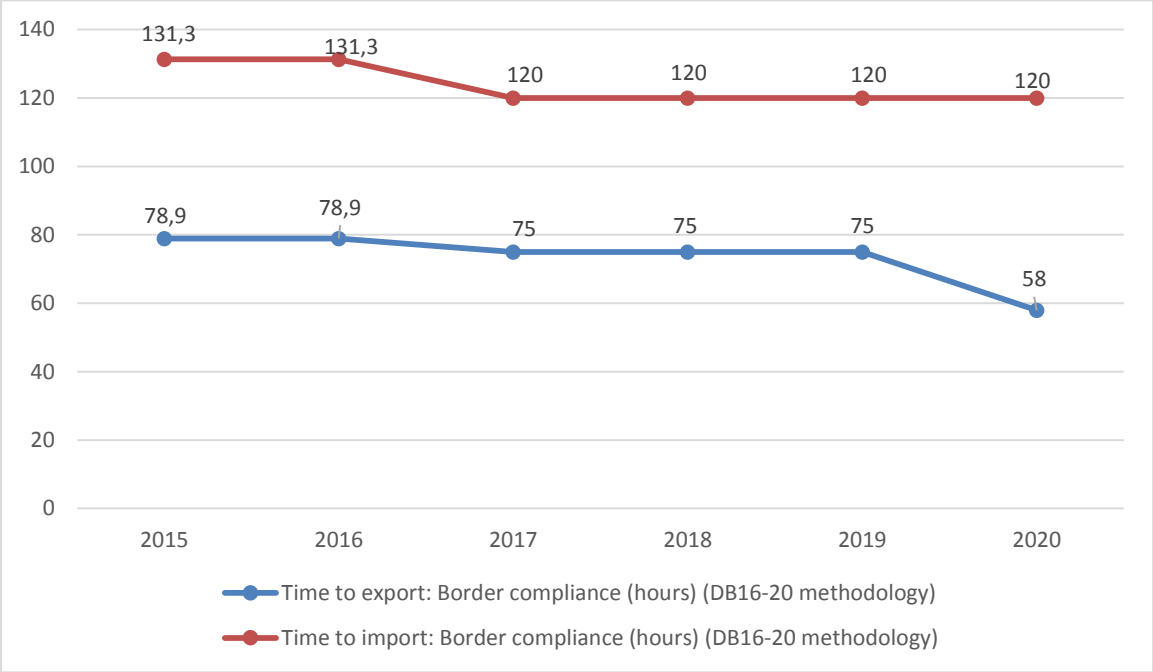
As a tool to evaluate the rise in the consumer prices in Pakistan, the Figure shows that while the share of food imports in the total merchandise imports has dramatically increased (39.57% increase) from 2019 to 2020, the food exports has fallen (6.77% drop) in the same time period (Figure 18). For instance, it was stated during the interviews that the main problem in international trade was exporting perishable food such as fruits and vegetables during the pandemic. However, in domestic food trade, the middlemen almost disappeared in the rural areas since the food markets were closed, and this way the farmers earned more money due to the demand for an active short food supply chain.

Figure 18 Food import and exports in Pakistan



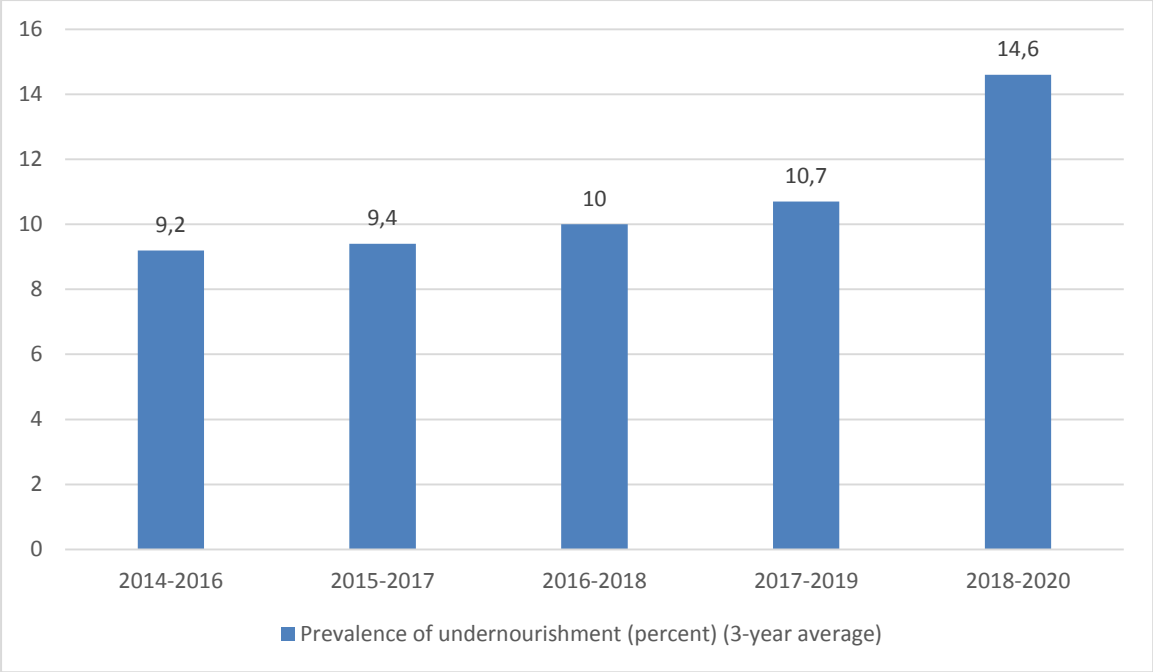
In terms of the time spent in the border compliance, it appears that the time spent for export was shortened in 2020 due to the COVID-19 since it was constant before the pandemic started. However, it can be seen that there was a constant trend the time spent for imports before the pandemic and it continued the same afterwards. This suggests that there may has been an increase in the demands for the products exported from Pakistan during the pandemic (Figure 19).

Figure 19 Time spent in export and import in Pakistan



In terms of the **final demand** and the consumer side, The COVID-19 pandemic seems to worsen on the food security indicators in Pakistan but still the numbers are below the World averages. For instance, in the three-year average measurements (from 2017-2019 to 2018-2020) the number of people undernourished increased 8,1% and 2,4 million people, which equals to the 1.09% of the population of the country (Figure 20). Pakistan is among the countries that systematically exposed to food crises each year over the last four years (WFP, 2021). Even before the pandemic, more than 1.2 million people were in food crisis or worse in the northern Pakistan (IPC, 2020). Although it cannot be proved with the available data for Pakistan, diet quality (beyond quantity) may have decreased in the country due to the economic impact of the pandemic. Because people may have more access to grain-based food products rather than more nutritious and perishable products which requires more labour-intensive production such as fruits, vegetables, meat and dairy products.

Figure 20 Prevalance of undernourishment in Pakistan



4.3. Saudi Arabia

4.3.1 Background

Kingdom of Saudi Arabia is a member of Arab group of OIC countries. It is situated in the Western Asia and is the largest country in the Arabian Peninsula. Has a population of 34,8 million, 84% living in urban areas. The country mostly composed of desert ecosystems and a dry desert climate characterized by extreme heat during the daytime, a steep drop in temperature during night-time, and very low annual rainfall. S. Arabia has a 20110 US$ GDP per capita (current US$) (WB, 2021).

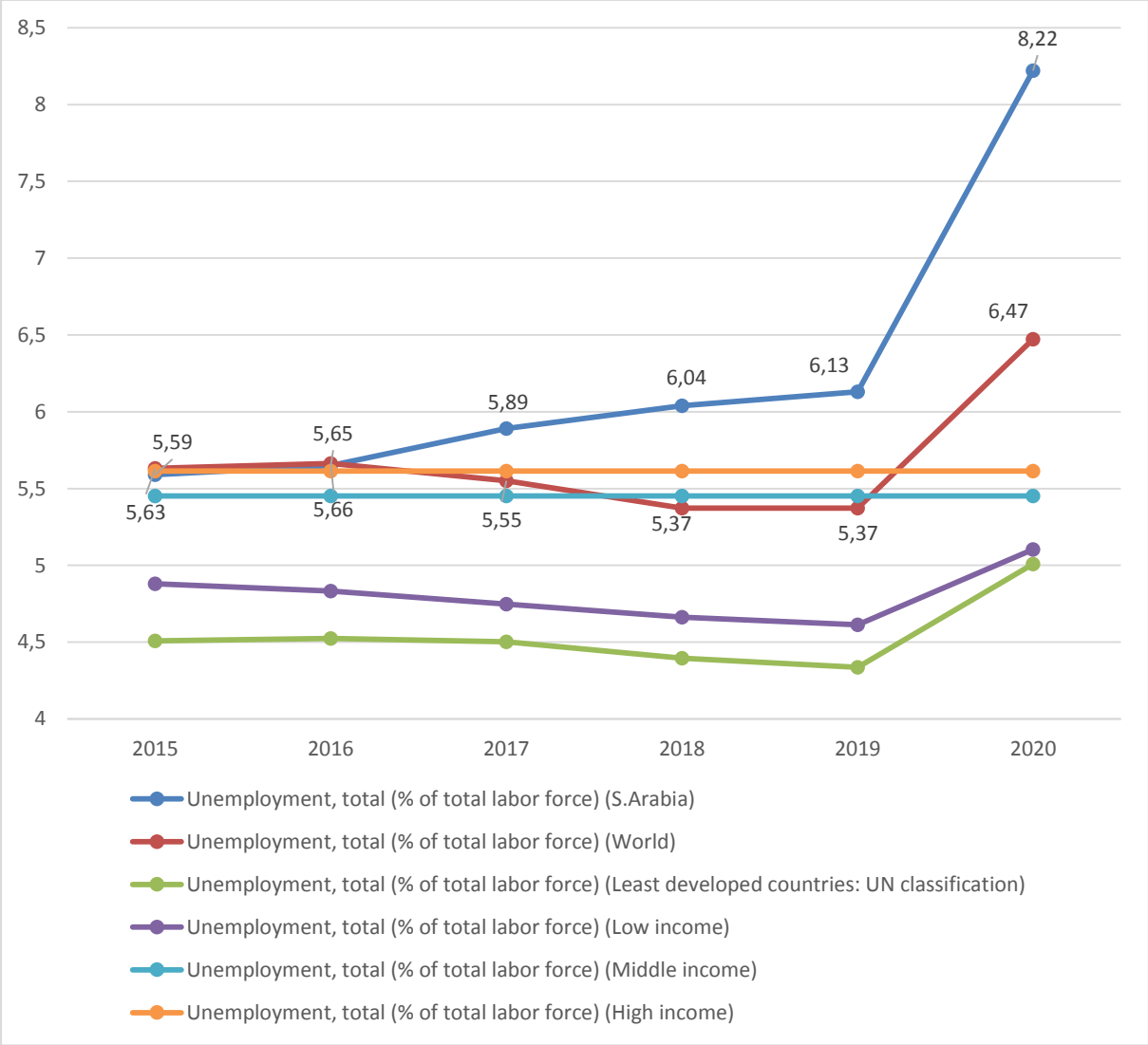
S. Arabia ranks 1st in terms of per cent agricultural area and land under permanent meadows and pastures and last in paddy rice production among the OIC member states (https://www.sesric.org/oic-tbf.php). The ratio of agricultural area (hectares) per rural population is 31.79 and arable land area (hectares) per rural population is 0.63 in 2019 (SESRIC, 2021).

4.3.2 Food Supply Chain under COVID-19 Pandemic in Saudi Arabia

Based on the available data, the indicators below were analysed in Saudi Arabia to evaluate the effects of the pandemic on the primary production in the country.

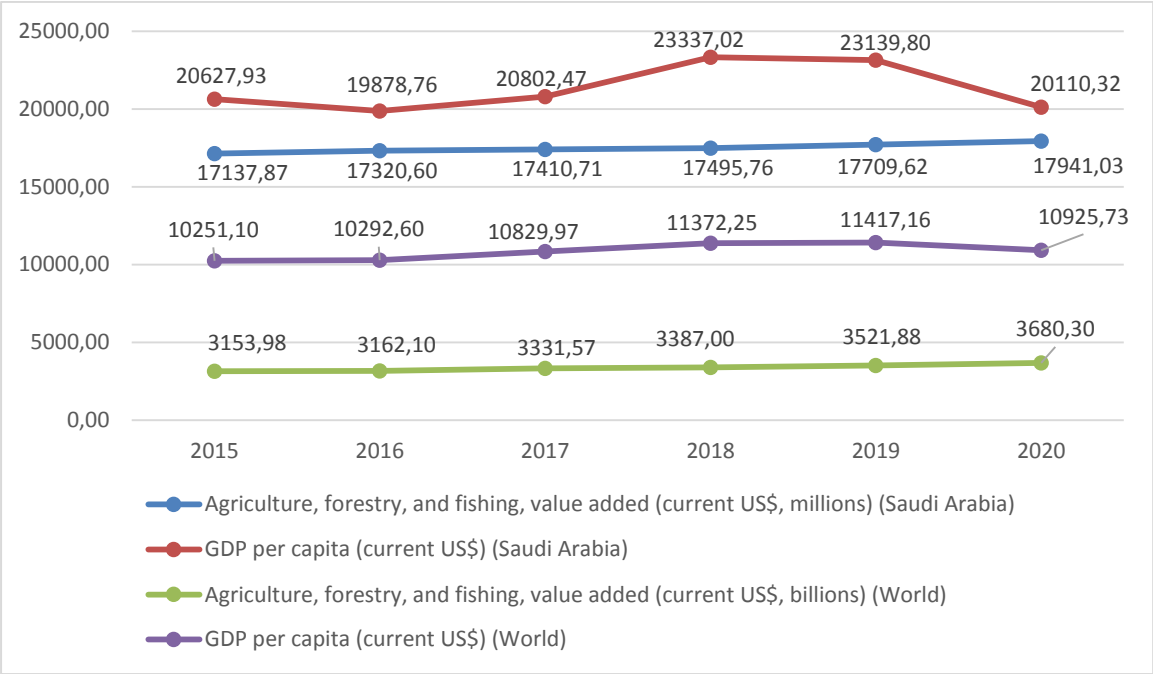
Not only in the agri-food industry, effect of the pandemic on the total labour market can be seen clearly in the World except for middle- and high-income countries. For instance, the average total unemployment estimates were stable before the pandemic, however, it increased 20.48% (5.37% to 6.47%) from 2019 to 2020 in the World. After the pandemic started, the same steep increase as the World averages in the total unemployment was also seen in low-income, low & middle income, LDCs countries and in Saudi Arabia from 2019 to 2020 (Figure 21). The only difference in Saudi Arabia was that the total unemployment numbers were already in an upward trend before the pandemic but the pandemic accelerated the increase from 6,13 in 2019 to 8,22 in 2020 (34.09% increase).

Figure 21 Unemployment in Saudi Arabia and in the World



When it comes to the economic indicators, the same upward trends can be seen in value added agriculture (current US$) before and after the pandemic. In the 2019-2020 period, it increased 4.50% in the World and 1.31% in Saudi Arabia (Figure 22). There was a continuous upward trend in GDP per capita (current US$) in the World until the pandemic and after the pandemic started it decreased 4.31% in 2020. In terms of GDP per capita, there were an upward trend until 2019, however, it decreased 0.85% in 2019 and 13.09% in 2020 in Saudi Arabia.

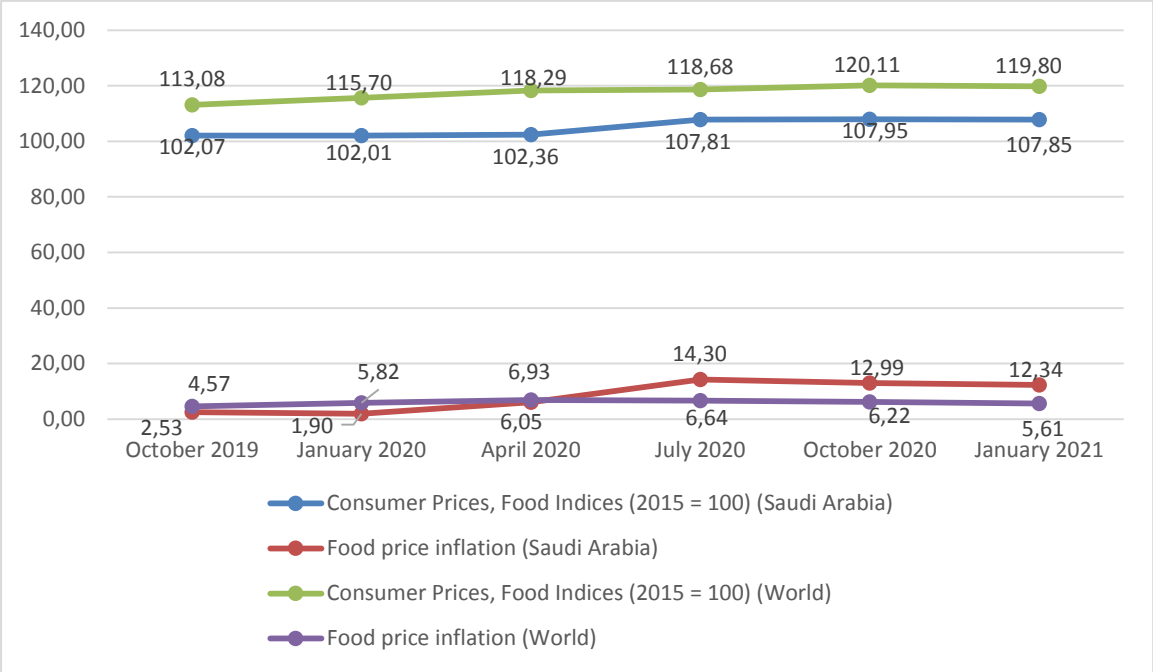
Figure 22 Economic indicators in Saudi Arabia and in the World



https://databank.worldbank.org/source/world-development-indicators

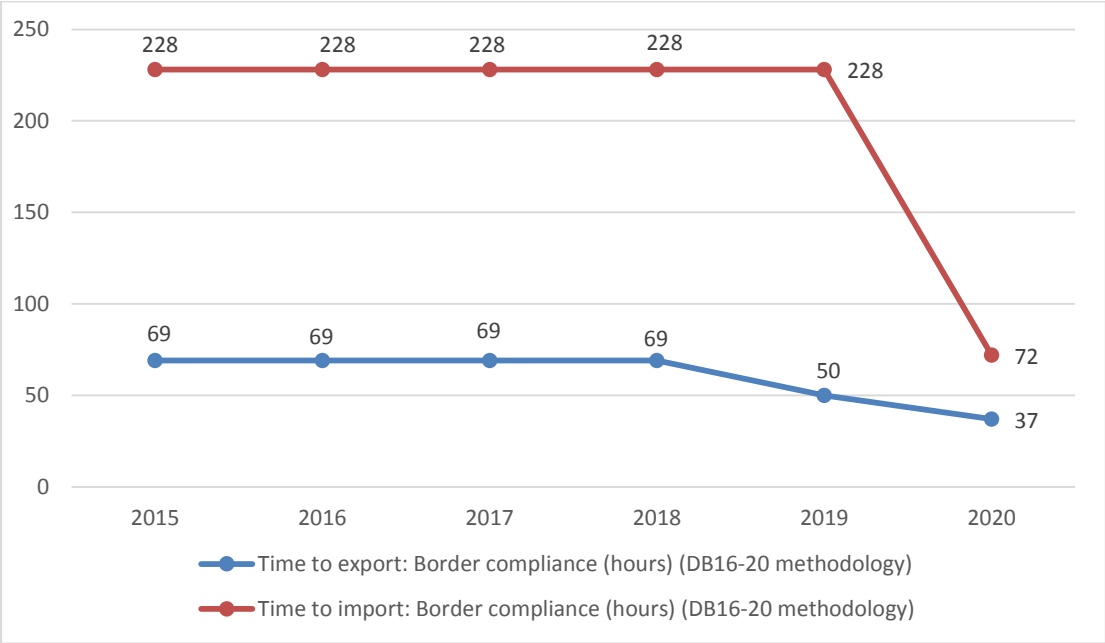
On the **trade** side, it can be seen from the Figure 23 that the consumer prices have been in a slightly upward trend both in the World and in Saudi Arabia during the pandemic in 2020. A slightly decrease was seen with the beginning of the year 2021 both in Saudi Arabia (0.09%) and in the World (0.26%). When it comes to the food price inflation, firstly a rise at the first half of the year 2020 and then a slight continuous drop was seen in the World trend while the food price inflation followed the same trend as the World averages except for the drop at the beginning of 2020. Both the World averages and the food price inflation remained higher than the pre-pandemic levels in 2021.

Figure 23 Consumer prices and food price inflation in Saudi Arabia and in the World



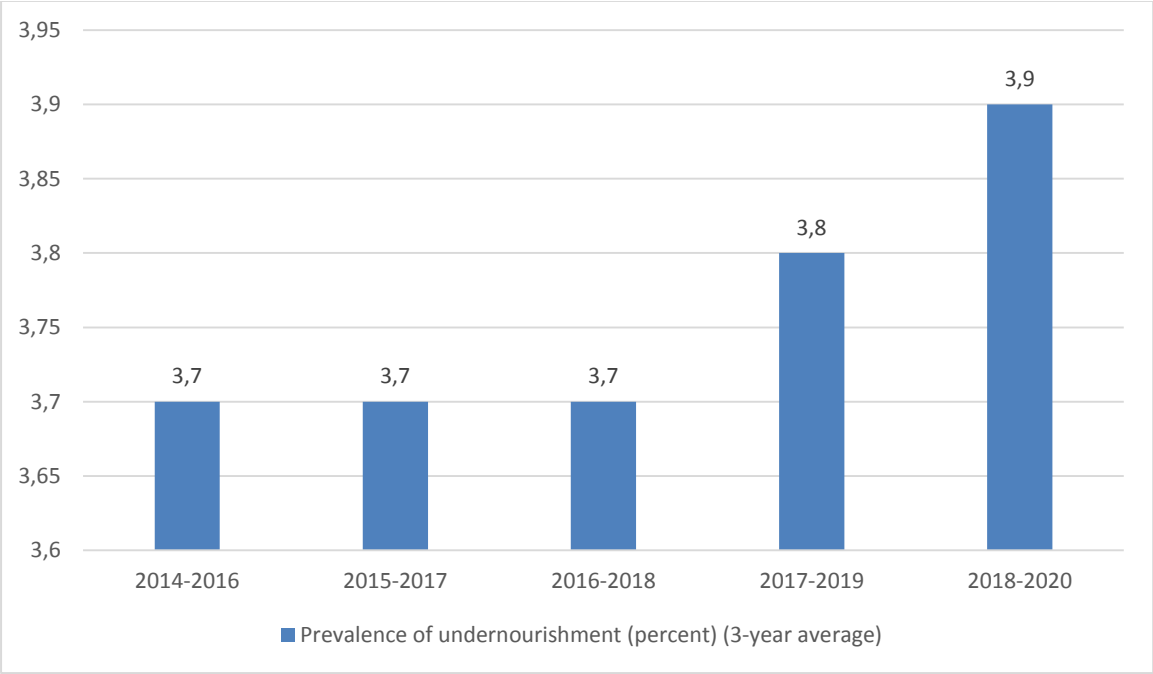
In terms of the time spent in the border compliance, it appears that the time spent for import and export was shortened in 2020 due to the COVID-19 since it was constant before the pandemic started. This trend appears to be in line with the situation in Nigeria and Pakistan (Figure 24). And, this may suggest that there has been an increase in the demands for the products imported to and exported from Saudi Arabia during the pandemic.

Figure 24 Time spent in import and export in Saudi Arabia



In terms of the **final demand** and the consumer side, Saudi Arabia does not seem to be affected from the pandemic unlike the prevailing situation in the majority of the World and the numbers are below the World averages. For instance, in the three-year average measurements (from 2017-2019 to 2018-2020) the number of people undernourished did not changed with 1,3 million people, which equals to the 3,74% of the entire population of the country (Figure 25).

Figure 25 Prevalance of undernourishment in Saudi Arabia



https://databank.worldbank.org/source/world-development-indicators

4.4 United States of America

4.4.1 Background

The United States of America (U.S.A.) is a North American country. The country has a population of 329,5 million, 82% living in urban areas (WB, 2021). The country has the third most populous country in the World. The climate is mainly continental and semi-arid but various due to the vast geographic area of the country.

U.S.A. has a 63543 US$ GDP per capita (current US$) (WB, 2021). United States of America (U.S.A.) was selected as an example of good practices in food supply chain management.

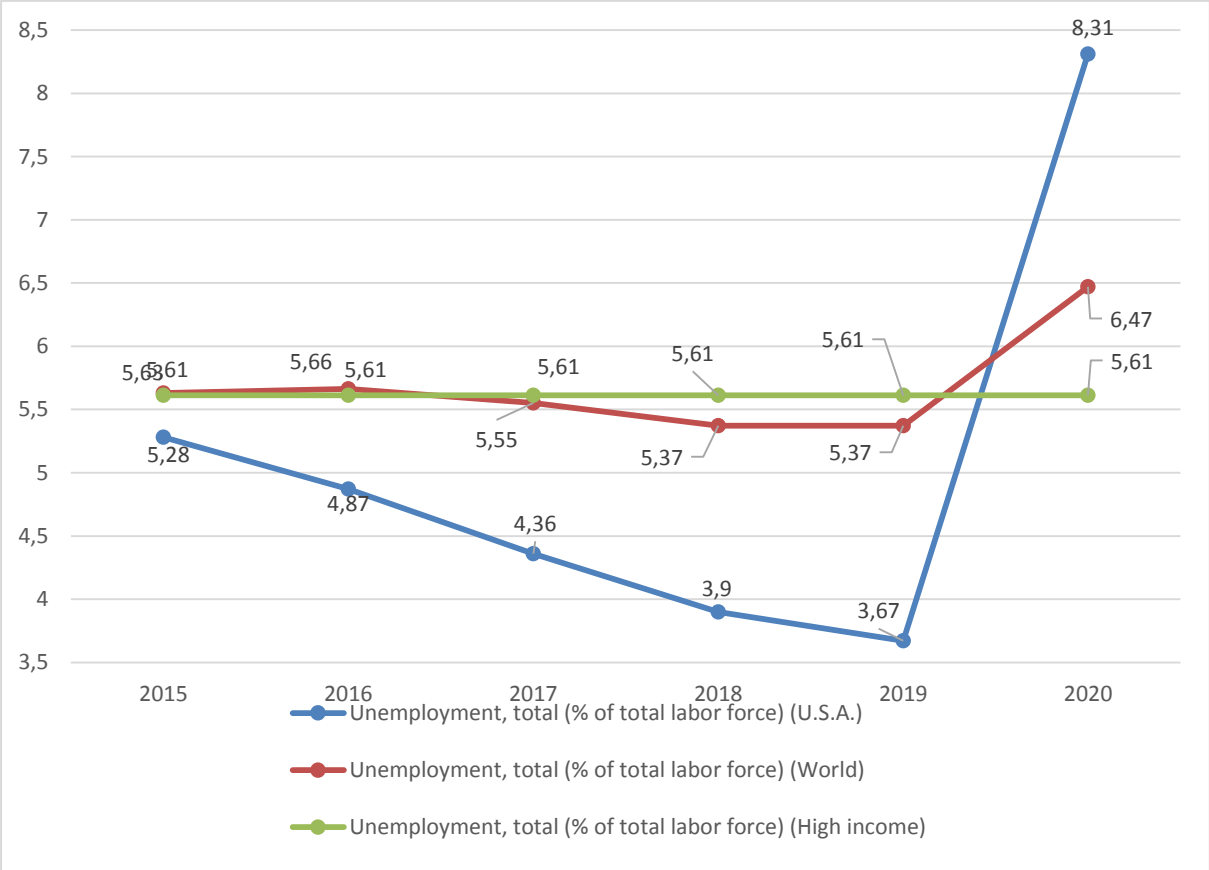
4.4.1 Food Supply Chain under COVID-19 Pandemic in the U.S.A.

Based on the available data, the indicators below were analysed in the U.S.A. in order to evaluate the effects of the pandemic on the primary production in the country.

Not only in the agri-food industry, effect of the pandemic on the total labour market can be seen in the World. For instance, the average total unemployment estimates were on a downward trend both in the OECD members, in the U.S.A. and in the World averages before the pandemic. However, it increased in

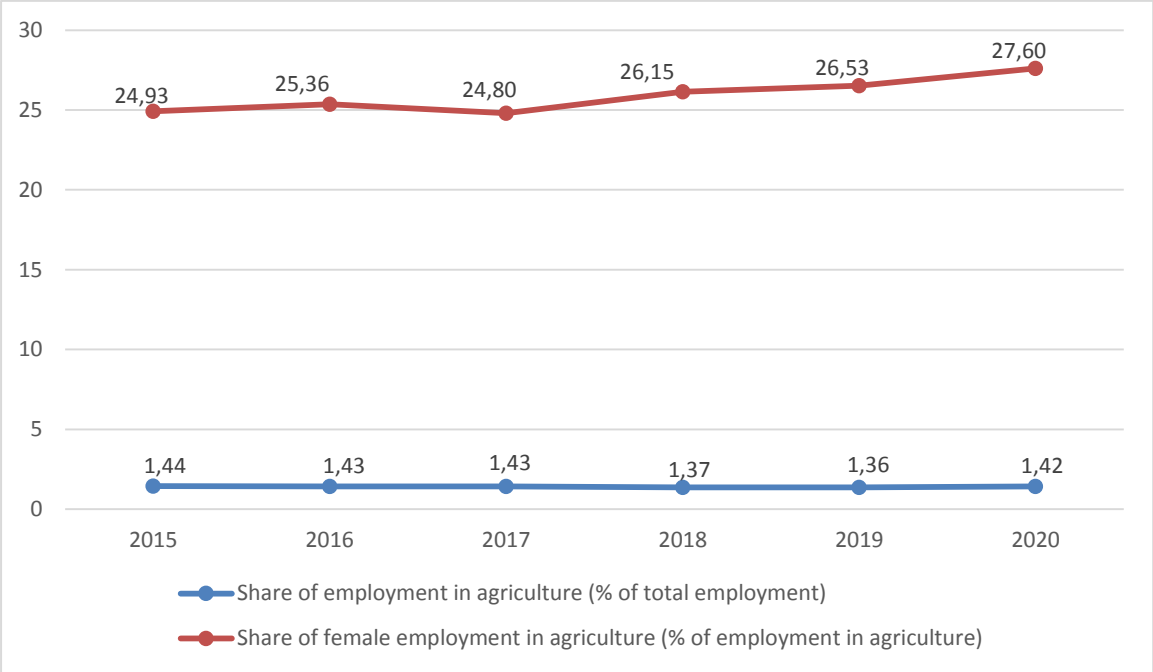
all three classifications after the pandemic with an increase rate 20.48% in the World, 36,92% in the OECD members, of 126.43% (from 3.67 to 8.31) in the U.S.A. from 2019 to 2020 (Figure 26). The steep increase in the U.S.A. in the total unemployment was way above the World and OECD member country averages and it was also seen in low-income, low and middle income, least LDCs countries 2019 to 2020. This high rate in the increase in employment also above the IFPRI 2020 estimates projecting a 35% job loss in the food industry and 21.26% of the jobs at risk at primary production, mainly due to the COVID-19 pandemic (IFPRI, 2020).

Figure 26 Unemployment in the U.S.A. and in the World



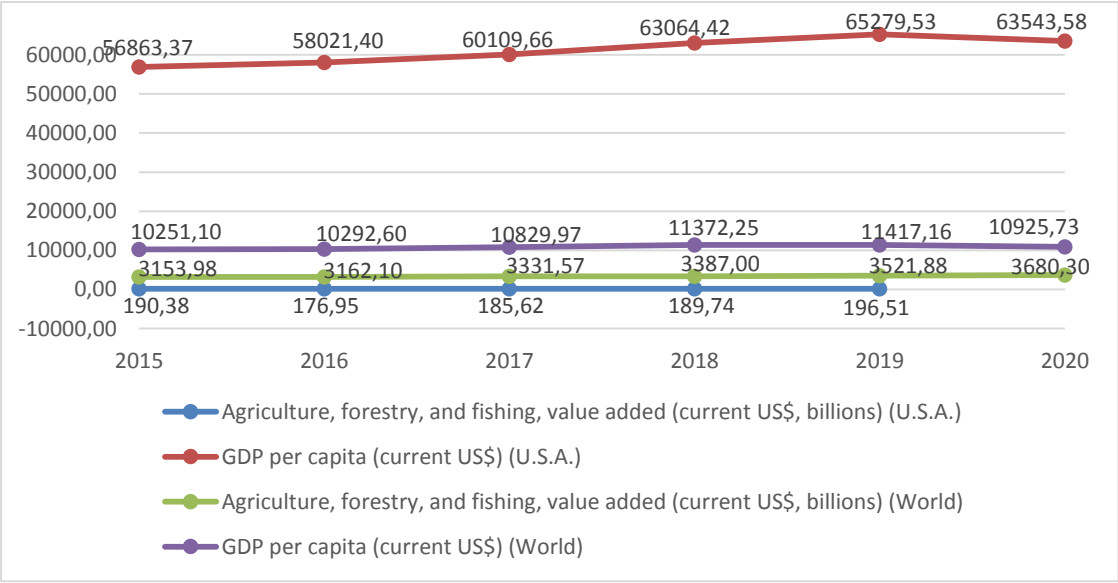
On the contrary to the above mentioned high total unemployment rate in the U.S.A., share of agricultural employment in total unemployment and the share of female employment in the agricultural employment have been on the rise in the country (Figure 27). A reason behind this lower share of agricultural unemployment in the total estimates could be that the agriculture is not a labour-intensive but a more capital- and knowledge-intensive industry in the U.S.A and this makes the whole supply chain more resilient in high-income countries in general. Therefore, it can be suggested that the low agricultural unemployment in the country may not cause a shortage in primary production and the country may not be affected intensively from the domestic supply crisis. Although not translated into the annual estimates, 22 million people lost their jobs overnight in early April 2020 in the country (IFPRI, 2020). In addition, especially highly concentrated markets, such as the meat industry, has been considerably affected from the pandemic through disruptions in the labour market.

Figure 27 Employment in agriculture in the U.S.A.



When it comes to the economic indicators, the same trends can be seen in value added agriculture (current US$) before the pandemic. In the 2019-2020 period, the value-added agriculture (current US$, billions) increased in 4.52% in the World but the estimate for the U.S.A. for 2020 has not been published (Figure 28). There was and continuous upward trend in GDP per capita (current US$) in the World until the pandemic and after the pandemic started it decreased 4.31% in 2020. In terms of GDP per capita, there were an upward trend until the pandemic, however, it decreased 4.031% in 2020 in the U.S.A.

Figure 28 Economic indicators in the U.S.A. in the World



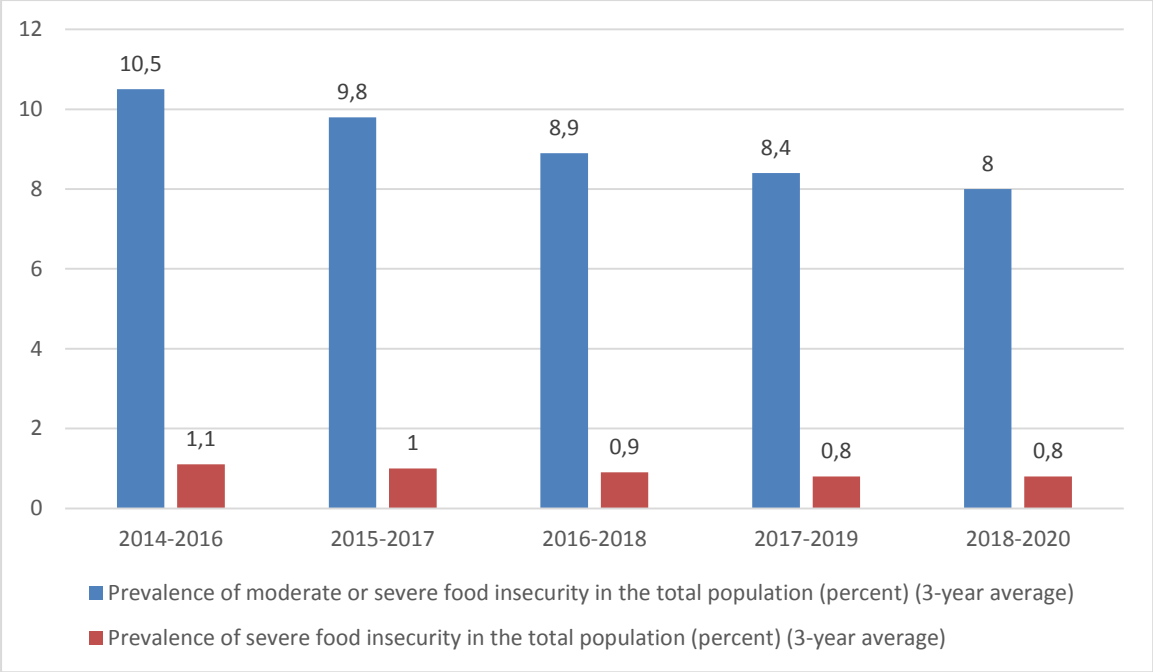
On the **trade** side, it can be seen from the Figure 29 that the consumer prices have been constant before the pandemic and with a 3.54% increase with the beginning of the pandemic and then stayed at the increased level afterwards in the U.S.A. while the consumer prices have been in an upward trend in the World except for January 2021 in the World. When it comes to the food price inflation, firstly a rise at the first half of the year 2020 and then a slight continuous drop was seen in the World trend and in the U.S.A. But, still, both the consumer prices and the food inflation has been lower than the World averages in the country during the pandemic. This picture may suggest that the food security in the U.S.A. has been affected by the pandemic less adversely than the World average. One of the reasons why the country has not been much affected from the pandemic in terms of food security may be that the U.S.A. is a major food exporter in a heavily concentrated global market.

According to the World Bank data, the time spent in export and import for border compliance stayed the same as 1.5 hours in the last 6 years meaning that the COVID-19 pandemic did not affect this time spent in the border in the U.S.A.

Figure 29 Consumer prices and food price inflation in the U.S.A

Although the COVID-19 pandemic has worsened the state of food security in the majority of the World, the U.S.A. does not seem to be affected from the situation. According to the most recent numbers, 10% of the households' face food insecurity in the country (Feeding America, 2021), and utilization and access to the food-still- pose the most important challenge. It can be seen the figure that there is an ongoing downward trend in the food insecurity in the population (Figure 30). For instance, in the three-year average measurements (from 2017-2019 to 2018-2020) number of people which are moderately or severely food insecure decreased from 27,5%, 26.5 million people; and the severely food insecure people stayed the same with 2,7 million people. Prevalence of undernourishment was <2.5 for these years.

Figure 30 Prevalance of food insecurity in the U.S.A.



The following are a summary of learnings for the OIC members to possibly draw upon:

1. Private industry is leading the sustainability efforts such as the incentives offered to the suppliers and consumers by large companies to support environmentally and socially responsible practices.
2. Public policy on food sustainability adopts the principles of "*reduce, reuse, and recycle*" in every step of the supply chain.
3. Reducing food loss and waste via raising awareness, providing incentives to public and private sectors, and leveraging new and existing partnerships to divert excess food.
4. Real time monitoring of risks across the food supply chain have helped the USA to identify and respond rapidly.
5. Adopting and establishing robust social safety nets for vulnarable households, women and children.
6. Extensive mitigation efforts to support agriculture sector-insurance funding.
7. R&D has been a cornerstone over the two decades for a sustainable food supply chain.

However it should also be kept in mind that the USA-as a global food exporter- make use of around 20 free trade agreements with partner countries reaching up to 50% of exported US products across all categories so the experience differs from the OIC in the scope of:

1. OIC can not copy exactly what U.S. does as systems are less developed, less funded and data may be harder to reach.
2. Individual OIC members may not have the funds for supporting safety nets for the most vulnerable; they may need partnership and support.
3. Protecting and maintaining the SFSCs is vital for OIC in particular for imports to keep the food security and its pillars.

5 Policy Recommendations and Conclusions

5.1 Policy Recommendations for OIC Members

Policy Advice I: Increasing international cooperation intra OIC by facilitating existing institutions.

Increasing cooperation intra-OIC to offer financial interventions (incentives, subsidies, funds etc.) by relevant OIC funding agencies, such as Islamic Solidarity Fund (ISF) and the Islamic Development Bank Group (IsDB); facilitating relevant OIC Working Groups such as Economic Policy Coordination Committee on COVID-19 to address the existing and future problems disturbing the food supply chain, and to develop strategic programmes on new funding mechanisms.

Rationale: Measures taken at national level to face and respond to the global scale and complexity of the crisis such as the COVID-19 has not been sufficient for any country. Concerning the unique nature and the scale of the crisis and bearing in mind the heterogeneity of the member countries concerning their socio-economic capacities, the situation demands greater coordination and joint efforts at both regional and global level. This is, in fact, in line with the objectives of the OIC Charter that calls for cooperation and coordination among Member States in humanitarian emergencies. With a large 1.5 billion-wide market, existence of 20 largest producers of world major agricultural staple food products, a young and vibrant youthful rural population and a relatively high revenue profile from its 18 middle income fuel exporting member states and halal food market reaching to around 440 bn USD; OIC has a big financial and labour potential to facilitate in order to address the existing and future problems disturbing the food supply chain. This is also in line with the professional standpoints of the experts interviewed that there is a need to cooperate at political and economic level in terms of halal food trade and direct investments. A new international cooperation scheme may increase the resilience of the food system in the face of new regional or global crisis related to a health or financial malfunction, and create new opportunities for OIC member countries to strengthen their existing potential for cooperation with each other. The US$ 2.3 billion fund allocated to the Respond-Restore-Restart strategy within the strategic preparedness and response program by the IsDB and ISF's US$ 1 million emergency assistance fund to help Member States, especially to Least Developed Countries (21 member countries) may be the starting point of further increasing these efforts.

Policy Advice II: Making the Food Systems More Sustainable.

Promoting climate smart agriculture and socially responsible practices by offering incentives to suppliers and consumers either through private sector (such as by the large companies leading the food sector) or public institutions is the key to increase the resilience of the food systems against any future crisis. These efforts may be used to adopt the principles of “Reduce, Reuse, And Recycle” and “One Health” in every step of the supply chain. Reducing food loss and waste via awareness, providing incentives and leveraging new and existing partnerships to divert excess food is another aspect of the problem.

Rationale: The COVID-19 pandemic was both a wake-up call to the vulnerability of our food systems and an insight into the ongoing threat posed by the climate crisis to nutritional security and our collective health. As stated by the experts during the surveys and interviews, one of the factors that was mostly defined as threats were extreme climatic events (droughts, floods, wildfires, hailstorms etc.). This suggests that there is a need to integrate environmentally sound practices in terms of waste management, climate change and extreme weather events to the FSC. Likewise, integrating social responsibility value addition schemes to the management of supply chains to increase economic and social viability of the food systems should be main tasks to consider when it comes to ensuring sustainability of the whole food supply chain. In addition, considering the “One Health” approach, meaning recognizing the linkages between human, animal, and environmental health appears to be a key to prevent future pandemics that may pose a risk to the food security at a regional or global level.

Policy Advice III: Protecting the Most Vulnerable Groups

As seen during the ongoing pandemic, the most affected part of the population was the most vulnerable (namely women, children, the displaced, the poor, immune suppressed and persons with disabilities) despite the available food aid and social protection programmes. Therefore, there is an urgent need to strengthen the available channels to provide fiscal and food aids to the most vulnerable population in the face of such global and complex crisis.

Rationale: The pandemic has disproportionately impacted on the most vulnerable in terms of all four pillars of the food security: availability, access, utilization and stability. The people who were already food insecure and vulnerable have been affected the most from the increase in food prices and income decline. These groups were forced to react with negative coping strategies during the pandemic such as getting less diverse diets and selling of productive assets – to overcome the income decline. More than 2 billion people didn't have regular access to safe, nutritious, and sufficient food in 2020. 35 % of them went to sleep on empty stomachs; including 135 million people who were on the edge of starvation. With the extra stimulus triggered by COVID-19, the cost of a healthy diet exceeded the international poverty line (established at USD 1.90 purchasing power parity (PPP) per person per day), making it unaffordable for the poor.

Primary and secondary impacts of COVID-19 have overstretched governments' capacities to protect especially vulnerable populations. The pandemic and related containment measures have exacerbated pre-existing drivers. Due to the loss in revenue of the governments and increase in the expenditure to contain the pandemic, the efforts to respond to the socioeconomic and health related impacts of the pandemic and to protect the most vulnerable through measures such as scaling up social protection programmes could not be sufficient in almost all countries around the World.

In the last 25 years, while the number of undernourished people in the World has fallen gradually, it remained almost the same in the OIC member countries. The measures that are already applied in OIC countries are in the form of direct cash-transfer, basic food assistance, or both. Overall, economic and income contraction amid the COVID-19 control measures increased the poor population thereby putting more people under a food-insecure state. The risk on the demand side threatened OIC members majorly relying on food imports and fiscally exports of raw commodities (e.g., oil) of which the prices have collapsed during the pandemic. Without social and economic mitigation measures such as fiscal stimulus and expansion of social safety nets, the impact on poverty would be devastating. In this sense, providing support to in terms of their productivity and access to market seems crucial during the pandemic. However, there is still an urgent need to offer public programs for enhancing safety nets and food assistance in the OIC region.

Policy Advice IV: Rethinking the international trade and logistics

A concerted, innovative, clear and cross-sectoral intervention is needed to get a food trade system providing better diets and resilience. The plan needs to be comprehensive, involving communities, businesses, and partnerships, and the resulting international trade systems should be free and foreseen in the face of a future crisis. International trade should be accelerated, e-commerce of agricultural products should be promoted, artificial constraints to domestic trade throughout the FSC should be removed to link the smallholder farmers to the market, and necessary adjustments should be made in trade and tax policies.

Rationale: Border closures and suspension of weekly and open-air markets in many countries have led to reduced regional trade and prevented farmers selling their produce, sometimes leading to localized food scarcity and increased prices. Closure of informal markets may have exacerbated the

increasing inaccessibility of nutritious foods. In addition to their social and cultural importance, informal markets (bazaars etc.) support healthy, nutritious diets as well as livelihoods of poorer population groups. In urban areas, consumers mostly depend on markets to purchase food. The fresh foods sold in supermarkets and formal markets are often less affordable or inaccessible to urban poor groups. The interruptions in the trade of perishable nutritious foods could be prevented by being exempt from the trade bans.

In order to keep the food value chain alive and keep global trade open, many OIC member countries have also made successful efforts to remove the key logistics bottleneck, such as the temporarily reducing VAT for agricultural products, allowing zero custom duties on essentially important imports, and relaxing the trade barriers. However, the FAO identified 28 OIC countries with weak food systems. OIC member states should be building back better – not returning to business as usual following the COVID-19 outbreak –to transform food systems to reduce poverty, improve food, agriculture and nutrition security.

Rural transformation to empower small producers and retailers and mainstream them in the food systems economy can help build resilient food supply chains. It is critical that smallholder farmers and micro, small, and medium-sized enterprises keep operating during such crisis. In poorer countries, these play a crucial role in supplying food to poor consumers. Supply chain disruptions have hit MSMEs hard, and they need access to fiscal aids and loans to stay operational. If small enterprises in agricultural value chains are shut down, the problems of food access and food availability could intersect, creating a more hunger.

The rebuilding of economies after the crisis may offer an opportunity to transform the global FSCs and make it more resilient to future shocks and turbulences while creating jobs. With a more efficient international trade system, exports can mitigate losses in revenues and imports can improve food availability and stabilize local food prices. In both exporting and importing countries, access to various markets can boost producers' productivity and income.

Policy Advice V: Preventing labor shortages

Providing unemployment insurance to the labor force working throughout the FSC, especially the ones without income security and sufficient savings appears to be a priority in allocating fiscal resources.

Rationale: COVID-19 caused millions of people around the world to be left unemployed due to lockdowns and travel restrictions. Food systems, which directly employ over a billion people, are about to lose 35% of formal employment, according to the FAO/IFPRI estimate. The jobs most at risk are in food processing, services, and distribution, disproportionately affecting female workers especially in food insecure hotspots. On average one-third of skilled workers were only able to continue to work efficiently. Labor shortages have further disrupted the food chain, with many laborers returning from neighboring countries or urban centers to their original homes in rural areas, awaiting the restrictions to be eased and the risk of infection to be minimized. Consequently, the income and purchasing power of rural households has been decreased due to limited opportunities for daily labor, closure of local markets and decline in local demand.

The pandemic substantially impacted all aspects of lives in OIC member states. It is estimated that more than 25 million increases in the number of unemployed people. This would result in huge policy challenges for OIC governments in tackling the socio-economic problems of affected populations during the post-COVID period.

Policy Advice VI: Promoting Primary Production

Development of strategic commodities for each OIC member country, reducing post-harvest losses and improving food stocks along the value chain, and promoting to be more self-sufficient at national level in terms of especially perishable, nutritious agricultural products may help preventing a new supply crisis in the face of a new food crisis.

Rationale: In most of the OIC member countries, agriculture is the leading sectors in terms of its contribution to income, employment, and trade. Furthermore, the number of people employed in the agricultural sector in the OIC member countries reached 26 percent of world's agricultural employment. However, OIC member states are still heavily exporting from non-OIC members. The main problems of the agriculture industry can be listed as poor market access, low level of agricultural productivity due to limited rural infrastructure and weak policy and institutional framework. With the pandemic, increase in the input prices, shortage in labour and inputs and the decrease in the demand has economically diminished the recent years' production as well as the next season's crop.

The economic impact of the pandemic may have more negative impacts on diet quality than on quantity, as grain supplies do not appear to be at risk. This is because their production is less labor-intensive and they can be stored for longer periods. Suppression measures like physical distancing requirements and restrictions on movement are affecting the production and transportation of high-value, labor intensive, perishable and nutritious foods, such as fruits and vegetables, meat, milk and other dairy products. Fresh produce, in particular, often requires many people to work in close proximity to cultivate, harvest and process. In addition, these perishable foods need to be moved quickly from farm to consumers, which makes them more vulnerable to travel restrictions and market shutdowns in turbulent times. Therefore, preventing supply crisis for such foods by being more self-sufficient at national level may be a policy option.

5.2. Risks and Relevant Strategic Recommendations

The low income OIC countries are the most susceptible to demand-side transmission of the pandemic. Almost 70% of the OIC countries have intermediate-high to high levels of risks in terms of demand-side transmissions. In contrast, only 10% have a low risk of exposure to the demand side.

Overall, economic and income contraction amid the COVID-19 control measures increased the poor population thereby putting more people in OIC under a food-insecure state. The below listed risks are highlighted from this study:

- The most vulnerable groups are forced to react with negative coping strategies during COVID-19 such as getting less diverse diets and selling of productive assets – to overcome the income decline.
- The risk on the demand side threatened OIC members majorly relying on food imports and fiscally exports of raw commodities (e.g., oil) of which the prices have collapsed during the pandemic.
- OIC member states especially in the MENA region is at higher risk.
- Food import is threatened due to decreasing revenue from commodity exports, fluctuation of exchange rates, and disruption of the global agri-food chain (FAOSTAT 2021).
- The decrease in the income of the people, made it more difficult to access to the food for daily needs.
- In order to minimize the negative impacts of the pandemic, OIC Member Countries kept the agri-food value chain functioning and protected the most vulnerable populations, including the displaced ones by mainly ensuring the sustainability of their food supply chains as much as possible; to minimize the negative impacts of COVID-19.

A Strategic Preparedness and Response Package (PRP) preferably coupled with a 'crisis management' is suggested to be applied at the OIC level at large (1 to 12 months duration) that was launched by Islamic Development Bank (IsDB) to support Health-Food-Development trilogy needs of OIC member countries by Responding, Restoring and Restarting (3Rs).

- Respond covering short-term (1-3 months) measures has focused on health and food emergence response including social safety nets to sustain and save lives.
- Restore designed for mid-term (3-12 months) and
- Restart, long-term (more than 12 months) approach, has involved in building resilience and robust key industries. IsDB allocated US$ 2.3 billion and launched US$ 1.5 bn COVID sustainability Sukuk to implement the program (FAO-WFP 2020, SESRIC 2020).

Similar programs are still needed to strengthen the resilience of the related OIC members under the effect of the pandemic.

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Annexes

Annex A: Country Groups

Arab Group	Asian Group	African Group
Algeria	Afghanistan	Benin
Bahrain	Albania	Burkina Faso
Comoros	Azerbaijan	Cameroon
Djibouti	Bangladesh	Chad
Egypt	Brunei Darussalam	Cote d'ivoire
Iraq	Indonesia	Gabon
Jordan	Iran	Gambia
Kuwait	Kazakhstan	Guinea
Libya	Kyrgyz Republic	Guinea-Bissau
Mauritania	Malaysia	Mali
Morocco	Maldives	Mozambique
Oman	Pakistan	Niger
Palestine	Tajikistan	Nigeria
Qatar	Turkey	Senegal
Saudi Arabia	Turkmenistan	Sierra Leone
Somalia	Uzbekistan	Togo
Sudan	Guyana	Uganda
Syria	Suriname	
Tunisia		
United Arab Emirates		
Yemen		

Note: * Guyana and Suriname are located in Latin America Region; Albania is in European Region. Due to the limited number of countries in that region, they are included in the Asian Group.

Annex B: Lists of Interviewed Experts and Informants

Country Expert/Informant	Affiliation
Nigeria	
Mr. Nasır Adamu Muazu	Director, Ministry of Agriculture and Rural Development, Nigeria
Mr. Abubakar Moustapha	
Mr. Zubairu Abdullahi	Director, Planning and Policy Coordination, Nigeria
Pakistan	
Prof. Dr. Hussnain Janjua Dr. Khurram Yousaf	National University of Sciences & Technology, Islamabad, Pakistan
S. Arabia	
Dr. Rajeh Alregas	
USA	
Prof. Dr. Li Ma	Institute for Biosecurity and Microbial Forensics Department of Entomology & Plant Pathology Oklahoma State University, USA
Dr. Jennifer van de Ligt	Director, Food Protection and Defense Institute (FPDI), University of Minnesota, USA
Dr. Lee Anne Jackson	CFSAN Food Lead, 2019 Novel Coronavirus FDA IMG, FDA Co-Chair, Food and Agriculture Sector Government Coordinating Council, MD, USA

Annex C: Expert Interview

Questions

1. How would you describe the current status of food security and malnutrition in your country? How did the situation of food security change in your country due to COVID-19 pandemic? Which particular food security pillar (food availability, access to food, utilization of food and stability of food supply) does pose the most important challenge in your country, in your opinion?

2. Does your country have a formal food sustainability strategy? How would you describe the current state of food sustainability in your country? Is there a widespread application of environmentally sound and socially responsible practices along the supply chain (in production, process, trade and distribution stages)? Do the food sustainability policies and programs effectively implement in your country?

3. How and why did the situation of sustainable practices in the food supply chain change due to the COVID-19 pandemic? In your opinion, which particular food sustainability drivers (environmental, social, economic) does pose the most important challenge in your country? For each of these drivers, what are the main sources of concern in terms of food sustainability problems? (e.g., negative environmental impacts, lack of social rights, economic instability etc.) How did the food sustainability practices affect from the COVID-19 pandemic?

4. How would you describe the current management status of food supply chain in your country? How did the management applications change in in the last decade? In your opinion, what are the main reasons behind the observed changes?

5. Is the structure of agricultural production in your country labour-intensive or capital-intensive? How the agricultural input prices (pesticides, fertilizers, seeds, machinery, power, agricultural workers) changed due to the COVID-19 pandemic? As a consequence of the change in the agricultural inputs, how the availability of the food in your country? How the purchasing power of the agricultural commodity consumers changed? During the pandemic, could the consumers access to the food products as much as the pre-pandemic conditions?

6. How the food trade in your country affected from export bans/restrictions, price swings, uncertainties, and overall economic situation due to the pandemic?

7. Is there a national information system in place to track food supply chains? Is it managed by the government? Are policies and programs regularly monitored and evaluated? Are sufficient governmental human resources with relevant know-how and sufficient financial resources allocated to ensure that the information system functions well?

8. What are the main strengths and weaknesses associated with sustainability of food supply chains in your country? What are the main opportunities and threats associated with food sustainability in your country? Could you give us some examples of good and bad practices that you observed in your country?

9. As an expert, whether and how frequently do you have contact with different domestic and international stakeholders about food sustainability matters? Is there a specific channel of communication among OIC member countries?

10. Would you like to share further thoughts about the sustainability of food sustainability and the effects of COVID-19 pandemic on the food supply chains in your country?

Annex D: Expert Survey

Questions

I. Respondent Information
Question 1: Which OIC country do you currently work in?

Question 2: Which of the following best describes your affiliation?
- Ministry
- Government agency
- Chambers of commerce and agriculture
- Farmers' associations & cooperatives
- International organization / NGO
- Commodity board
- State-owned enterprise
- Academia
- Other

II. Effects of COVID-19 Pandemic on the Food Supply Chain
II-A. Primary supply
Question 3: Is the structure of agricultural production in your country labour-intensive or capital-intensive?
[ ] Labour-intensive
[ ] Capital-intensive

Question 4: How did the changes in input prices of pesticides, fertilizers and seeds during the COVID-19 pandemic affected national food supply (when compared to the pre-pandemic conditions)?
[ ] Decreased
[ ] Increased
[ ] Stayed the same

Question 5: How did the changes in input prices in terms of machinery and power during the COVID-19 pandemic affected national food supply (when compared to the pre-pandemic conditions)?
[ ] Decreased
[ ] Increased
[ ] Stayed the same

Question 6: How did the measures taken due to COVID-19 pandemic affected the availability of agricultural workers in your country (when compared to the pre-pandemic conditions)?
[ ] Decreased
[ ] Increased
[ ] Stayed the same

Question 7: As a consequence of the change in the agricultural inputs mentioned above, how the availability of the food in your country changed due to the COVID-19 pandemic (when compared to the pre-pandemic conditions)?
[ ] Decreased
[ ] Increased
[ ] Stayed the same

II-B. Trade

Question 8. How did the availability of food in your country affected from export bans/restrictions due to the COVID-19 pandemic?
[ ] Negatively affected
[ ] Positively affected
[ ] Not affected

Question 9. How did the availability of food in your country affected from price swings due to the COVID-19 pandemic?
[ ] Negatively affected
[ ] Positively affected
[ ] Not affected

Question 10. How did the agricultural labour market in your country affected from overall economic situation and uncertainty due to the COVID-19 pandemic?
[ ] Negatively affected
[ ] Positively affected
[ ] Not affected

II-C. Final Demand

Question 11. How the purchasing power of the agricultural commodity consumers changed due to the COVID-19 pandemic?
[ ] Negatively affected
[ ] Positively affected
[ ] Not affected

Question 12. How did the access of the consumers to the food products change due to the COVID-19 pandemic (when compared to the pre-pandemic conditions)?
[ ] Decreased
[ ] Increased
[ ] Stayed the same

Question 13. How did the food insecurity and malnutrition change in your country due to the COVID-19 pandemic (when compared to the pre-pandemic conditions)?
[ ] Negatively affected
[ ] Improved
[ ] Not affected

III. Sustainability of Food Supply Chains

Question 14: Does your country have a formal **Food Sustainability** strategy (sustainability of food supply chains in terms of environment, social and economic perspectives)?
[ ] Yes
[ ] No
[ ] No answer

Question 15: How would you describe the current state of food sustainability in your country?
[ ] Good
[ ] Acceptable
[ ] Moderate
[ ] Critical
[ ] Extremely Critical

Question 16: How did the situation of food sustainability change in your country in the last decade?
[ ] Improved
[ ] Deteriorated
[ ] Did not change much
[ ] Do not know

Question 17: In your opinion, what are the main reasons behind the improvement of food sustainability in the last decade? (Please check all that apply.)
[ ] Agricultural supply chain reforms (subsidies, changes in market structure etc.)
[ ] Economic growth and poverty alleviation
[ ] Increase in institutional capacity and good governance
[ ] Decrease in food loss and waste
[ ] Improved local food markets
[ ] Improved adaptiveness and resilience of food systems against changing climate and extreme climatic events
[ ] Decreased negative environmental impacts
[ ] Improved rights and safety of the workers
[ ] (Please state other reasons, if any)

Question 18: Are food **sustainability** policies and programs effectively implemented in your country?
[ ] Yes
[ ] No
[ ] Do not know

Question 19: Is there a national information system in place **to track food supply chains**?
[ ] Yes
[ ] No
[ ] Do not know

Question 20: Is there a widespread application of **environmentally sound practices** along the supply chain (in the stages of production, process, trade and distribution)?
[ ] Yes
[ ] No
[ ] No answer

Question 21: Is there a widespread application **social responsibility** practices such as providing decent jobs, inclusive value chains, social investments etc.?
[ ] Yes
[ ] No
[ ] Do not know

IV.C Gaps and Needs
Question 22: Which particular food security pillar does pose the most important challenge in your country, in your opinion?
[ ] Food Availability
[ ] Access to food
[ ] Nutritional impact on consumers (Utilization of food)
[ ] Stability of food supply

Question 23: Which particular food sustainability pillar does pose the most important challenge in your country, in your opinion?
[ ] Environmental sustainability
[ ] Social responsibility
[ ] Economic viability

Question 24: Are the following factors strengths or weaknesses for your country in terms of **sustainability** of your national food supply chain?

	Strength	**Weekness**
Existing state of agricultural supply chains		
Existing national social policy framework (for workers in agriculture & food industry)		
Existing national environmental policy framework (for agriculture & food industry)		
Existing national economic aids (for agriculture & food industry)		
Existing national information system infrastructure (for agriculture & food industry)		
Existing national institutional capacity (economic, legal, social)		
Existing national disaster management capacity		
Please add if you find something relevant		

Question 25 Are the following factors opportunities or threats for your country in terms **of sustainability** of your national food supply chain?

	Opportunity	**Threat**
Agricultural labour force		
Increasing temperatures		
Extreme climatic events (droughts, floods, wildfires, hail storms etc.)		
International food prices, price swings		
Export bans/restrictions intra-OIC		
Export bans/restrictions (global)		
Swings in the agricultural input prices		
Swings in agricultural employment and food industry		
Swings in purchasing power of the consumers		
Global/Regional economic integration		
Global/Regional political integration		
Halal food trade during the COVID-19 pandemic		
Foreign direct investment during the COVID-19 pandemic		
Please add if you find something relevant		

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