

**Czech University of Life Sciences Prague**

**Faculty of Economics and Management**

**Department of Economics**



**Master's Thesis**

**The Impact of the COVID-19 Pandemic on the  
Commodity Market: A Case Study of Wheat**

**Author of the thesis**

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

## DIPLOMA THESIS ASSIGNMENT

Tuhin Mohammad

Economics and Management

Thesis title

The Impact of the COVID-19 Pandemic on the Commodity Market: a Case Study of Wheat

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### Objectives of thesis

The Covid-19 pandemic has had significant impacts on global commodity markets. Among these commodities, Wheat is one of the most widely traded and consumed crops globally. Wheat is a crucial staple food for many countries, and any fluctuations in its price can significantly impact global food security.

This study aims to investigate how the COVID-19 pandemic influenced the agriculture commodity sector, namely Wheat, during the COVID-19 spread and the lockdown measures. The primary aim of this paper is to understand if any changes in the Producer price of wheat dynamics occurred in terms of COVID-19. To extend, this paper examines the economic consequences of COVID and how different variables influence the global producer price of wheat and understands the correlation between variables, e.g. Producer price of Wheat, COVID, Production Value, Export Value, and Food Inflation. This study aims to develop a model to understand the correlation between all the variables and find the parameters' significance level.

### Methodology

The study was conducted from 2023 to 2024. The data used in this thesis was derived from FAOSTAT from 2000 to 2022 for 22 years. This study investigates the impact of the COVID-19 pandemic on the commodity market, with a specific emphasis on the wheat sector. Before moving to the empirical data analysis, the current study first estimated the descriptive statistics to summarize the data of variables under consideration. Statistical hypotheses were evaluated using OLS regression analysis across all dimensions to assess this model's goodness of fit. This paper used Gretl software to get the regression analysis output.

**The proposed extent of the thesis**

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GEMAN, H.: *Commodities and Commodity Derivatives: Modeling and Pricing for Agriculturals, Metals and Energy*. John Wiley & Sons., U.K., 2009. ISBN: 978-0-470-68773-4  
Mottaleb, K.A., Kruseman, G., Snapp, S. (2022) Potential impacts of Ukraine-Russia armed conflict on global wheat food security: A quantitative exploration, *Global Food Security*, Volume 35, 100659, ISSN 2211-9124. doi: <https://doi.org/10.1016/j.gfs.2022.100659>.  
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TVALCHRELIDZE, A., G.: *Economics of Commodities and Commodity Markets*, Nova Science Publishers, Inc., 2013. ISBN 978-1-622-57786-6

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## **Declaration**

I declare that I have worked on my master's thesis titled “The Impact of the COVID-19 Pandemic on the Commodity Market: A Case Study of Wheat” by myself and I have used only the sources mentioned at the end of the thesis. As the author of the master's thesis, I declare that the thesis does not break any copyrights.

In Prague on 31-03-2024

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# The Impact of the COVID-19 Pandemic on the Commodity Market: A Case Study of Wheat

## Abstract

This article comprehensively examines the worldwide influence of the COVID-19 epidemic on the wheat commodities market. The study examines the correlation between the producer price of wheat (dependent variable) and several parameters, such as wheat production value, export value, food inflation, and COVID-19. The analysis relies on a dataset that covers twenty-two years, specifically from 2000 to 2021. This study assessed the influence of COVID-19 by including a binary variable in the dataset covering the period from 2019 to 2021. Using the statistical software Gretl, This study calculated the coefficient by applying the Ordinary Least Squares regression analysis technique. This study illustrates that the COVID-19 epidemic has significantly impacted the prices established by producers. The impact of COVID-19 on wheat producer prices is substantial and unfavourable. The COVID-19 pandemic has caused a producer price decline of 112.129 units. Moreover, wheat prices are positively influenced by the production value of wheat and food inflation, whereas the export value has a negative effect. All of the variable associations are statistically significant at the 0.05 significance level. The findings provide vital insights into the market dynamics within the COVID-19 epidemic and highlight the challenges faced by commodities markets during global crises. This analysis is limited by its dependence on historical data and its omission of certain variables that could impact the price of producer wheat. Upon detecting the likely presence of autocorrelation, The completion of an exhaustive assessment of this data and carefully assessing the need for implementing further adjustments to the model. In summary, the model demonstrates a substantial statistical influence, with the coefficients for Production Value and Food Inflation also displaying individual significance. The model suggests that the producer price of wheat is considerably affected by COVID-19 and factors such as production value, export value, and food inflation.

**Keywords:** COVID-19, Pandemic, Commodity, Inflation, Export, Producer, Production, Positive, Negative, Impact, Significant.

## Abstrakt

Tento článek komplexně zkoumá celosvětový vliv epidemie COVID-19 na trh s komoditami pšenice. Studie zkoumá korelaci mezi produkční cenou pšenice (závislá proměnná) a několika parametry, jako je hodnota produkce pšenice, hodnota exportu, inflace potravin a COVID-19. Analýza se opírá o soubor dat, který pokrývá období 22 let, konkrétně od roku 2000 do roku 2021. Tato studie hodnotila vliv COVID-19 zahrnutím binární proměnné do datového souboru pokrývajícího období od roku 2019 do roku 2021. software Gretl, Tato studie vypočítala koeficient pomocí regresní analýzy metody obyčejných nejmenších čtverců. Tato studie ukazuje, že epidemie COVID-19 významně ovlivnila ceny stanovené výrobci. Přítomnost COVID-19 má významný negativní dopad na výrobní cenu pšenice. V důsledku pandemie COVID-19 cena výrobce zaznamenala pokles o 112 129 kusů. Ceny pšenice jsou navíc pozitivně ovlivněny produkční hodnotou pšenice a inflací potravin, zatímco hodnota exportu působí negativně. Všechny asociace proměnných jsou statisticky významné na hladině významnosti 0,05. Zjištění poskytují zásadní pohled na dynamiku trhu v rámci epidemie COVID-19 a zdůrazňují výzvy, kterým čelí komoditní trhy během globálních krizí. Tato studie je omezená, protože závisí na historických datech a nebere v úvahu všechny proměnné, které mohou ovlivnit cenu pěstitelské pšenice. Když je zjištěna pravděpodobná přítomnost autokorelace, je zásadní tato data pečlivě vyhodnotit a zvážit potřebu dalších úprav modelu. Souhrnně řečeno, model vykazuje podstatný statistický vliv, přičemž koeficienty pro hodnotu produkce a inflaci potravin také vykazují individuální významnost. Model naznačuje, že výrobní cena pšenice je značně ovlivněna přítomností COVID-19 a také faktory, jako je hodnota produkce, hodnota exportu a složka potravinové inflace.

**Klíčová slova:** COVID-19, Pandemie, Komodita, Inflace, Export, Výrobce, Výroba, Pozitivní, Negativní, Dopad, Významný.





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# 1 Introduction

The COVID-19 epidemic poses a significant risk to multiple nations. European nations, the United States, and the United Kingdom frequently see disruptions stemming from the novel Coronavirus. Countries in Asia, including China, Iran, India, and Pakistan, also experienced negative consequences due to the novel. The COVID-19 outbreak is largely linked to substantial economic, social, political, and psychological effects. The COVID-19 pandemic necessitates inevitable expenditures for both the countries directly impacted and their adjacent nations. The COVID-19 pandemic results in both tangible and intangible costs, affecting the economies of nations through several channels. The short-term consequences of COVID-19 are the direct exhaustion of human and physical resources, as well as the health issues faced by individuals and the disruptions to the activities of both consumers and producers. The long-lasting ramifications of COVID-19 are the disturbance of several economic operations and a decrease in productivity. The measurable costs related to COVID-19 include a reduction in a nation's total income, the pace of economic growth, global trade, local investment, influx of foreign direct investment, and money earned from tourism. Furthermore, there has been a rise in the rates of unemployment, exports, and inflation. The intangible consequences of COVID-19 include a reduced quality of life, increased emotional anguish, and heightened levels of stress. Intangible costs refer to the subjective well-being of persons, which can be evaluated using various metrics. According to Mitchel et al. (2005), well-being can be described as the difference between all factors that bring satisfaction and all factors that cause distress. Individual satisfaction is a component of well-being, and COVID-19's effects might have an impact on it.

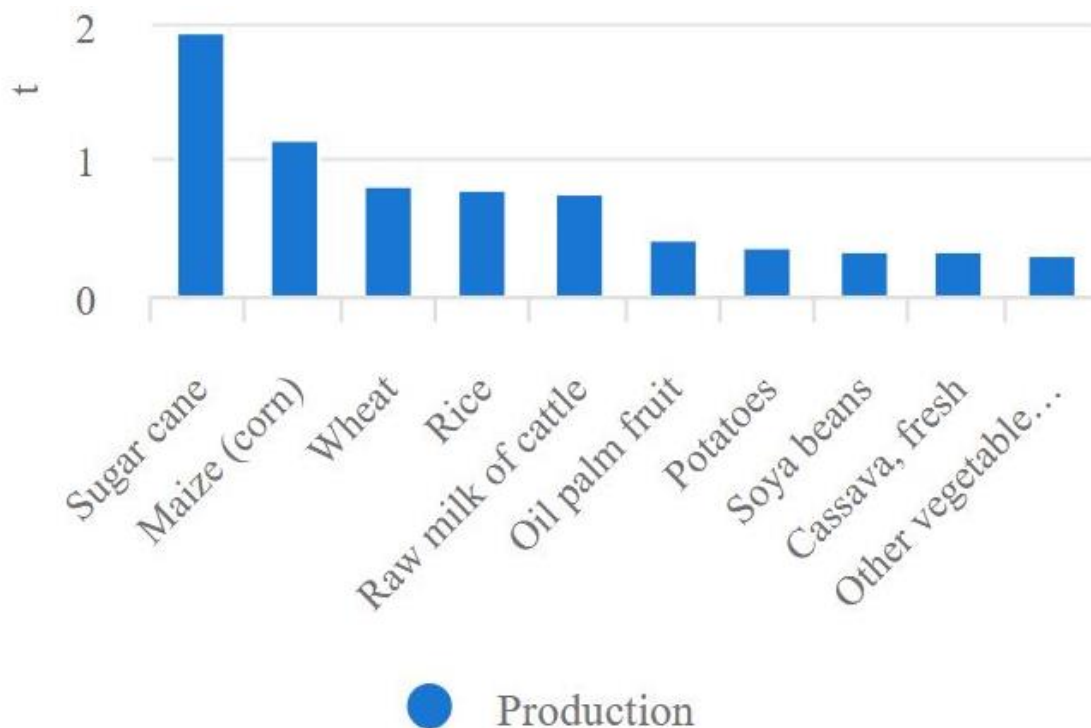
The FAO specialists have stated that the COVID-19 epidemic, unfavorable meteorological conditions, and geopolitical tensions, particularly the significant Russian military activity in Ukraine, have caused significant disruptions in supply chains. During periods of wartime aggression, Ukrainian agricultural producers suffer significantly increased risks due to the difficulty of transporting and selling products on the global market, as well as restrictions on production activities. Concurrently, the worldwide decline of market supply increased its vulnerability to adverse weather conditions in other producing areas, hence intensifying its volatility. The increased price volatility is a particular concern since it presents additional

risks that affect the profits and expenses of all those active in the market. (Hrabyńska et al., 2022).

The COVID-19 lockdown in Italy had an adverse effect on the country's economic condition. Many households saw a decrease in income, which forced many to be confined to their houses. Both of these factors influenced food consumption; specifically, a loss in income led to a decrease in available funds for buying food. (Braut et al., 2022).

Wheat is an important global cereal and crop. Wheat is the most widely cultivated crop, occupying a total area of more than 220 million hectares. (Kiss,2011).This cereal is comparable to maize and rice in terms of production volume. Most produced commodities are Sugar cane, Corn, Wheat, Rice, and so on as follows:

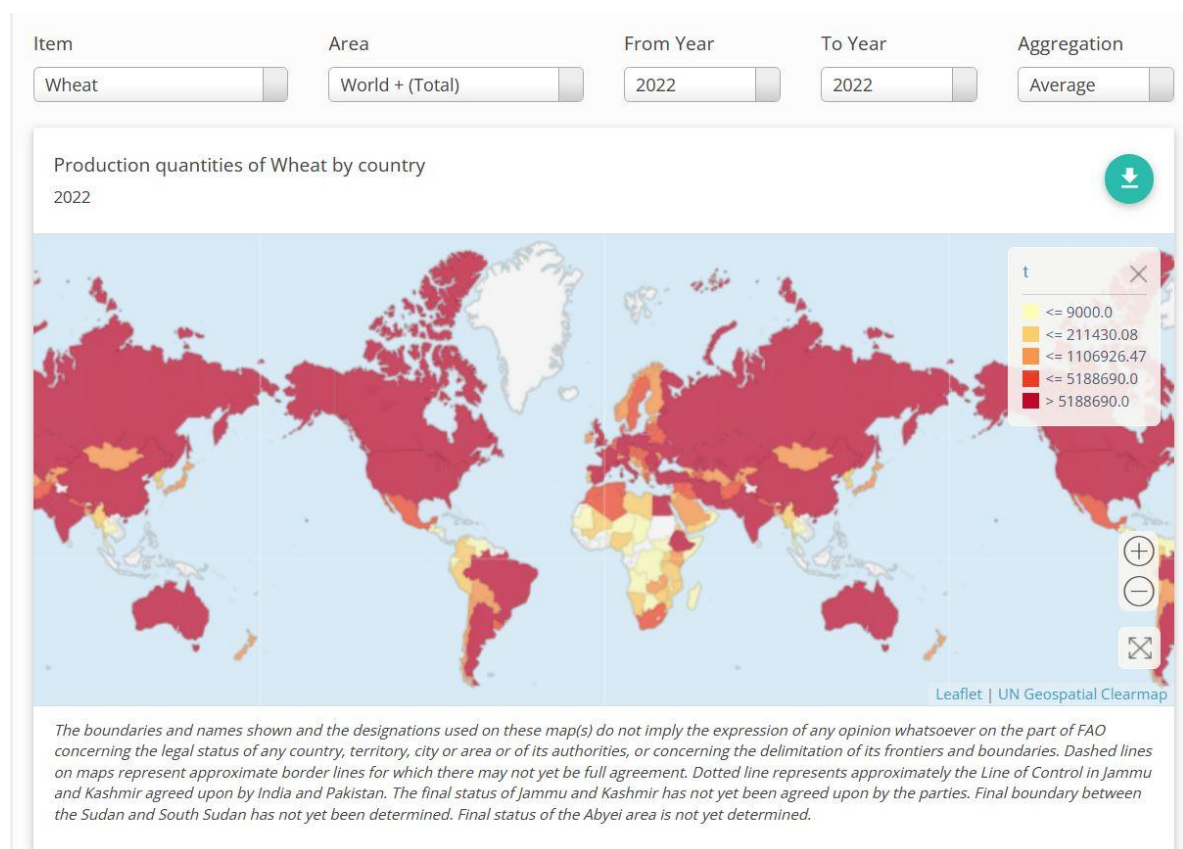
**Figure 1 Most produced commodity.**



Source: FAO, 2024.

The statistics shown here are derived from the FAOSTAT database on wheat production in different parts of the world.

**Figure 2 Production Quantities of Wheat by country.**



Source: FAO, 2024.

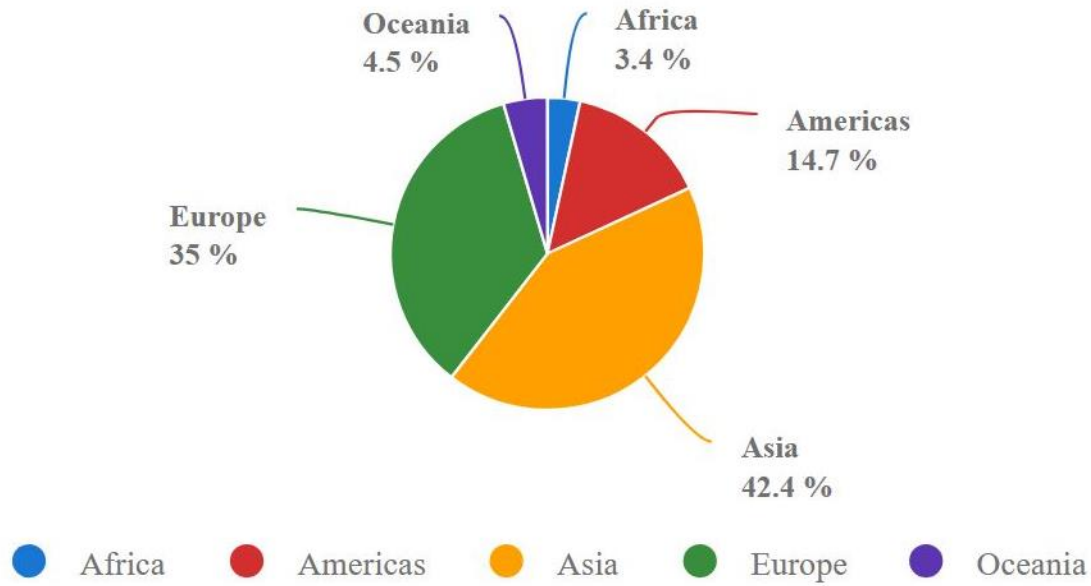
China emerged as the top worldwide wheat producer in the marketing year 2022–2023, surpassing 137 million metric tons. The European Union attained a manufacturing volume of over 134 million metric tons, solidifying its status as the second-largest manufacturer. Russia and Ukraine together produced around 25 percent of the worldwide wheat trade.

The expected wheat production is estimated to be 3.17 metric tons per hectare, consistent with the previous year's harvest. It signifies an 11 percent increase compared to the average yield over the prior five years. The projected harvested area is expected to reach 28.8 million hectares, representing a 1 percent decline compared to the previous year but a 4 percent rise compared to the average of the prior five years.

In the last thirty years, there has been a small reduction of approximately 0.25% in the amount of land utilized for farming, while there has been an increase of nearly 1.5% in crop

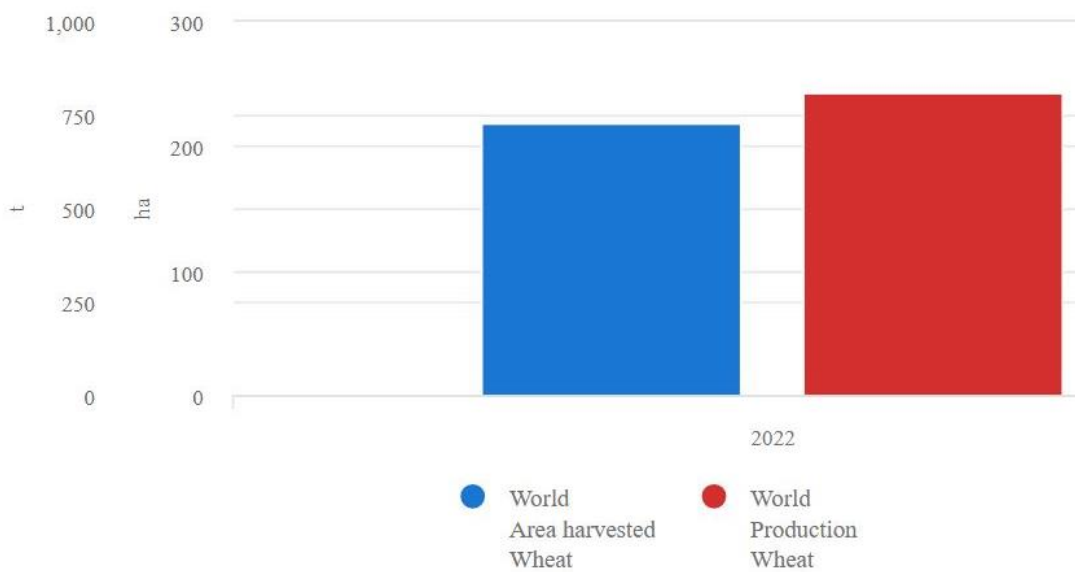
yields. This can be ascribed to technological improvements. (Enghiad et al., 2017). Net production value of wheat reaches the total amount of 137K billions of Int.

**Figure 3 Production Share of Wheat by region.**



Source: FAO, 2024.

**Figure 4 Yield quantities of Wheat in World**

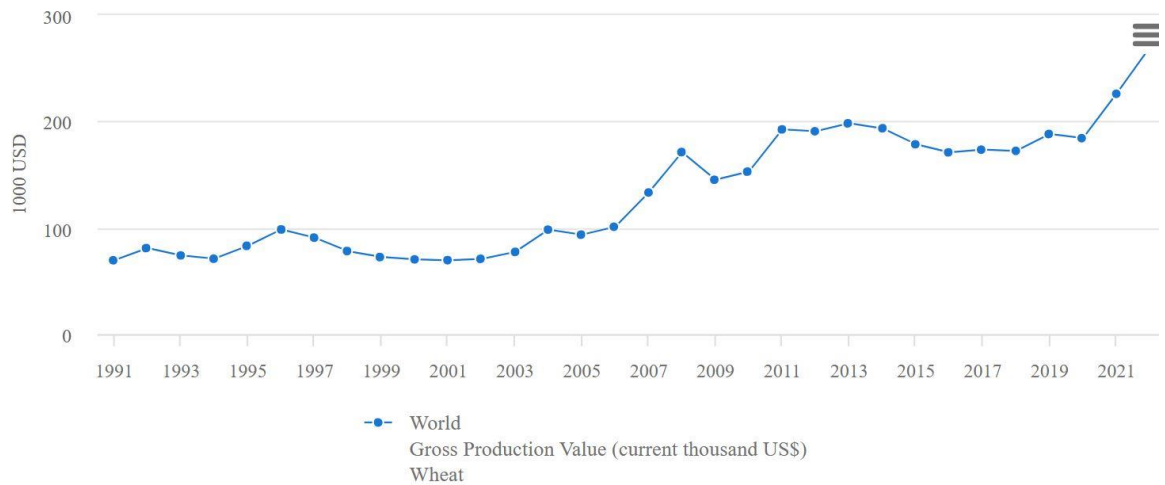


Source: FAO, 2024



**Figure 5 Gross production value of Wheat**

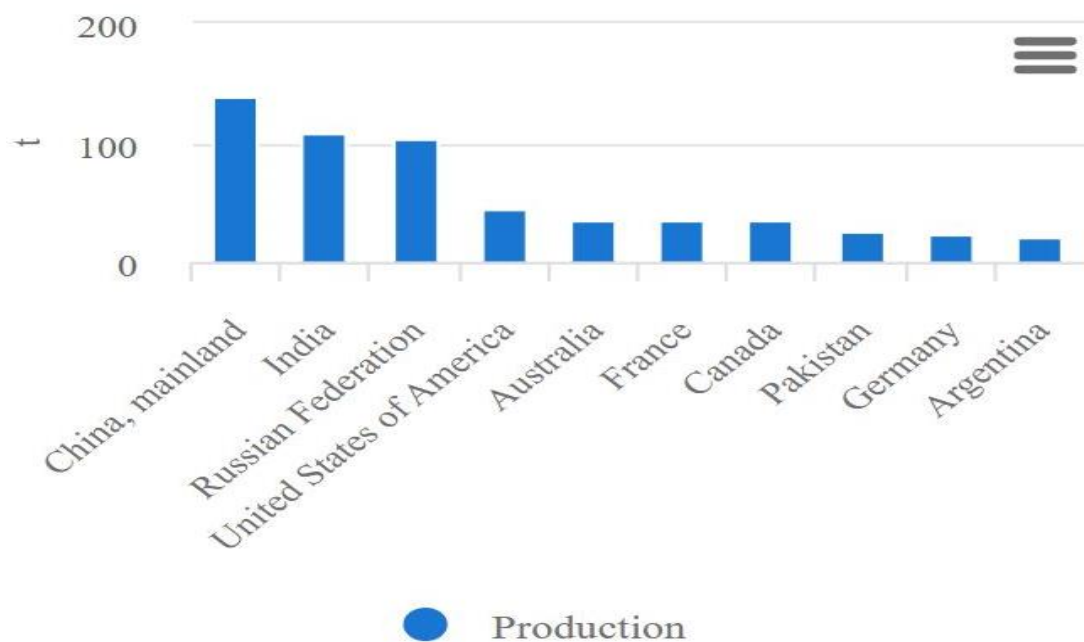
Gross Production Value (current thousand US\$) - Wheat  
1961 - 2022



Source: FAO, 2024.

Countries that are nowadays leaders in wheat production include China, India, Russian, USA, Australia, France, Canada, Pakistan, Germany, Argentina.

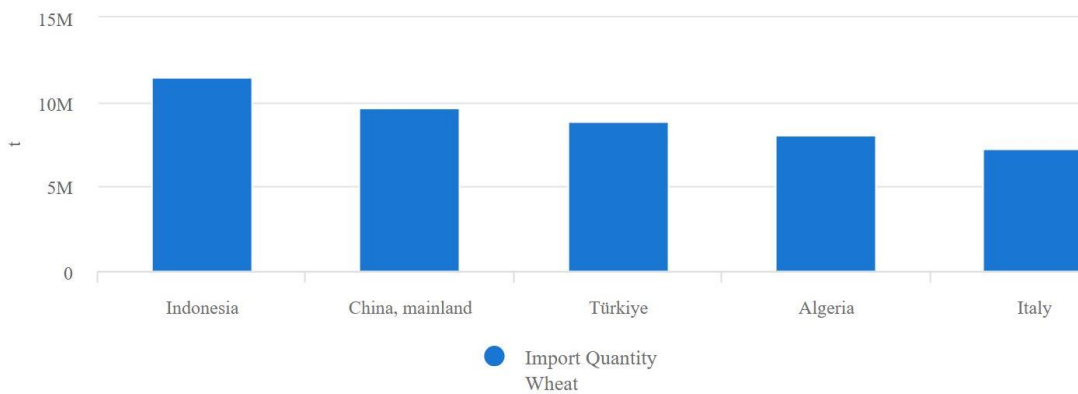
**Figure 6 Top 10 countries of wheat production in 2021.**



Source: FAO, 2024

Wheat is widely esteemed for its substantial contribution to human and animal nourishment, as well as its diverse applications in the culinary business (such as bread, pasta, confectionery, baby food, beer, and alcoholic beverages), pharmaceutical industry, and other sectors. Global estimates indicate that wheat contributes about 20% of the total calories and proteins in human nutrition on a daily basis, with the percentage rising to approximately 50% in India. Therefore, wheat plays a vital role in guaranteeing food security. (Grewal, Goel, 2015; Jeločnik et al., 2017). As a result, there is a substantial market demand and trading convenience for wheat, which is a highly valuable commodity. In recent years, the global export value of wheat has fluctuated between around 35 to over 50 billion USD, influenced by factors such as climate conditions and production levels. (Kefyalew, Henneberry et al., 1997; Imexco, 2017). Main wheat exporters and importers are presented by next Figure as follows- Countries that are nowadays leaders in wheat export include Indonesia, China, Turkey, Algeria, Italy.

**Figure 7 Top 5 import country.**



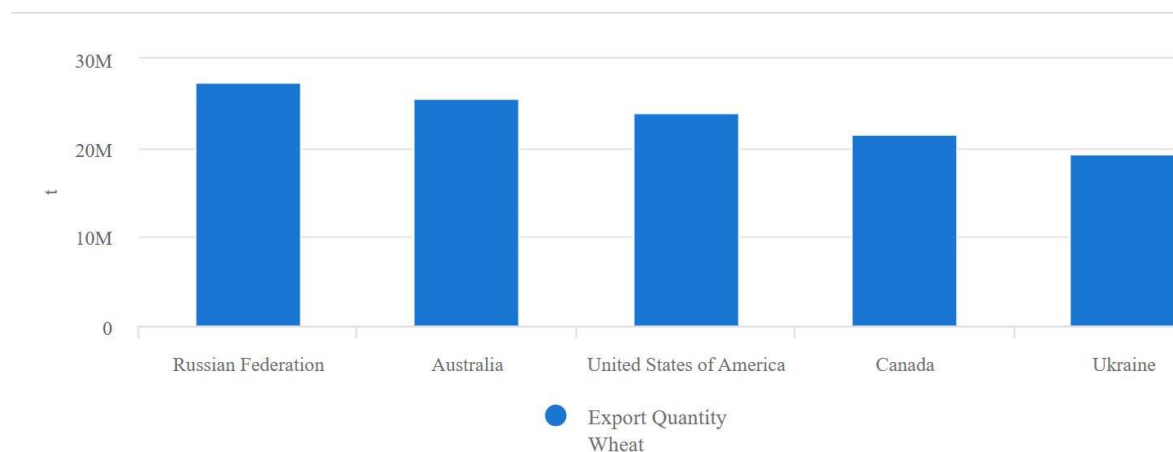
Source: FAO, 2024

The COVID-19 epidemic has had a direct impact on logistical groups that are involved in the transportation, storage, and distribution of commodities. Logistics enterprises play a crucial role in both domestic and international value chains by enabling trade and commerce and assisting businesses in getting their products to clients. The pandemic-induced

disruptions in the sector may have repercussions for competitiveness, economic growth, and job creation. ( IFC., 2020)

Countries that are nowadays leaders in wheat export include Russian Federation, Australia, USA, Canada, Ukrain as follows:

**Figure 8 Top 5 export country.**



Source: FAO, 2024.

The subsequent sections of the paper are organized in the following manner: Section 2 provides an elaborate exposition of the objectives and methodology and the sources of data employed. Section 3 comprises a comprehensive examination of the pertinent literature. Section 4 and 5 provides a description of the findings and further analysis. Section 5 concludes the study.

## **2 Objectives and Methodology**

The COVID-19 pandemic has revealed vulnerabilities in the global agri-food system, putting it under great stress. It may be a trigger event that sets off structural changes meant to fortify the food system. The pandemic harmed farmers and changed the global food chain due to reduced market accessibility, declining commodity prices, restricted availability of farmworker labour, and shifting consumer demand..

### **2.1 Objectives**

The Covid-19 pandemic has changed the way the entire economy operates, impacting different sectors, including agriculture. This study seeks to analyze the effects of the COVID-19 pandemic on the agricultural commodities sector, with a specific emphasis on Wheat, during the spread of the virus and the enforcement of lockdown measures. The primary aim of this study is to investigate whether there have been any changes in the dynamics of wheat producer pricing in response to the COVID-19 epidemic. This article seeks to examine the economic consequences of the COVID-19 epidemic. The study specifically examines the global producer price of wheat and explores the correlation between many indicators, including COVID-19, production value, export value, and food inflation. Based on the available literature, the COVID epidemic and the ensuing lockdown may have influenced the modification of the producer price of wheat. This study aims to develop a model that can understand the relationship between all variables and assess the statistical significance of all parameters.

### **2.2 Methodology**

This research investigates the world market for commodities related to wheat agriculture based on secondary data. All of the information is collected on the FAOSTAT website. With FAOSTAT, information about food and agriculture is publicly available. Data on prices, production, imports, exports, inflation, and other relevant subjects are available on this e-governance portal.

#### **2.2.1 Study Process and Setting**

The study was conducted in the period 2023-2024. This paper aims to analysis the impact of the COVID-19 pandemic on the commodity market, with a specific emphasis on

the wheat sector. Information was taken for the period from 2000 to 2021 for the period 22 years. The data analysis used the Ordinary Least Square (OLS) technique. The study additionally establishes the research framework and process, encompassing the following: constructed a comprehensive literature review to assess and integrate the research findings of previous academics to develop the theoretical framework for this study. To develop statistical hypotheses for each dimension, the literature review discusses the theoretical framework of elements that influence the producers selling price of wheat in the commodity market for producers amidst the COVID-19 pandemic. This study constructed One equation model by utilizing OLS based on the theoretical foundation of this title. Statistical hypotheses were evaluated using OLS regression analysis across all dimensions to assess this model's goodness of fit. This investigation aimed to ascertain the determinants that impact producer prices amidst the COVID-19 pandemic.

In this paper has been set out hypothesis that the COVID-19 , affect the producer price of Wheat. This paper make use of step-by-step causality in order to identify whether COVID-19 "impact" the values of producer price of the Wheat. To do so, this paper used one equation econometric model which is refer as Ordinary Least Square method regresstion analysis. This paper used Gretl software to get output of regresstion analysis. If this paper show significant result for P- value less than 0.5, it means COVID-19 has presence on the producer price.

### **2.2.2 Data Source**

The data used in this thesis was derived from FAOSTAT and described on Table-1. Information was taken for the period from 2000 to 2021 for the period 22 years. Using FAOSTAT data, The data on the producers' price of wheat (US\$/ton) (annual average), production value of wheat (US\$/ton/1k), export value of wheat (US\$/ton/1k) (annual average) was collected from FAOSTAT. Also the data food inflation (US\$/ annual average percentage) was collected from FAOSTAT. This study measured the COVID-19 effect using a dummy variable in the data from the year 2019 to the year 2021.

### **2.2.3 Theoretical framework and model specification**

During the lockdown, there was a significant shift in food consumption habits as people who were used to eating out had to start eating at home. ( Maugeri et al., 2020 ).

Moreover, studies have shown a substantial influence of the Covid-19 pandemic on several markets and commodities, leading to the occurrence of spillover effects. (Ben Amar et al., 2020).

Finally, Laborde et al. (2020) Previously, it has been argued that implementing export quotas and other trade policy measures in response to the COVID-19 problem will increase world food prices. (Laborde et al., 2020).

Heck et al. (2020) explain the COVID-19 epidemic as threatening the “software” and not the material hardware” of food production, as other simultaneous climatic and ecological crises do.

#### **2.2.4 Ordinary least squares (OLS)**

The Ordinary Least Squares (OLS) model is a widely used regression technique commonly applied to examine the relationship between a group of explanatory variables and a dependent variable. This study examines the relationship between a dependent variable and a set of explanatory factors using the Ordinary Least Squares (OLS) model. The relationship is depicted by a regression line, often known as the line of best fit, which can be mathematically written as:(Benoit, n.d.)

$$Y_i = \beta_0 + \beta X_i + \varepsilon_i$$

where  $Y_i$  represents dependent variable (producer price of Wheat) in globally  $i$ ;  $\beta_0$  is the intercept;  $\beta$  is the vector of regression coefficients; and  $x_i$  signifies the explanatory variables (i.e. Production value, export value, food inflation, COVID).  $\varepsilon_i$  denotes the random error

#### **2.2.5 Economic Model**

This study constructed the following general model based on the objectives of the thesis and variable under consideration :

$$PP_{1t} = f(PV_{1t}, EV_{2t}, FI_{3t}, COVID_{4t})$$

Source: Authors Own work (2023).

Where are the above model shows that PV, EV, FI, and COVID-19 are the functions of PP, which represent producer price changes in the context of globalization over time.

### 2.2.6 Econometric Model

However, the previously mentioned model could be transformed into regression form as provided below:

#### Equation : 1

$$PP = \beta_0 + \beta_1 \cdot PV + \beta_2 \cdot EV + \beta_3 \cdot FI + \beta_4 \cdot COVID + \varepsilon$$

Source: Authors Own work (2023).

### 2.2.7 Variable Declarations

**Table 1 variable declaration**

Variable	Name	Unit	Description
PP1t	Producer price of wheat	kg/capita	Endogenous
PV2t	Production value	kg/capita	Endogenous
E1t	Unit vector		Exogenous
EV2t	Export value	czk/tonne	Exogenous
FI3t	Food inflation	czk/tonne	Exogenous
COVID4t	COVID-19 Pandemic	czk	Exogenous

Source: Authors Own work (2023).

COVID = Presence of COVID-19 (binary variable, 1 if present, 0 otherwise)

$\beta_0$  = Intercept term

$\beta_1, \beta_2, \beta_3, \beta_4$  = Coefficients for each independent variable

$\varepsilon$  = Error term

### 2.2.8 Data Description

Before moving to empirical analysis of the data, current study firstly estimated the descriptive statistics in order to summarize the data of variables under consideration. The descriptive statistics includes mean, median and the range (i.e., minimum, and maximum values) of the data. Besides, this study also identified the standard deviation of the variables.

### 2.2.9 Econometric Modelling process

This model involved estimating the existence of COVID-19 pandemic impact on the agriculture commodity based on a case study on Wheat—coefficient support to identify the dimension and trend of the relationship between each exogenous variable and endogenous variable. Error term represents an exogenous variable that the endogenous variable does not

explain. This study consist to assess each variable. This study refred to evaluate the overall fit of the model to the data. Therefore, this study used the OLS (Ordinary Least Square) method regression analysis via coefficient estimated.

## 2.2.10 Data Table

**Table 2 Data table**

Year of production	Producer Price_ USD_ Average_ tonne	Production Value_ USD_ 1k_ tonne	Export Value_ USD_ 1k_ tonne	Food Inflation_ Avverage_ Percentage	COVID -19	UV
2000	195.08	69438887	14156447	3.48	0	1
2001	191.33	68179631	14610853	3.48	0	1
2002	202.64	69174532	15272790	2.44	0	1
2003	266.07	75484017	15948216	2.58	0	1
2004	340.18	96409715	19304405	4.17	0	1
2005	272.36	91552465	17595722	3.43	0	1
2006	283.84	98727512	20513856	3.66	0	1
2007	347.75	132363029	30445633	5.23	0	1
2008	347.70	170574095	44165577	11.21	0	1
2009	330.45	144658574	31540103	3.65	0	1
2010	326.87	152234655	32698270	2.90	0	1
2011	292.81	191114901	46863893	5.59	0	1
2012	274.39	190305981	48915628	3.98	0	1
2013	286.75	197838093	49384865	3.13	0	1
2014	288.02	193045262	47785569	2.60	0	1
2015	284.78	177444289	38736620	2.61	0	1
2016	293.82	170693201	36491843	1.85	0	1
2017	343.57	174840876	39013851	2.14	0	1
2018	242.74	172544106	41066053	2.45	0	1
2019	250.60	187217150	40198714	3.55	1	1
2020	215.53	185165253	44854898	4.80	1	1
2021	200.74	221811847	54940688	5.38	1	1

Source: FAO, 2023



### **3 Literature Review**

In the early 21st century, the world has faced various challenges, including the 2003 spike in oil prices and the 2007-08 global financial crisis. The ongoing COVID-19 pandemic has decreased economic productivity and created uncertainty in the pricing of natural resource commodities, which has garnered the interest of academic scholars.

#### **3.1 Lessons from the Past Epidemics**

Throughout history, the world has experienced several epidemics, including the Great Influenza of 1918-1920, Severe Acute Respiratory Syndromes (SARS) in 2003, Avian Influenza (H5N1) from 2004 to 2006, Middle East Respiratory Syndromes (MERS) in 2012, Influenza A Virus Subtype (H7N9) in 2013, and the most recent COVID-19. Pandemics such as the Great Influenza, SARS, MERS, and COVID-19 have substantially impacted the economy. The epidemic significantly influenced the working class, the allocation of advantages, the buildup of wealth, and socio-political systems. It resulted in a transition from feudalism to a system of centralized governance. (Bell & Lewis et al., 2005).

The Spanish Flu caused around 39 million fatalities in 43 countries, several deaths similar to that of World War I, and had a role in the events that led to World War II. Scientific research has demonstrated that the influenza virus reduces GDP by an estimated 6-8%. (Barro et al., 2020), while Correia et al. (2020) this pandemic caused a decrease in manufacturing activity of approximately 20%. The SARS pandemic of 2003 is considered a "services market disruptor" since it generated social anxiety and led to a notable reduction in social interactions. Consequently, there was a significant decrease in the need for and availability of workers, especially in the service industry, ranging from 20% to 70%. (Lionello et al., 2017). Furthermore, the global macroeconomic impact of SARS was estimated to range from USD 3-10 million per case to USD 30-100 billion worldwide. (Smith et al., 2006). The outbreak of this disease led to economic losses amounting to USD 12.3-28.4 billion, a 1% decrease in China's Gross Domestic Product (GDP), and a 0.5% decrease in Southeast Asia's GDP. (MacKellar, 2007).

Since 2012 in Saudi Arabian patients with severe respiratory sickness was discovered The Middle East respiratory syndrome coronavirus (MERS-CoV). (Zaki et al., 2012).

From April 2012 to January 2020, the World Health Organization (WHO) has documented 2519 cases of Middle East Respiratory Syndrome (MERS) that have been confirmed through laboratory testing. Among these instances, there were a total of 866 fatalities, leading to a case-fatality ratio of 34.3%. A total of 2121 cases, the bulk of which were reported from Saudi Arabia, were recorded. Among these incidents, there were 788 fatalities, leading to a case fatality rate of 37.1%, as reported by the World Health Organization (WHO, 2020). The outbreak resulted in a substantial economic downturn of \$10 billion, specifically affecting the tourism sector in South Korea. Anticipated outcomes indicate a projected decrease of 0.1% in the GDP growth rate for the year 2015. (Joo et al., 2019).

COVID-19, a new and unique virus, appeared worldwide in late December 2019. The outbreak originated in Wuhan, the principal city of Hubei province in China. (Zhou et al., 2020; C. Huang et al., 2020; Zhu et al., 2020). The International Labor Organization (ILO) has estimated that over 25 million jobs could be lost globally due to COVID-19, leading to a possible economic loss of around US \$220 billion in developing countries. (ILO, 2020). The voluntary social isolation and the lockdown's execution severely affected leisure, travel, tourism, and catering. By 2020, China was predicted to lose over \$95 billion due to the forfeiture of 75% of its revenue. (Hoque et al., 2020). On March 23, 2020, OECD Secretary-General Angel Gurría stated that the enormous scope of the current shock has made economic forecasting more complicated than ever. The pandemic has also brought on a severe financial crisis that will affect our communities for years. OECD Interim Economic Outlook did the first assessment of the expected impact of COVID-19 on global growth, released on March 2, 2020. However, we have already progressed well beyond the more dire scenario anticipated at the time (COVID-19, 2020). There is a vast amount of research on the causes of recessions. The literature on the causes of recession is vast (see Bentolila et al., 2018; Jagannathan et al., 2013; Main & Sufi, 2010; Stiglitz, 2010; Bezemer, 2011; Bagliano & Morana, 2012; Gaiotti, 2013). However, the one brought on by COVID-19 is not like any other that has happened recently. The outbreak and spread of the coronavirus produced a different kind of recession than before. For example, the 1997 collapse in the value of the Thai baht caused an economic downturn and financial calamity that extended to numerous Asian countries, leading to the Asian debt crisis. (Radelet & Sachs et al., 2000). Since 2008 and 2009 world financial crisis includes of included loose monetary policies that created a

bubble, weak regulatory frameworks, subprime mortgages, and unsustainable leverage levels in the banking sector. ( Allen & Carletti et al., 2010). The implementation of a flexible exchange regime, pipeline vandals, rising gas prices at the pump, dropping crude oil prices, decaying infrastructure, and an unstable exchange rate were the main causes of Nigeria's 2016 recession.(Olanrewaju et al., 2018).

COVID impacted the global economy, affecting billions of households and generating interruptions in economic growth, trade, healthcare, unemployment, and tourism. The pandemic has led to quantifiable and incalculable costs, including immediate consequences such as resource depletion, health challenges, and consumer and producer activity interruptions. Long-term implications involve disruptions in economic operations, decreased productivity, and increased unemployment, exports, and inflation rates. Governments are giving greater importance to advancing public health rather than defensive strategies, aiming to provide financial aid to those in lower and moderate socioeconomic brackets. Countries with developed economies, such as the UK, Germany, and Norway, offer VAT rebates to stimulate consumer demand. Authorities have encountered difficulties in reducing debt ratios, enacting austerity measures, and managing inflation. However, it is crucial to enact significant changes and increase taxation while offering incentives to industries and enterprises to guarantee their viability. The World Bank is formulating strategies to tackle these challenges and ensure the sustainability of industries and businesses. Developing countries must involve both the commercial and public sectors to implement these policies effectively. (Khan, A et al., 2021).

### **3.1.1 The impact of COVID-19 disease on agriculture**

A wealth of information confirms that the COVID-19 pandemic has a substantial effect on agriculture and the food supply chain, namely in terms of food demand and security. This leads to significant harm for the most vulnerable individuals. The COVID-19 epidemic has significantly impacted human behavior and activity, particularly in agriculture. The implementation of limitations on movement, combined with reduced ability to buy, has dramatically affected the demand for food, undermining food security. These circumstances have had a more significant impact on different demographic groups that are already disenfranchised. With the increasing number of cases, nations are enacting stricter measures to control the spread of the virus, affecting the worldwide agricultural supply chain. The

paramount goal of any implemented intervention should be to prioritize preserving public health and food security, even if it means sacrificing economic growth. However, other governments adopt an opposing stance. (Siche,2020)

### **3.1.2 Impact of COVID in Europe agriculture**

The COVID-19 pandemic has profoundly affected our traditional way of life. In the context of 2020, the global strategy for handling the pandemic consisted of widely implementing lockdowns and other strict measures. The enforcement of these limitations has substantially influenced the HORECA sector, small-scale vendors, labor standards, and transportation options. At a national level, the evaluation confirms that the European Union's agriculture sector demonstrated significant resilience during the outbreak and is expected to maintain this resilience despite the differing effects on the food industry in different Member States. The impact of GDP shocks on the agri-food sector is negligible. However, changes in consumer behaviour can have long-lasting effects on specific industries, such as the meat production sector. Trade operations served to alleviate disruptions in the domestic market. Nevertheless, they resulted in substantial price swings in local and worldwide markets, especially in areas where ornamental and potato crops are cultivated. The influence of price changes on the supply side was considerably more substantial than the consequences of deploying lockdown measures. The restricted functioning of food services has posed multiple challenges for producers and food processors, who had to quickly adapt to fulfil the requirements of consumers' home kitchens as they became more hesitant to adopt different dietary practices. The impact of the income shock has been reduced due to the ability of low-income individuals to adapt their consumption of food commodities and the introduction of policy measures to prevent job losses and avoid a broader economic collapse. (Gonzales-Martinez, A. R et al.,2021).

### **3.1.3 Impact of COVID-19 on Bangladesh's agriculture sector**

Bangladesh's agricultural output, marketing, and international trade were greatly affected and disrupted by the COVID-19 pandemic. Amidst the epidemic, there was a substantial decline in the cost of essential agricultural commodities during the initial production phase. The COVID-19 pandemic had a significant and unparalleled effect on the supply chain of agricultural commodities. However, due to a lack of merchants from faraway markets, producers were forced to limit their sales to the local market, thereby shortening

the supply chain. However, the COVID-19 pandemic has resulted in a substantial decline in the income derived from crucial export commodities. The agricultural input and output markets faced several challenges, including the timely acquisition of agricultural inputs, the promotion and sale of farm products, adjusting to changes in consumer purchasing behavior, and handling the decrease in income in rural households. The restriction on importing essential inputs due to the COVID-19 pandemic hurts the production activities of agricultural enterprises. Furthermore, the marketing endeavors of agro-based companies were hindered due to the limitations imposed on the mobility of their market representatives. It is crucial to acknowledge that crises and opportunities arise concurrently, and COVID-19 is no exception. Despite the potential threats posed by the pandemic, it also expedited and enhanced the incorporation of digital technologies into agriculture and food systems. More precisely, the e-commerce of agricultural products, namely mangoes, has shown a substantial surge. The outbreak highlights the urgent need to improve rural infrastructure, use automation, and embrace new technology to strengthen the resilience and productivity of the agricultural industry. Efficient cooperation among governments at different levels, the general public, farmers, and industry is crucial for tackling the epidemic and reinstating farm productivity and food security. The government and its several ministries should take responsibility for leading the way in this field. The COVID-19 epidemic has significantly impacted specific individuals, particularly those employed in agriculture. Recognizing these individuals as the ones most significantly affected by the crisis and prioritizing them in the current government financial assistance program is paramount. This can be achieved by either direct monetary aid or providing input subsidies. To confirm transparency, it is essential to create a single national database exclusively for farmers. This database will maintain a concise and all-encompassing roster of recipients. The database must be synchronized with a distinct national identity number and verified by the local authorities. To ensure the uninterrupted transit of agricultural products, the government can develop dedicated transportation routes and methods, such as a specialized train service exclusively designed for the movement of agricultural goods. Moreover, it is crucial to establish a specialized governing body or regulatory authority to supervise any disturbances in the input and output markets. This would facilitate prompt and practical answers. Introducing a public reserve system for agricultural products and production resources to handle unexpected events is a viable approach that would benefit both farmers and consumers. (Islam, M. S., Hossain et al.,2023).

### **3.1.4 Impact of COVID-19 on Caribbean's agriculture sector**

The COVID-19 epidemic has had a substantial effect on impoverished regions, particularly Small Island States (SIDS) in the Caribbean. These countries are particularly susceptible to risks and hazards due to various geophysical and socio-political factors, significantly impacting vulnerable agricultural sectors. The pandemic exacerbated the already precarious agri-food systems of Small Island Developing States (SIDS) in the Caribbean. The steps implemented to manage the current crisis have greatly disturbed food systems by endangering the production, distribution, and marketing of goods, exposing the region's food security to risk. Caribbean Small Island Developing States (SIDS) heavily depend on food imports and international markets to secure their food supply. Moreover, these nations depend substantially on agricultural exports and have a substantial population involved in agricultural pursuits, making them particularly vulnerable to the issues brought about by the epidemic. The problems were exacerbated by restrictions on the export of food products and the limits imposed due to lockdowns and border closures. Moreover, the region's food and nutrition security is susceptible to climate change and climate-related disasters. Dealing with the aftermath of multiple disasters co-occurring is a persistent and continuous threat. The research confirmed that the impacts of the COVID-19 pandemic were evident across the entire agri-food supply chain, and various challenges and disruptions were seen among all the organizations and governments involved. Every group in the study experienced multiple difficulties and disruptions, such as a decrease in income, a decline in sales, and a loss of market opportunities. Nevertheless, the effect differed among the groups and was influenced by socio-demographic factors. Traditionally, persons with lower incomes and smaller businesses were more susceptible to the negative consequences of the epidemic. It is crucial to investigate the implications of the COVID-19 pandemic on agri-food systems throughout the Caribbean and identify the solutions that have been implemented to manage these effects. Examining the outcomes and effective strategies employed will aid in making well-informed decisions grounded in evidence and highlight the most efficient techniques as these countries continue to tackle the difficulties posed by the pandemic. This study revealed that the COVID-19 pandemic resulted in challenges and interruptions across the whole agri-food supply chain in the Caribbean. All players encountered specific challenges and shocks, while others have shown significant relationships with socio-demographic factors. Generally, people with lower socioeconomic status and smaller businesses were more susceptible to the adverse effects of the epidemic.

The findings suggest that some well-established organizations effectively managed the challenges and disruptions brought about by the COVID-19 pandemic by implementing creative strategies or capitalizing on internet marketing opportunities. Periodically, the occurrence of favorable circumstances resulted in the creation of new companies. Multiple consumers have documented adopting more nutritious eating patterns and increasing their intake of products obtained from nearby sources. This is noteworthy because the Caribbean is usually recognized as one of the most unhealthy regions, and its strong dependence on food imports contributes to a significant level of food insecurity. (Daley, O et al.,2022).

### **3.1.5 Impact of COVID-19 on USA farmers**

The COVID-19 epidemic has shown weaknesses and placed considerable pressure on the agriculture and food systems in the United States. This occurrence has the potential to act as a catalyst for making structural reforms targeted at improving the resilience of the food chain. The pandemic resulted in substantial disruptions to the food supply chain in the United States, impacting farmers in various ways. The problems encompass diminished market entry, lowered commodity pricing, restricted agricultural workforce availability, and shifts in consumer demand. The media coverage of farmers' reactions to these stressors was classified into three distinct pathways: (i) reactive or mitigating reactions, (ii) adaptive reactions, and (iii) transformative reactions. The mainstream media predominantly emphasized the disruptive ramifications of the pandemic on the agricultural system in the United States, explicitly highlighting the adverse repercussions for farmers. Additionally, they emphasized the prompt and decisive measures implemented by policymakers and players in the food supply chain. The discourse around the epidemic's impact on farmers primarily focused on the consequences for farmers themselves and the measures implemented by institutional actors rather than the farmers' reactions to the stress induced by the pandemic. The media primarily focused on the emotional well-being of farmers and their efforts to deal with difficulties while neglecting to highlight adaptive or transformative approaches. National newspapers demonstrated a greater inclination to cover farmer responses and highlight examples of flexible and innovative methods instead of agricultural trade publications. Our research indicates that in the early stages of the outbreak, the news media primarily depicted the situation as a sudden and uncontrollable 'natural' disaster that resulted in considerable adverse outcomes. The press mainly emphasized immediate policy actions to mitigate the effects of the pandemic rather than providing fair coverage of the

efforts made by farmers or conducting a thorough examination of the fundamental structural factors that contributed to the vulnerabilities revealed by the pandemic. Both mainstream media and specialized agricultural publications tend to promote narratives that downplay the likelihood of the pandemic leading to a more resilient system. (Jackson-Smith et al.,2021).

### **3.1.6 Impact of COVID-19 on Nigeria**

Nigeria, the country with the highest population density in Africa, has encountered various challenges in healthcare, food security, and accessibility due to the COVID-19 pandemic. Food security is widespread availability and easy access to safe and nourishing food for everyone. The reliability of the food supply network is contingent upon its efficiency. The COVID-19 pandemic has worsened Nigeria's food security crisis, adding to the difficulties already faced by the country as a developing nation. This problem has arisen due to various factors, such as disruptions in the food transit network, reduced agricultural production induced by global lockdown measures, and limited availability of farming resources such as fertilizers, workforce, and strict controls. The convergence of these factors has resulted in a pervasive scarcity of food and escalating expenses, presenting an escalating peril to the stability of homes in the nation and engendering an ambiguous outlook for its populace. This study evaluates the effects of the COVID-19 pandemic on the food security of households in Nigeria, as well as the repercussions of the lockdown and changing business environment on farmers' food production operations and selling activities. Furthermore, it evaluates the impact of pandemics on agro-industrial companies and the strategies implemented by governments to promote the long-term viability of the agriculture industry. This study investigates strategies to improve the production, accessibility, and availability of local food by implementing interventions, such as offering financial incentives or subsidies to farmers, revitalizing dormant agricultural organizations, and promoting local food production and processing. (Agbugba et al.,2022).

## **3.2 Price Insulation**

Based on an initial review of recent shifts in global commodities markets, it has been determined that the significant rise in global wheat prices could exacerbate poverty and food insecurity, especially after the invasion of Ukraine. Domestic markets frequently benefit from a certain degree of insulation from global markets due to variables such as transportation expenses and protective measures like export restrictions, tariff reductions,



and import subsidies. The fluctuation of worldwide wheat prices directly impacts the prices of wheat farmed within a country. Evaluating the extent to which significant food commodities in each country are protected from price fluctuations is crucial for understanding the effects of local wheat price changes on poverty and food insecurity. (Martin et al., 2022).

When there is a spike in global food costs, there is a significant concern about how it will affect a country's pricing, which in turn impacts both farmers and consumers. These prices are responsible for inducing the requisite alterations in demand and supply and determining the repercussions on households. The degree of the transmission of changes in global pricing also impacts the consequences of disruptions on global market prices. Should export market restrictions or variable levies be implemented, the prices within significant countries may remain unaffected by fluctuations in global market pricing. In this scenario, the markets with stronger connections to global markets will need to shoulder a greater share of the burden in adapting to the sudden change, which could result in a substantial rise in the instability of global market prices. (Martin & Anderson, 2012)

### **3.3 Hedging Strategies**

Farmers can anticipate the market price of wheat and reduce business risks on their farms by comprehending the connection between production costs and market price. This information enables individuals to determine whether to sell their wheat before the harvest, immediately after the harvest, or retain it for future sale. Empirical evidence has confirmed that there is a minimum threshold for the market price of storable agricultural commodities. When the market price approaches or surpasses the production costs, farmers will stop selling their crops and hoard them, anticipating a future price increase. The analytical findings reveal a strong and favourable correlation between operating expenses and the market value of wheat. This indicator allows for anticipating future trends in wheat prices and promotes timely decision-making regarding the best appropriate strategy for mitigating price risks. (Janković et al., 2020)

The fluctuation in commodity prices and the belief that speculative behaviour played a role have generated a renewed interest in futures markets. The wheat market is negatively affected by various variables, including production costs, increased demand, price volatility,

and the significant impact of nonproduction factors, such as speculative ones.(Zuppiroli & Revoredo-Giha, 2016)

The yearly manufacturing expenses of corn vary and depend on the corn harvests and input costs. Accurate price trend predictions empower agricultural producers to sell their products strategically at the most advantageous times, enable grain purchasers to get the most favourable prices and assist commodities market speculators in achieving significant profits, among other benefits. Farmers are hesitant to reduce the price of their products when market prices approach the variable production costs per unit. They are reluctant to sell their items at a price equivalent to the variable costs. Alternatively, they option to retain the products and postpone the sale, decreasing the supply and halting any additional price decreases. When the prices exceed the production cost, producers earn a profit, and the supply of grains increases, which helps to reduce further price increases. An evident and robust association was discovered between operating costs per bushel and expenses per bushel and price. There is a stronger link and less variability between the operational cost per bushel and the price in USD dollars per bushel at harvest.(Kovačević et al., n.d.)

### **3.4 Price Volatility**

During the current COVID-19 epidemic, there has been a continuous increase in global food costs and increased instability. The main factors responsible for this problem mainly stem from concerns regarding food security, international food distribution network disturbances, and bad weather conditions that affect agricultural production. The COVID-19 pandemic has altered the interconnection between volatility in futures contracts for agricultural commodities. (Palason et al.,2022, March).

the COVID-19 pandemic increased volatility in financial markets and had a significant and enduring effect on the underlying dynamics of commodities markets. the pandemic has led to a consistent rise in earnings volatility in various agricultural commodity markets. Amidst the pandemic, the wheat market experiences a transient yet advantageous impact on profits due to the hoarding phenomenon. wheat exhibit the most robust cross-correlations regarding returns. Nevertheless, the degree of financial integration among agricultural commodities is restricted in regular market conditions and during periods of crisis. the dollar exchange rate and Brent oil prices as crucial macroeconomic determinants that impact the future returns of

agricultural commodities. The impact of these elements becomes far more pronounced during the epidemic and its ensuing repercussions. The temporal investigation reveals the persistent financial instability in agricultural commodities markets. This turbulence is greater than in prior instances, such as the 2008 economic crunch and the 2014 drop in oil prices. The growing volatility of particular agricultural commodities signifies a heightened level of uncertainty and risk, which mandates adopting risk management strategies. The transitory nature of the hoarding effect on wheat market returns during the COVID-19 era is apparent, underscoring the need for investors to recognize the immediate benefits while acknowledging the limited long-term viability of these effects. Furthermore, the substantial increase in the unpredictability of rice returns during periods of intense pressure emphasizes the need for investors in the rice business to consider this heightened volatility when making decisions. (Iuga et al., 2024)

### **3.5 Food Supply Chain**

Implementing targeted assistance throughout the whole supply chain will help mitigate the economic consequences. During the outbreak, the food prices in Indonesia exhibited a volatile pattern. While there was some level of predictability, there were fluctuations in both positive and negative directions when comparing the average expenses before and after the COVID-19 epidemic. This phenomenon is shaped by the nearness of customers and producers and the intricate logistical difficulties related to transportation infrastructure in a particular area. (Yudha et al., (2023).

The Covid-19 epidemic placed unprecedented strains on food supply chains. Farms faced difficulties acquiring specific resources, particularly temporary labor, during crucial periods. Inadequate workforce and frequent shutdowns greatly hindered processing operations, especially in the meat processing sector. The air transportation of perishable commodities, such as fruits and vegetables, encountered substantial disturbances essential for ensuring their prompt delivery. The demand for restaurants and food services experienced a significant decline while the retail food market increased. Nevertheless, supply networks in prosperous nations have demonstrated exceptional durability up to this point. The shop shelves were restocked once people stopped hoarding, and participants in the supply chain increased their working hours, expanded their workforce, simplified their product offerings, and looked for other suppliers. (Deconinck et al., 2020).

Food supply are disturbed by COVID-19. During the outbreak, food shortages may leave shoppers depressed and frightened at supermarkets and grocery stores. The commercial strength of rich nations affects global food supply networks. Understanding the food supply crisis in wealthy industrialized nations like France and Germany is vital. Contrary to popular opinion, France and Germany, the EU's two largest economies with robust agricultural systems and riches, have had a food supply interruption since March 2020. Early in the COVID-19 pandemic in these two countries, food distribution was hampered, disrupting daily life and business. Due to home demand, supermarkets and grocery stores limit canned products and shelf-stable milk. After major food supply restoration, France and Germany improved. Pandemic travel restrictions don't affect food distribution. However, the pandemic caused food and drink shortages. COVID-19 has had little impact on agriculture, and the food market is stable. High technology makes France and Germany's labour-intensive farm industry less vulnerable to COVID-19. COVID-19 has little impact on agriculture if rapid demand is not the main cause of food shortages in France and Germany. Hidden industrial decline, especially in food manufacture and delivery. Food output declined in France and Germany in March 2020. French food manufacturing declined by 2.3% in February 2021 compared to 2020. In March 2020, German food production declined by 4.1% compared to 2019. The manufacturing of food goods sub-industry preserves dairy and food. Shops' shortages of long-lasting milk and preserved foods are straining France and Germany's food supplies. Falling motor vehicle, trailer, and semi-trailer production threatens food supplies. MTS transports food from suppliers to supermarkets and grocery stores in these vans. Due to food, beverage, and MTS manufacturing capacity constraints, France and Germany's food supply chains are under pressure during the outbreak. (Liu, 2020).

### **3.6 Global Agriculture market**

COVID-19 has affected global agriculture markets by reducing demand. In 2020, global meat prices declined by 7–18% and dairy prices by 4–7% due to the economic slowdown. Biofuel costs fell in the 2020 recession. Main suppliers of maize and oilseeds dropped in price. The outbreak has cut income and disturbed local distribution networks in many developing nations, exacerbating food poverty. Due to the transitory interruption and unresponsive demand for most agricultural products, world food intake remained steady. Agriculture's greenhouse gas emissions have decreased because of COVID-19. Carbon dioxide equivalents fell 1%, or 50 million tons, in 2020–2021. Farm markets are influenced

by COVID-19's consumer spending decline, like others. Many global projections predict macroeconomic metrics like GDP. Biofuels and their main suppliers are most affected: US maize and European rapeseed. These commodities' competitiveness depends on oil prices and transportation fuels. Price doesn't alter food selections since people are price-insensitive. Production changes for price modifications take time. Thus, GDP variations have little effect on global output and consumption. High-value commodities like cattle, dairy, and biofuels cause the most production changes. From 2020 to 2021, the COVID-19 demand shock's marginal impacts on world output predict a 1% influence on global GHG emissions. Importantly, influential producers like livestock husbandry have lowered emissions by 2-3%. These adjustments produced 50 million metric tons of CO<sub>2</sub> equivalents between 2020 and 2021. Agriculture GHG emissions may seem modest in climate policy. Importantly, the report should assess the implications of the European Green Deal or other non-2019 measures. Productivity and consumption incentives can outweigh COVID-19. Disruptions may have escalated food prices in various countries. Even though we may not be able to replicate this circumstance, production and supply disruptions, decreased exports by important grain producers, and negative GDP consequences would lead to less dramatic price decreases and possibly price spikes. Low-income, food-dependent people struggle with price rises and pay cuts. (Elleby et al.,2020).

### **3.7 Agri-food supply chains**

North American agri-food supply networks efficiently ship various products at competitive prices. The initial stages of the COVID-19 pandemic and the temporary yet almost complete interruption of the food service supply chain exposed an unforeseen vulnerability. Prices and production in the agri-food business have rebounded to levels seen before the epidemic, in contrast to limited availability. Though rigid, most food supply chains' focus on consumer needs caused initial disruptions but aided recovery. Assessment of the six commodities is increasingly dependent on supply chain knowledge. The pandemic may drive company consolidation and impede supply chain product variety because versatility in managing varied alternatives is beneficial. Automation will transform several industries, notably labour. This approach ensures worker reliability and efficiency. Some businesses may not adapt to food buying patterns if the epidemic produces a recession. If so, industry consolidation may rise. The changes include online purchasing and a desire for durable local items. Online shopping simplifies supply chains and connects small

manufacturers and processors to buyers. COVID-19's long-term effects on global trade and industry in poor nations are uncertain and may hinder poverty reduction. COVID-19 will likely not affect North American agriculture's food cost SDGs. The sustainable development goals depend on global trade and agriculture, which has intensified the epidemic.(Weersink et al.,2021).

### **3.8 Spillover effect**

This study examines the timing and frequency of how impacts are transferred between the food and crude oil markets, which are essential sectors in the economy for vital goods, during the pandemic. The findings suggest that the food-oil market system exhibits the most pronounced spillover impact in the immediate period. Furthermore, the repercussions shown during the epidemic are considerably less prominent than those displayed during the financial crisis. Moreover, the pandemic has dramatically amplified the effect of maize on the crude oil market while diminishing its influence on soybeans and rice. Amidst the COVID-19 epidemic, the wheat market will likely experience an impact from other markets, namely corn and soybeans. These findings are of great importance for market participants with varying timeframes, as they help them comprehend the repercussions of the pandemic on food and oil markets and mitigate the spread of risk across diverse markets or assets. (Cao et al.,2021).

### **3.9 Natural Resources Commodity Price Volatility**

The problems in the early 2000s included the 2003 oil price surge and the 2007–2008 global financial crisis. COVID-19 has hindered economic development and affected commodity markets. China's economic performance and natural resource commodity prices from 1990 to 2020 were evaluated. Renewable energy, green financing, and power were examined before and during the COVID-19 pandemic. Researchers confirmed that natural resource commodity price variations affect the economy. According to studies, renewable energy, sustainable power, and green finance increase economic efficiency. Data reliability is supported by thorough regression. These findings may impact energy, natural resources, and economics lawmakers, governors, and academics. COVID-19, the 21st century's biggest worldwide event, has harmed health and delayed economic growth. Many commercial and industrial operations have been delayed by COVID-19 infections and deaths worldwide. The economic slump lowered demand for most natural resources, causing commodity price

volatility. A nation's economic growth depends on other factors. Industrial production, other economic activities, and transportation require natural resources. China was the first to suffer from COVID-19, hurting its economy. This study examines how natural resource commodity prices affect China's economy before and after COVID-19. Economic performance is assessed after investing in renewable energy, power, and green financing. The study used the 1990–2020 time series. Many econometric approaches have yielded empirical estimates. Empirical study shows variable natural resource commodity prices. Natural resource price variations offset Chinese economic growth. The inverse relationship between these metrics is due to investor-unsettling resource price volatility. Reduced confidence stopped investors from investing in oil, coal, and natural gas, prohibiting corporations from increasing production. Revenue flow decreases as production and other economic activity fall, raising unemployment and diminishing products and services. Renewable energy investments and electricity use boost economic growth, according to research. Renewable energy investment helps businesses move from non-renewable. This gearbox costs a lot upfront. This change minimizes dependence on conventional energy and natural resource price instability in the long term. Thus, China's economy benefits from faster industrial output. (Deng,2022).

### **3.10 Purchasing of Suboptimal Foods**

COVID-19 has hampered global food production and shipping. Initial epidemic hysteria led clients to save lots of food. The overabundance of unconsumed and expired food reduces market opportunities. Lower pricing has led some customers to buy earlier or lower-quality meals, increasing suboptimal food. This study examined outbreak-related customer behaviour. The study examined the key factors influencing COVID-19 pandemic consumers' purchases of low-quality food, their links, and strategies to improve. Perceived benefits dominate conduct attitude, according to research. Second- and third-ranked Perceived Behavioural Control and Subject Norms matter. These variables matter more than the environment. They focus on whether low-quality meals encourage consumption because this best expresses their value. Even if low-quality meals are cheap, customers must acknowledge their environmental benefits. Environmental benefits influence consumer behaviour, especially during COVID-19. A few households lost income owing to the pandemic. Customers now care more about pricing. Thus, cheap, low-quality food is more appealing. Suboptimal lunch choices save food and the environment. This method

encourages low-quality food purchases and consumption. The study model explains COVID-19 clients' bad meal choices. Consumers favour perceived benefits while buying low-quality goods. Environmental concerns, attitudes toward conduct, topic norms, and perceived behavioural control also influence buyers. The TPB model's Attitude Towards Behaviour, Subject Norm, and Perceived Behavioural Control affect customers' purchases. A consumer's chance of buying low-quality food increases if their thinking changes or is influenced by external influences. The Theory of Planned Behaviour mediates the effect of perceived benefits on customers' intentions. COVID-19 has helped individuals comprehend and buy low-quality food. Lower-quality commodities must be pushed during the pandemic for economic and environmental reasons. Use economic incentives and environmental principles to modify behaviour. (Yang,2022)

### **3.11 Global Food Security**

The Covid-19 epidemic has substantial consequences for global food security. The virus and corresponding government measures have resulted in a significant economic recession and disruptions in food distribution networks. The concurrent adoption of these elements has significantly impacted the food and nutrition security of billions of underprivileged individuals worldwide. The implications differ depending on the product's qualities, the resource intensity of the food systems, and the amount of economic development. The COVID-19 pandemic significantly impacts the food security and nutrition of socioeconomically disadvantaged individuals more than affluent individuals. Women, children, and migrants are disproportionately affected. Finding a middle ground between controlling migration and enforcing social distancing measures is essential. This should be done in conjunction with government efforts to improve marginalized communities' food and nutrition security and livelihoods. It is crucial to enhance the robustness of food supply networks and food systems on a large scale to ensure their future resilience. While many food systems have seen significant disruptions, some have shown more resilience, leading to minor impacts on food supplies. Technological advancements are aiding in resolving obstacles and improving the strength of food distribution networks for the future. The insights and lessons gained during the COVID-19 pandemic should help us collectively formulate enhanced strategies and construct resilient and equitable food systems. (Swinnen,2020).



The COVID-19 pandemic in Nepal has caused significant disruptions in the availability and accessibility of agricultural inputs, resulting in negative impacts on farm production and food security in 2020. While agriculture was deemed crucial for the survival of most assessed towns, the retail and wholesale sectors of the business industry were disproportionately impacted by the epidemic. The production of maize and rice experienced a little decrease in 2020 compared to 2019. The main reason was a shortage of imported agricultural materials, such as seeds, fertilizers, and insecticides, resulting from the COVID-19 epidemic. This occurred due to an increasing reliance on easily obtainable seeds within the immediate vicinity. According to credible sources, there is an anticipated decline in the production of rice and maize in 2020 as compared to 2019. Moreover, there is a projected rise in households experiencing food insecurity in their regions. The COVID-19 pandemic has shown the necessity for meticulous deliberation, emphasizing the insufficient readiness of both the public and commercial sectors to provide and distribute agricultural resources. (Gautam et al., 2023).

### **3.12 Food Consumption**

Implementing the COVID-19 shutdown in Italy had a detrimental effect on the country's economic conditions. A considerable proportion of households had a decreased income, forcing them to restrict their movements to their homes. Both of these factors influenced the consumption of food. Initially, decreased sales led to reduced financial resources for acquiring meals. Furthermore, the confluence of the adverse psychological consequences of reduced income and the pandemic resulted in a change in consumption habits, characterized by a rise in the utilization of alcohol and tobacco. Changes in the economic conditions of households directly affect their budget. Specifically, as economic conditions worsen, households encounter more severe financial constraints. Conversely, when the economy improves, households have fewer strict financial limitations. On the other hand, the lockdown and restrictions imposed at the beginning of the outbreak may have compelled individuals who were used to eating out to have their meals at home instead, thus affecting the amount of food consumed within families. Moreover, the mandated inactive way of life that arose from the limitations may have impacted eating habits. (Braut et al., 2022).

### **3.13 Export and Import**

The COVID-19 pandemic has profoundly affected the global healthcare system and has caused considerable disruptions to the global economy and international trade of products. The import and export trade volumes have significantly declined in most countries globally. The worldwide supply chain process was effected by the COVID-19 epidemic, the crisis handling, and each country's official actions. The COVID-19 pandemic significantly impacted the import sector more than the export sector in most nations which has been shows in this study beased on different data analysis. (Wang et al., 2022).

The decrease in the workforce results in significant trade-side consequences, especially in businesses that heavily rely on labour, such as meat processing and producing processed fruit and vegetables. Key consequences are predominantly noticed in major producers, such as the United States and Brazil, where significant outbreaks have impacted the production of key commodities. The recession caused by the epidemic significantly affected consumption, resulting in significant decreases in imports, especially in processed goods and labour-intensive commodities. The positive impacts of exporting on the production side were outweighed by the consequences of importing on the consumption side, as evidenced by the results of this investigation. Overall, we forecast that there will be trade deficits amounting to several billion dollars. These findings indicate that the pandemic will significantly and severely impact trade in the food and agriculture industries.(Ridley et al., 2023)

### **3.14 Innovative, sustainable, and circular agriculture**

While it is possible to adequately supply enough food to maintain the entire global population by 2100, many countries, particularly Africa, anticipate substantial difficulties ensuring food security. Unfortunately, there is a high likelihood that billions of people in Africa and other emerging regions may experience famine and malnutrition. The catastrophic consequences, including extensive hunger, malnourished children, severe poverty, and significant migration, would not only affect these nations but also have a global impact. Participating in international trade and providing food aid is not a sustainable and practical option, as the main objective for any nation should be to attain food sovereignty, guaranteeing an ample supply of nutritious food at reasonable prices. Protocols that assert their universal applicability will not provide practical answers. It is crucial to thoroughly and

continuously investigate all possible approaches to improve and increase food production. It is essential to encourage more in-depth discussions and increase active involvement, including the participation of scientific specialists. The effort encompassed many initiatives to increase crop yield per unit area, investigate novel food sources, optimize food waste and nutrient management systems, and produce nutrients through unconventional agricultural methods. Most innovative and pioneering food research is carried out in developed countries, which do not face the significant challenges encountered in Africa and certain regions of Asia. Therefore, many solutions necessitate tailored customization or evaluation in situations marked by socioeconomic and agroecological inadequacies. Developing technology that is robust, cost-effective, and user-friendly is imperative. Establishing ties with the countries where these solutions will be deployed is paramount. In addition, the participants acknowledged that several solutions are developed and improved separately within different scientific disciplines, but they need to be merged into an interdisciplinary conceptual framework. Their proposition involves promoting increased cooperation and minimizing competition among scientists in future undertakings. Moreover, they suggest conducting practical, compelling, and relevant research in difficult situations. By utilizing collaborative research frameworks that engage professionals from diverse disciplines and the general public, including citizen science, we can avoid inefficient resource allocation and accelerate the implementation of practical solutions customized to local conditions through collective learning. An all-encompassing and outcome-driven research strategy that focuses on addressing food security challenges and promoting long-lasting sustainability. Organic agriculture requires a conducive and inventive environment for academics, entrepreneurs, politicians, farmers, and consumers to promote food sovereignty. (Rahmann et al.,2021).

### **3.15 Post Pandemic**

The worldwide COVID-19 epidemic has posed distinctive and arduous obstacles that have significantly affected diverse businesses. Out of all these sectors, the agrifood system has shown a significant vulnerability to disturbances. The pandemic profoundly and extensively impacted all facets of the agrifood sector, particularly agrifood systems. However, they emphasized some measures that were implemented or proposed to mitigate the disruptions caused by the pandemic and ensure the resilience of the agrifood sector for future comparable events. The notable resilience measures identified encompass the enforcement of robust policy measures, the promotion of urban agriculture, the provision of

assistance to small-scale farmers, the enhancement of the international market, the advancement of technology, the fostering of collaborations, the investment in research and development, and the promotion of the consumption of innovative foods. To guarantee a robust and protected food supply after the pandemic, policymakers, academics, and stakeholders have adopted a comprehensive strategy that includes the following measures. (Salisu et al., 2024).

Their astute and morally dubious acts have characterized the emergence of authoritarian political leaders in the past decade. The surge of populism in politics can be attributed to a sincere desire for policies that deeply resonate with the broader populace in contemporary cultures. The current state of society requires restructuring economic policy to prioritize the working classes, middle classes, and marginalized social groups who have not yet experienced the economic advancements observed in recent times. This societal demand stems from a tangible factor: increasing inequality and economic instability. During the late 1970s, conservative ideologies gained popularity and were followed by implementing neoliberal social and economic policies. At the same time, globalization and the transformation of global corporate capitalism started in the 1990s. As a result, many middle-class individuals in developed nations experienced declining job opportunities, social welfare benefits, and living standards in their communities. The prevailing conditions of inequality and economic insecurity create a favorable setting for the emergence of political polarization and the rise of authoritarian political populism. In this scenario, inequality and economic instability have served as a powerful element that undermines the unity required for a well-functioning democratic society, promote participation in the market economy, and protect democracy from sinking into the chaos of authoritarian populism. The present objective is to restore that unified impact, akin to what was achieved during the Great Depression of the 1930s and World War II. This essay argues that the adhesive stated before must stem from a new social contract formed after the pandemic. Moreover, this distinctive social contract's primary objective is to reorganize businesses to address the inequitable allocation of surplus (the generated value) among salaries, CEO compensation, and dividends. It is imperative to examine the underlying causes. There is a disagreement regarding the existence of two entities. Since the 1980s, capitalism has exhibited a partiality towards shareholders, disregarding the interests of employees, suppliers, customers, and communities. On the other hand, the merging of corporate organizations and the resulting

rise in market control have led to stagnant pay growth and insecurity over employment. Nevertheless, the inadequate distribution of resources is just one element that contributes to inequality and economic instability. Additionally, they can occur as a result of pre-distribution malfunction. The income and job opportunities gap is a result of the difference between the abilities and expertise of the general population and the specific qualifications that companies are looking for, which has been caused by technological progress. In contrast, the mechanisms used by the Welfare State to redistribute wealth, such as taxation and social programs, have seen a decline in their effectiveness in addressing the inequities caused by the economy. Various political notions have emerged to tackle this disparity and economic volatility, such as neoliberalism, far-right, far-left, and radical progressive ideologies. All endeavors are directed toward resolving the matter of distribution, employing various methodologies based on whether they emphasize pre-distribution, redistribution, or distribution. The historical events of the 1930s show that not everyone willingly embraces or follows the future. A forward-thinking and imaginative social agreement should be based on the revival of the fundamental role of the Social Economy, which is the third pillar of economic well-being. The recent trend of emphasizing the market and the State over other factors has made market economies incapable of generating employment possibilities of superior quality. (Costas , 2020).

### **3.16 AI-Driven Agriculture Production**

Agriculture is vital for the survival of humanity as it serves as a pivotal means of food production, among other sources like fishing. Regrettably, the Agricultural industry is hindered by the effects of global warming and other environmental challenges, especially in economically disadvantaged nations. An estimated 720 to 811 million people experienced food insecurity. Modern agriculture encounters substantial hurdles and barriers, including the need for extensive surveillance and monitoring systems that encompass climate, energy, water, fields, operations, expenditures, fertilizers, diseases, and other relevant aspects. The COVID-19 pandemic has worsened the weaknesses and deficiencies inherent in global food systems. Modern agricultural practices may prioritize maximum productivity and financial gains, often overlooking the importance of environmental preservation and long-term viability. Significant infrastructure modifications and automated procedures are necessary for a projected population of 10 billion individuals in the next three decades to establish an agricultural system that can effectively fulfil their requirements. Nevertheless, these

challenges can be surmounted by harnessing sophisticated technologies and propelling the progress of Artificial Intelligence (AI) in agricultural methods. Artificial intelligence (AI) is expected to significantly contribute to achieving global sustainability objectives across several industries, particularly in integrating renewable energy sources. AI technology is expected to rejuvenate established and expanding agricultural sectors through the integration of autonomous equipment and instruments.(Mana et al., 2024)

It is estimated that by 2050, the world population will exceed 9 billion people, necessitating a 70% increase in agricultural output and food supply to meet the rising demand. Due to limited resources, the effects of climate change, the ongoing COVID-19 outbreak, and negative socioeconomic predictions, meeting this need is challenging without computational and forecasting methods. The field of agri-technology has seen significant growth due to the progress in big data and high-performance computing technologies, which have enabled the development of machine learning. AI has opened up new possibilities for data-intensive scientific study. Diseases and pests throughout the plant's developmental phase provide substantial risks, impacting the entire process from seed production to seedling development.(Tarek et al., 2023)

### **3.17 Precision Technologies**

The European Green Deal has formulated a distinct and all-encompassing strategy to enhance the ecological sustainability of agriculture. Various concerns, including climate change, fuel and commodity market crises, the COVID-19 epidemic, and the current conflict in Ukraine, influence the global need for food of superior quality. To tackle these difficulties, minimising the adverse external effects of agricultural output and guaranteeing equitable remuneration for farmers is imperative. The application of precision agriculture shows great potential in its capacity to contribute to sustainable development. Precision agriculture is an advanced farming method that considers the differences in crops and soil across a field in terms of space and time. The goal is to enhance the effectiveness and long-term sustainability of the farm by implementing a comprehensive strategy. Nevertheless, farmers persist in their reluctance to embrace it.(Finco et al., 2023)

The fluctuation in commodity prices and the belief that speculative behaviour played a role have generated a renewed interest in futures markets. The wheat market is negatively

affected by various variables, including production costs, increased demand, price volatility, and the significant impact of nonproduction factors, such as speculative ones.

## 4 Practical Part

The data used in this paper are the global context of Wheat agriculture commodity market (total production value, export value, producer price average, food inflation average). The data were downloaded from FOASTAT database and span the period 2000 until 2021. All the values are showing in yearly basis. Wheat is the major commodities of the agricultural sector. This agricultural commodities were chosen based on the fact that this were considered among the most important and multipurpose agricultural commodities, and moreover, because these commodities were used (primarily) for the so many reasons, namely for food source of animals and food source or beverage for people.

### 4.1 Statistical Description

The descriptive statistics of the time series are depicted as follows:

**Table 3 Descriptive statistics**

Statistical description, using observed data from 2000-2021				
	<b>Prd Price_tn_avg</b>	<b>Prd Val_ usd1k</b>	<b>Ex Val_ usd1k</b>	<b>Food_inf_per</b>
Mean	276.2736364	146855366.9	33841113.36	3.832272727
Median	284.31	170633648	37614231.5	3.48
Standard Deviation	51.55146985	49894662.63	13362260.56	1.952773197
Minimum	191.33	68179631	14156447	1.85
Maximum	347.75	221811847	54940688	11.21

Source: author's own work (2024)

During the specified period, the product had an average price of \$276.27 per ton, with a range of prices between \$191.33 and \$347.75. The median price of \$284.31 suggests an equitable distribution of prices. However, the standard deviation of \$51.55 indicates significant fluctuation around the average. The product had an average price of \$146,855,366.90 per thousand units in US Dollars. The median value of \$170,633,648 suggests a reasonable spread, while the range is substantial, ranging from \$68,179,631 to \$221,811,847. The item's worth exhibits significant variability, as seen by the standard deviation of \$49,894,662.63. The export trends indicate that the mean value of each commodity exported was \$33,841,113.36 in US Dollars per thousand units. The median export value of \$37,614,231.50 indicates a moderately even distribution despite significant



swings ranging from \$14,156,447 to \$54,940,688. The export value variance is significant, as seen by the standard deviation of \$13,362,260.56. The mean food inflation rate stood at 3.83%, signifying a mild yearly price surge. The median inflation rate of 3.48 percent, ranging from 1.85 percent to 11.21 percent, suggests a well-distributed pattern. The inflation rate fluctuates significantly, as seen by the standard deviation of 1.95 percent.

## 4.2 Estimation of the model in SW Gretl

Equation :1 practical analysis based on theoretical equation 1 as follows:

Producer Price<sub>1t</sub>

$$= 103.115 + (4.02331e - 06) * \text{Production value}_{2t} - (1.36017e - 05) * \text{Export Value}_{2t} + 15.1084 * \text{Food Inflation}_{3t} - 112.1290 * \text{COVID}_{4t} + \varepsilon_{1t}$$

**Table 4 Regression Analysis**

Model : OLS, using observations 2000-2021 (T=22) Dependent variable: Producer price of Wheat ( average/ tonne / USD)					
Independent Variable	Coefficient	Std. Error	t-ratio	P-Value	
Const	103.115	35.8484	2.876	0.0105	**
PrdVal_usd1k	4.02331E-06	9.71223E-07	4.143	0.0007	***
ExVal_usd1k	-1.36017E-05	3.64317E-06	-3.733	0.0017	***
Food_inf	15.1084	4.32431	3.494	0.0028	***
COVID	-112.129	22.633	-4.954	0.0001	***
Mean dependent var	276.2736	S.D. dependent var	51.55147		
Sum squared resid	17697.74	S.E. of regression	32.26521		
R-squared resid	0.682885	Adjusted R-squared	0.608270		
F(4, 17)	9.15209	P-value (F)	0.000392		
Log-likelihood	-104.8083	Akaike criterion	219.6166		
Schwarz criterion	225.0718	Hannan-Quinn	220.9017		
Rho	0.039957	Durbin-Watson	1.778511		

Model estimation SW Gretl

Source: author's own work (2024)

## 4.3 Economic Verification of the model

Economic validation demonstrated the importance of the parameters estimated from an economic perspective. This study has avobe regresstion analysis and model and data

presented, based on that this paper analysis the coefficient, how different variable affecting the producer price of Wheat. The parameters are interpreted as follows:

The intercept term is estimated at 103.115 usd/tonne/year/average, which means that if the other influences were zero, the annual Wheat producer price would be 103.115 usd/tonne/year/average, The constant is positive and indicates positive Wheat producer price when the other influences are zero. This figure is slightly lower than the value of Wheat producer price.

When other influences are zero, Wheat producer price increases by (4.02331e-06)/usd/tonne/year/average for every 1 tonne/year/usd increases in production value of wheat. TWe can say that the model is statistically significant at the significance level  $\alpha=0,05$ .he constant is positive and indicates positive Wheat producer price when the other influences are zero.

When other influences are zero, Wheat producer wheat decreases by (1.36017e-05) usd/tonne/year/average for every 1 tonne/year/usd increase in export value of Wheat. The constant is negative and indicates negative Wheat producer price when the other influences are zero. It shows opposite relation between producer price and export value.

When other influences are zero, Wheat producer price increases by 15.1084 usd/tonne/year/average for every 1tonne increase increase in Food Inflation. The constant is positive and indicates positive Wheat producer price when the other influences are zero.

When other influences are zero, Wheat producer price decreases by 112.129 usd/tonne/year/average for every 1 tonne increases in COVID-19 pandemic. The constant is negative and indicates a negative Wheat producer price when the other influences are zero. It shows the opposite relation between producer price and COVID.

#### **4.4 Statistical Model Verification**

Verifying statistical models is crucial to finding the reliability and precision of the derived parameters in an economic model. Statistical verification is a comprehensive examination of the outcomes and understanding of the validation findings of the statistical

model. The process of statistical model verification confirms the significance of the computed parameters and the general suitability of the econometric model for analyzing the producer price of wheat. The findings inspire confidence in the model's outputs' authenticity and validate its efficacy in influencing decision-making in the agricultural commodity market.

#### 4.4.1 Testing the significance of the estimated parameters

The P value was used for testing and was compared to a significance level of  $\alpha = 0,05$ .

**Table 5 F-test**

	Constant	Production value	Export value	Food Inflation	COVID
P-value	0.0105	0.0007	0.0017	0.0028	0.0001
Level of Significance ( $\alpha=0,05$ )	0,10	0,05	0,05	0,05	0,05
Statistical Significant	Significant	Insignificant	Significant	Significant	Significant

Source: author's own work (2024)

Interpretation of the results of the F-test:

According to the results of the F-test, since in this case the P-value is equal to 0.0003392, which is less than the significant level  $\alpha=0,05$ , we reject H0.

This study paper found that the model is statistically significant at the significance level  $\alpha=0,05$ .

#### 4.4.2 Coefficient of determination

Adjusted coefficient of determination in our model:

$$\text{Adjusted } R^2 = 0.608270$$

The coefficient of determination says that the change in the Producer Price of Wheat is explained by changes in the exogenous variables in the given econometric model from 60.8270%. This is a good result, suggesting that there are variables affecting the Producer

price of Wheat that this study add to the model. This study paper accept the results of this model fit.

## 5 Results and Discussion

This study used annual data of producer price, production value, export value, and food inflation, as well as the period of COVID, ranging from 2019 to 2021, to explore the impact of COVID-19 on the dynamic of the agricultural commodity market on the item Wheat. This paper's analysis was based on descriptive statistics, ordinary least squares regression and literature review. Table 3 summarizes the descriptive statistics, the average price per metric ton of the commodity throughout the analyzed period was approximately \$276.27, with fluctuations ranging from a minimum of \$191.33 to a maximum of \$347.75. The median price of \$284.31 suggests a fair distribution of prices, but the standard deviation of \$51.55 indicates a significant level of variability around the mean. The average cost per ton of the commodity represents buyers' usual expenditure. The standard deviation of price reflects changes in market demand, supply, and external factors like geopolitical events or natural disasters. Understanding these patterns can aid stakeholders in making educated decisions regarding production, acquisition, and pricing strategies. The average value of the commodity, denominated in USD per 1000 units, was around \$146,855,366.90. The median figure of \$170,633,648 suggests a considerable spread, with significant variations observed between the minimum (\$68,179,631) and maximum (\$221,811,847) values. The item's value shows substantial variability, as seen by its standard deviation of \$49,894,662.63. The average and middle values of the commodity demonstrate its economic significance in trade and money generation. The volatility in value assessments highlights the instability and uncertainty associated with commodity investments. Higher standard deviations suggest potential profit opportunities and increased vulnerability to market fluctuations. Stakeholders might employ risk management strategies to mitigate potential losses. The average export value of the commodity, expressed in USD per 1000 units, was approximately \$33,841,113.36. The median export value of \$37,614,231.50 suggests a well-balanced distribution, while notable disparities exist between the lowest (\$14,156,447) and highest (\$54,940,688) values. The export numbers demonstrate a moderate level of fluctuation, as evidenced by the standard deviation of \$13,362,260.56. The average export value provides vital insights into the commodity's position in international trade and its importance in the global market. Changes in export values are signs of changes in demand from countries that import, changes in trade rules, or interruptions in transportation and logistics. By broadening the scope of export markets and varying supply chains, it is possible

to successfully mitigate the risks that arise from relying too heavily on specific regions or trading partners. The analyzed time frame exhibited an average food inflation rate of approximately 3.83%, indicating a moderate annual increase in food prices. The median inflation rate of 3.48% suggests a consistent range, with fluctuations ranging from a minimum of 1.85% to a maximum of 11.21%. The inflation rates display a moderate level of unpredictability, as evidenced by the standard deviation of 1.95%. The average food inflation rate denotes the annual increase in food prices, which can impact consumers' purchasing power and overall economic stability. Inflation rates can become volatile due to factors such as variations in production costs, currency exchange rates, or government policies. Monitoring inflation trends enables policymakers to implement appropriate measures to stabilize prices and ensure food security for the population. As an illustration in equation 1 practical part, upon conducting the regression analysis, it is evident that all the coefficients in the OLS model are highly statistically significant, with a p-value of less than 0.05. The empirical evidence that is presented in the research demonstrates that the impact of the COVID-19 epidemic had a major impact on the price of wheat that was produced by farmers. This influence may be seen in agricultural commodities all across the world, while the producer price dropped by 112.129 units during the global crisis that was caused by the COVID-19 epidemic. There is a negative correlation between COVID-19 and the producer price of wheat in the national and international agricultural commodity market. Economic activity is declining because of The COVID-19 pandemic, leading to decreased global demand for agricultural goods. Due to pre-pandemic production decisions, suppliers are expected to experience delays in their response. As a result of this delay, there will likely be an oversupply of certain agricultural goods shortly. Therefore, there will likely be a rise in the stocks of agricultural goods, leading to a further decline in commodity prices until consumer demand returns to normal levels. Moreover, the decline in oil prices will result in a fall in the costs connected with agricultural production. In this scenario, the convergence of these factors is causing a decrease in the price of agricultural commodities relative to the anticipated levels in the baseline. The COVID-19 pandemic has presented unprecedented hurdles for worldwide supply networks and commodities markets, with significant consequences for the wheat industry. In this discussion, we will analyze the many impacts that the pandemic has had on the wheat commodities market based on the given case study. As a result of the logistical difficulties and limitations on mobility caused by the epidemic, the transportation of wheat, among other agricultural products, was hampered. The

transportation and border restrictions impeded the smooth transit of harvested goods to markets and processing facilities and the transportation of necessary inputs such as machinery and fertilizers. These disruptions resulted in higher expenses and reduced farmers' efficiency, impacting the wheat supply. Implementing lockdown measures and social distancing rules resulted in a shift in consumer behaviour, with an increase in home baking and culinary activities. The increase in household consumption was counterbalanced by the closure of additional restaurants and catering services despite a surge in demand for wheat-based items such as bread and pasta. Consequently, the fluctuating demand for wheat led to market dynamics and pricing instability. Wheat producers encountered numerous hurdles, with the primary ones being economic uncertainty and fluctuating exchange rates. The wheat futures market exhibited heightened price volatility due to various factors, including protectionist policies, trade interruptions, and apprehensions regarding future supply and demand forecasts. To mitigate the negative impacts on wheat prices, the government intervened by providing financial assistance and implementing measures to stabilize the market. The epidemic significantly influenced wheat prices, both within the country and on a global scale. Moreover, alterations in international demand affected both the availability and price of wheat in the domestic market. The higher export values indicated a substantial global demand for the product, increasing domestic prices as farmers allocated more production for exports. On the other hand, a decrease in demand for exports caused an increase in local supply, leading to a subsequent price decrease. Investments in wheat production influenced fluctuations in supply and market expectations. Infusing additional capital enhanced crop output and improved productivity, influencing market trends and prices. Various factors, including market competition, input expenses, and meteorological conditions, influenced the correlation between wheat prices and production value. The increase in food inflation has resulted in elevated wheat prices, worsened by disruptions in the supply chain and changes in consumer behaviour. The manufacturers adjusted the selling prices to mitigate the escalating manufacturing costs, which affected consumers' purchasing power and consumption patterns. The pandemic underscored the necessity for efficient risk management strategies and suitable governmental intervention to mitigate market instability and guarantee food security. Implementing techniques such as promoting rural development, ensuring farmers' access to resources, and managing market risks through agricultural exchanges or marketplaces can effectively stabilize the wheat commodity market. The case study illustrates the profound influence of the COVID-19 epidemic on the wheat

commodities market. These repercussions result from the intricate interplay between supply chain disruptions, changes in consumer behaviour, volatile economies, and export dynamics. Effective policy interventions and risk management approaches are crucial for managing market volatility, safeguarding food security, and rejuvenating the agricultural economy after the epidemic. To successfully manage the risks brought about by the pandemic and enhance the ability to withstand challenges in the wheat business, it is crucial to analyze and adapt to the ever-changing market dynamics continuously. There could be a variety of explanations for the modifications that were discovered in the analysis. The literature study comprehensively analyzes the many impacts of the COVID-19 pandemic on the commodities market, encompassing sectors such as agriculture, food supply networks, and international trade. The epidemic originated in late 2019 and has caused unprecedented challenges for the global economy, leading to disruptions in the production, distribution, and consumption patterns in multiple countries. The data indicates that the pandemic has substantially and widely influenced the commodity market, affecting developed and developing nations. Gonzales-Martine (2021) states that the agriculture industry in the European Union has encountered heightened price instability because of border closures and trade restrictions. The closure of food service establishments has changed people's eating patterns. Consumers prioritize essential items above non-essential ones, resulting in shifts in purchasing patterns that affect commodities markets. The meat production business has been greatly affected by shifts in customer demand. The fluctuations have affected both makers and buyers, contributing to market instability. Despite disruptions in global supply chains and changes in consumer habits, the sector has effectively maintained stability. Producers have promptly adapted their manufacturing and distribution strategies to fulfill the requirements of consumers' domestic kitchens. Low-income individuals have effectively adapted their consumption patterns, thus reducing the pandemic's overall impact on food security (Gonzales-Martinez et al., 2021). Siche (2020) investigates the detrimental effects of limited mobility and reduced purchasing power on the demand for food, which result in a decrease in food security. Daley et al. (2022) and Jackson-Smith et al. (2021) emphasize the pandemic's influence on price volatility in local and global markets, particularly on commodities like ornamental and potato crops. In their study, Daley et al. (2022) investigate the successful strategies employed by different organizations to address challenges by using Internet marketing opportunities and responding to evolving consumer behavior. The imposition of mobility restrictions and the decrease in purchasing power have negatively



impacted the demand for food, compromising food security in several regions (Siche, 2020). Small Island Developing States (SIDS), comprised mainly of developing nations, have become more susceptible to interruptions in global trade, which has raised significant worries regarding food security (Agbugba et al., 2022). Agbugba et al. (2022) have discovered a worldwide disruption in agricultural supply networks, specifically examining the consequences for Nigeria's food security. This disruption arises from disruptions in the food distribution network and decreased agricultural production. Agbugba et al. (2022) examine the impacts of border closures and trade restrictions on global supply networks, leading to disruptions that adversely affect both exporters and importers. Farmers and organizations have employed adaptive and transformative techniques to tackle challenges, such as leveraging Internet marketing opportunities and responding to changes in client behavior (Jackson-Smith et al., 2021; Daley et al., 2022). In their study, Jackson-Smith et al. (2021) analyze the strategies implemented by farmers to address the disruptions caused by the pandemic, focusing particularly on adaptive and transformative approaches. Analyzing the relevant literature places great emphasis on the impact of the pandemic on agricultural commodities. The imposition of lockdowns and mobility restrictions has hurt agricultural activities, leading to a scarcity of workers, interruptions in the supply chain, and variations in demand. Agricultural producers have faced challenges in reaching markets, moving commodities, and acquiring vital inputs, leading to decreased productivity and less profitability. Additionally, the closure of restaurants, hotels, and other food service establishments has led to alterations in consumption habits and changes in the demand for particular agricultural goods. The assessment of the relevant literature also emphasizes the impact on global trade and product pricing. The decline in global trade has had an adverse impact on both exporters and importers, further worsening the economic difficulties experienced by numerous nations. The pandemic has also affected consumer behavior, namely the shift in individuals' attention towards vital commodities and the reduction in expenditure on non-essential items. Moreover, the assessment highlights the discrepancies in the pandemic's impact on various regions and sectors. While certain nations and organizations have exhibited the ability to withstand and recover from difficulties, others have experienced notable obstacles and defeats. In addition, certain vulnerable groups, such as low-income households and small-scale farmers, have seen a disproportionate effect from the disruptions in the commodity market. The significant and extensive effects that the COVID-19 outbreak has had on the commodity market. Food insecurity is increasing in

several regions due to disruptions in agricultural supply chains, leading to food production, distribution, and access difficulties. The epidemic's ambiguity and volatility impact producers and consumers, leading to commodity price oscillations. Recent changes in customer behavior have emphasized the need for adaptation in handling shifting market dynamics. Companies and organizations that have effectively adapted their strategy and implemented strategic modifications in response to changing circumstances have shown their ability to withstand and overcome change. The uneven distribution of consequences across various regions and industries highlights the necessity for tailored actions and assistance for vulnerable persons. The pandemic has exposed vulnerabilities in worldwide supply chains and trade networks, underscoring the significance of developing robustness and improving local and regional food systems. These efforts will involve providing financial support for constructing physical buildings, modifying laws and regulations, and offering aid to farmers and enterprises associated with the agricultural and food industries. In essence, the COVID-19 pandemic has profoundly impacted the commodity market. Several unique variables have described this influence, including supply chain interruptions, price volatility, consumer behavior shifts, and international trade obstacles. Nevertheless, despite these difficulties, there are instances of resilience and adjustment that underscore the significance of developing inventive approaches to alleviate the impact on the commodity market. The agricultural commodity sector in Europe has shown remarkable resilience. However, there are still ongoing issues. To successfully traverse the unpredictable post-pandemic landscape and create an environmentally sustainable European commodity market that can withstand challenges, policymakers, industry stakeholders, and consumers must continue working together cooperatively. The COVID-19 epidemic has profoundly transformed the commodity market, presenting many problems and opportunities for participants. Countries can minimize the long-term effects of the epidemic and develop stronger and more sustainable commodities markets by actively implementing innovative and adaptive measures, drawing on knowledge gained from previous errors and experiences. Despite the massive disruptions caused by the COVID-19 outbreak to food supply systems at local and global levels, most developed nations possess a high level of resilience in managing interruptions to their food supply. Trade limitations brought on by COVID-19 may have a significant influence on the agricultural revenue and gross domestic product of these countries. However, major cereal producers are already seeing an increase in their domestic grain supply. It is mostly due to a decrease in global trade and prices that this has occurred.

The impact of COVID-19 travel restrictions and labour shortages, which caused disruption, was primarily responsible for the fact that agricultural product prices were no longer transferred between the provincial markets. It is essential to comprehend the relationship between production costs and wheat market prices and how they connect to other grains to comprehend the profitability of wheat production over a longer time horizon (Kovačević et al., 2017). A variety of stocks and commodities have been greatly impacted by the COVID-19 problem, according to Ben Amar et al. (2020). Export prohibitions and other trade policy measures were shown to have raised food prices globally after the COVID-19 crisis, exacerbating famine and causing financial losses for producers in the countries that imposed export restrictions. According to the findings of many studies, the COVID-19 pandemic caused a wide variety of effects on goods marketplaces. One of the most significant markets is the one that deals with wheat. An excellent illustration of how restricted mobility and low money might alter eating patterns is provided by the fact that Italy's economy was forced to shut down due to the outbreak (Braut et al., 2022). As a result of changes in spending habits brought about by challenges with money and a decline in sales, there has been an increase in the consumption of tobacco and alcohol. In addition, the implementation of confinement regulations has resulted in a shift in how individuals consume food within their homes, leading to an increase in the number of meals prepared at home. This is a perfect example of the complex connection between consumer behaviour and economic conditions. According to Wang et al. (2022), the pandemic has hurt international trade since it has disrupted global supply networks and led to significant reductions in the quantities of commodities that are imported and exported at the same time. Many businesses, such as those that process cattle, are negatively impacted by a staff shortage. According to Ridley et al. (202), this results in significant trade imbalances in the agricultural and food industries. Problems with production on a massive scale, mostly in the United States and Brazil, have made things even more difficult for nations dependent on imports. In the wake of the pandemic, efforts are being made to put resilience measures into place to ensure that the agricultural and food industry continues to function efficiently and for an extended period (Salisu et al., 2024). By assisting small-scale farmers, improving the global market, and encouraging more people to try new foods, legislative efforts, technical advancements, and partnerships are all contributing to the success of these endeavours. The fact that populism and authoritarian politicians are so prevalent, on the other hand, makes it even more obvious that structural changes are required to combat economic disparity and instability (Costas, 2020). Utilizing

cutting-edge agricultural technologies favourable to the environment, such as precision technology and agriculture driven by artificial intelligence, opens up fascinating new avenues for assisting the environment and ensuring sufficient food for everyone. It is possible to increase long-term sustainability in farming using artificial intelligence and precision agricultural equipment. This can also help decrease damage to the environment and maximize the use of available resources. According to Martin et al. (2022), it is necessary to implement price protection and insulating strategies in domestic markets to mitigate the effects of any changes in international markets. These policies must be adhered to to maintain wheat prices' stability in the United States. Among these measures is the prohibition of exports and the provision of financial assistance to imports. Janković et al. (2020) assert that producers should employ hedging strategies to mitigate business risks and acquire a comprehensive understanding of the prices that goods will be priced at on the market. This will ensure that things remain the same even if the market is unstable. Using the wheat industry as an example, this paper investigates how the COVID-19 epidemic altered supply lines and price fluctuations in the commodity market. They do so by focusing on the wheat industry. In their respective studies, Iuga et al. (2024) and Palason et al. (2022) investigate the challenges that arise due to issues in the supply chain, a shortage of personnel, transportation issues, and markets for agricultural products that are becoming less reliable. As a result of the disruptions, prices and availability have been altered, resulting in negative consequences for producers and buyers. In their respective studies, Elleby et al. (2020) and Cao et al. (2021) investigate how the food and oil industries are intertwined and how the pandemic impacts the agriculture sector on a global scale. The virus has severely affected many markets, including those for wheat, corn, and soybeans. This set of findings demonstrates how challenging managing risk adequately across a diverse range of investment opportunities is.

People's behaviours were significantly altered due to the COVID-19 epidemic, and as a result, they were more prone to purchase meals of lower quality. According to a study conducted in 2022, this pattern was most likely brought about by limited budgets and the notion that it would be beneficial. According to Swinnen (2020), it is concerning that the pandemic is having a variety of repercussions on the capacity of vulnerable individuals to obtain food. This demonstrates how critical it is to establish programs specifically designed to close the existing social and economic disparities and ensure that everyone has access to nutritious meals. An extensive amount of information is provided in the case study

conducted by Gautam et al. (2023). This study examines the challenges that wheat producers and consumers in Nepal faced during the pandemic from a regional perspective. An example of how external influences can readily impact rural economies is provided by problems with farming inputs and outputs. As a result, we all must collaborate to improve and strengthen the underlying food systems. Wheat is one of the most significant grains and crops in the world. Taking into account how much arable land is needed to cultivate wheat. It is the crop product that finds the greatest application. The US, China, India, and the Russian Federation are the biggest wheat producers. The total wheat net output value of the top 10 nations is 66.5 billion Int. USD. The food, pharmaceutical, and animal nutrition industries recognize the worth of wheat due to its high consumption value. Global estimates indicate that wheat contributes more than 20% of daily human calories and protein intake, guaranteeing food security. Due to its exceptional marketability and mobility, wheat has a very high global export value; historically, its worth has fluctuated between 35 and over 50 billion USD, depending on production levels and meteorological conditions. Production costs heavily influence wheat prices. The quantity of variable production costs and yields largely determines the variability in manufacturing costs per unit over time. The price of oil has the largest impact on production costs. However, the weather significantly impacts yields during the vegetative stage. On the other hand, by utilizing the concept of economies of scale directly, farmers can distribute a greater amount of produce over the same fixed expenses. The average cost per production unit may decrease as the farm's output rises. When growing crops like wheat that can be preserved, farmers have to decide whether to store their produce and wait for a higher price or sell some before or after harvest. Rising global stock values drive wheat prices down, but rising interest rates increase wheat price volatility. Producers boosted their investments and production costs in reaction to the high prices of the wheat market, which led them to set aside more area for wheat farming. Other nonproduction factors have a significant impact in addition to increasing production costs, demand, and price volatility. Factors connected to speculation that affect the price of wheat. In addition to impacting domestic markets, climate change has the potential to impact global markets by lowering yields, limiting supply, and changing market prices. Seed, manure, mineral fertilizers, pesticides, agrochemicals, custom operations, water, motor fuel, lubrication, electricity, and maintenance for mechanized and older equipment are among the operational costs associated with wheat production. They also cover interest in other variable costs, building and machinery maintenance, and operational inputs. On the other hand, hired labor,

machinery acquisition expenses, missed labor opportunities, land rental rates, specific taxes, fees, insurance, general farm overhead, general farm utilities, office supplies, business travel, etc., are examples of fixed costs in the wheat-producing industry. Understanding the link between wheat prices and production costs can be useful when selecting potential sales terms. A farmer can also project wheat market prices based on estimated or expected production costs and the price/costs connection to decide whether to employ hedging strategies in the derivatives market. By understanding how production costs and wheat market prices are related, farmers can reduce the inherent business risks and anticipate price movements. Based on this knowledge, They can store and sell after harvest, sell before harvest, or sell immediately. The COVID-19 epidemic profoundly affected every facet of life, including the agricultural industry. The main impact of COVID-19 on agriculture has been seen through changes in the demand and supply balance, labour shortages, and consequences for rural economies. Agriculture functions as the predominant source of revenue, particularly in low-income countries. These countries are experiencing a shortage of goods, and the COVID-19 epidemic will likely affect them substantially. The agricultural output of underdeveloped countries is more vulnerable to the impact of COVID-19 due to their significant dependence on labour-intensive farming methods. The COVID-19 pandemic has greatly affected food availability, mostly because of disruptions in the production and transportation processes. The disruptions have increased retail costs, making it more challenging for customers to afford food. Agricultural activities have prioritized ensuring a reliable food supply, as agriculture is a major source of sustenance. The epidemic has substantially impacted the agriculture industry, specifically the supply-side repercussions on trade. The repercussions mostly result from reductions in the workforce, which disproportionately affect industries that rely heavily on manual labour. The recession caused by the pandemic has resulted in significant declines in the import of commodities, which are more significant than the impact of supply-side exports. The COVID-19 pandemic has had unprecedented repercussions on the world economy, particularly due to the critical significance of the food and agriculture sector, raising significant concerns about its impact. In the present global context, nations rely significantly on international trade to meet the growing need for food and agricultural commodities. Export markets are of utmost importance for producers. Hence, it is imperative to understand the virus's impact on commerce in order to devise appropriate policy interventions and safeguard global food security amidst the epidemic. The outbreak has led to substantial disruptions in both the

demand and supply aspects of the economy, leading to extensive effects on worldwide trade in goods and services, especially in agricultural trade. After the epidemic, farmers and processors encountered special challenges related to the supply side. The virus spread quickly because of the crowded working conditions and proximity of workers, which created a significant challenge for farming and processing value chains that depend on a big labor force. As a result, personnel has been scarce throughout the peak periods of production and harvest, leading to major disruptions in the supply chain, product shortages, and increased prices for both food producers and consumers. Ultimately, these negative supply shocks led to a limited availability of goods for export. On the demand side, the apprehension triggered by the outbreak, government directives to remain at home, and the resulting increase in unemployment and income have altered consumer spending patterns for food and agricultural products. As a result, there was a significant increase in spontaneous buying at retail businesses, while revenues at restaurants and other food service establishments experienced a steep fall. The pressures mentioned have caused a rippling effect in the food supply chain, leading to disruptions in distribution channels and food stuck upstream due to order cancellations. As a result, the shocks on the demand side have impeded the flow of commodities in the export market. Countries with a high ratio of consumption and increasing gaps between global and domestic prices, possibly caused by efficient price insulation, have greatly contributed to the escalation of global market prices. Upon analyzing current patterns in global commodity markets, it has been ascertained that the substantial surge in worldwide wheat prices may contribute significantly to the escalation of poverty and food insecurity, particularly in the aftermath of the COVID-19 pandemic. However, prior studies suggested that worldwide price increases were unlikely to substantially affect prices, which are crucial for agricultural incomes, food security, and poverty. Domestic markets often enjoy certain protection from global markets due to transportation costs and protective measures like export bans, tariff reductions, and import subsidies. Fluctuations in global wheat prices ultimately impact the prices of most domestically produced wheat. The enduring connections between domestic and foreign prices are probably affected by a political-economy balance between the interests of producers and consumers. This equilibrium tends to restore itself as domestic prices return to their longer-term correlation with world prices. During the COVID-19 era, there was a transmission of the escalation in global prices to domestic prices, leading to a persistent upward price trend. The combined impact of this price insulation was to magnify the increase in worldwide prices, leading to a more than double jump in the required

price increases during the COVID-19 pandemic. This research provides scholarly background for understanding the interplay between national food security, market volatility, and global disruptions. Several caveats to this study might motivate researchers to dig further. To start with, comparing the research participants would have helped determine whether the widespread spread of COVID-19 has affected the price of wheat for consumers, but it wasn't part of this study. Academics might look into this further down the road. In addition, has the COVID-19 pandemic affected the worth of wheat imported? The effects of these characteristics were not taken into account in this research. Researchers may one day look into the various ways economic variables are categorized in depth. In addition, the effect of COVID-19 on the commodity market producer price of wheat is the main focus of this research. In addition, the researcher delves deeply into client perceptions to analyze and contrast the changes that have taken place following the outbreak. Lastly, it's important to remember that different regions or nations could have different ideas about how much producers should charge. To help local governments, schools, and related professionals make better judgments, the researcher plans to perform in-depth evaluations of many scenarios in various places in the future. This will give them agricultural insights. This data will be useful for policymakers in identifying areas where agricultural commodities are vulnerable to complex disasters caused by several factors and establishing ways to mitigate these risks. The potential methodological limitations of this work are acknowledged, most notably about the Ordinary Least Square regression model. Uncertainty in the results is introduced by the model's sensitivity to the initial circumstances of the estimating process and its dependence on data. This is particularly true when the data set length increases or additional variables are incorporated. Furthermore, the model may misrepresent regime changes' slow and incremental nature by assuming abrupt and instantaneous transitions between them. All the more reason to recognize and address the methodological shortcomings of this study in light of these comments.



## 6 Conclusion

The main aim of this study is to examine the outcome of sudden instabilities in the global agriculture commodities markets, with a particular focus on the Wheat market during the COVID-19 epidemic. This study applies the Ordinary Least Square (OLS) regression model to analyse the variations in the mutual correlation among many financial indicators in the wheat market during the COVID-19 epidemic. This study used several macroeconomic factors as variables or parameters, e.g., the Global producer price average, the total export value of Wheat, the total production value of Wheat, food inflation and COVID-19. Where producer price is considered a dependable variable, the rest of the parameters are considered independent variables. This study aims to find each independent variable's correlation with the dependent variable. The result will help to identify areas where wheat producer prices impact various parameters. The choice to analyse the agricultural commodity Wheat is driven by its significant attraction to international investors. The trade volume observed in the global market determines the selection criteria. In addition, we perform an analysis and include four significant macroeconomic factors that influence the producer price of Wheat commodities. This thesis utilizes the Ordinary Least Square model to explain the influence of the COVID-19 pandemic on the instability of agriculture commodity markets based on a case study on Wheat and the enduring transformations in commodities markets. This study primarily look for crucial determinants of agricultural commodity markets, particularly Wheat, in the context of the COVID-19 pandemic. This study paper researched the impact of COVID-19 on the producer price of Wheat in the global market. Using descriptive statistics and regression analysis, we established a hypothesis regarding the effect of Covid-19 on the prices of Wheat commodities. The evidence supported the stated hypotheses, as based on findings, COVID-19 significantly impacts Won's heat prices. This paper's findings imply that COVID-19 contributes statistically significant information to the modelling of wheat commodities. This fact displays the great impact of COVID-19 on the agricultural sector worldwide, affecting the total economy. Based on the model's forecast, the COVID-19 pandemic is projected to result in a substantial decrease in the producer price of Wheat, with an approximate loss of 112.129 units per tonne. The COVID-19 pandemic caused obstacles in the supply chain, affecting various sectors, including agriculture. The implementation of movement limits on borders and challenges in organizing transportation and distribution have hindered agricultural product movement, leading to supply chain

disruptions. The disruptions in transportation and logistics may have impeded the timely delivery of inputs such as fertilizers and machinery, as well as the transportation of harvested crops to processing facilities and markets. These disruptions might lead to inefficiency and increased expenses. As a result of disruptions in the supply chain, there has been a decrease in the pricing established by producers. The epidemic has been notably affected by changes in consumer behaviour, resulting in considerable fluctuations in wheat prices. Implementing lockdown measures and strict adherence to social distancing regulations has led to alterations in consumption patterns, with customers progressively opting to cook and bake meals in their residences. While there was a significant boost in demand for wheat-based items such as pasta and bread, the closure of restaurants, hotels, and catering services has offset this rise in household consumption. A wheat surplus has resulted in a fall in prices due to decreased demand from the food service business, which typically consumes a significant amount of Wheat. The epidemic has increased the challenges faced by wheat farmers as a result of wider economic limitations. Economic instability, chaotic financial markets, and fluctuations in currency exchange rates can affect investor sentiments and speculative behaviour in commodities markets, specifically in wheat futures. Uncertainties surrounding future demand and supply, as well as trade disruptions caused by protectionist measures or export bans, can increase price volatility and result in a decline in prices. It is essential to evaluate the influence of government interventions and actions in mitigating the adverse effects of the epidemic on wheat prices. Implementing techniques such as providing financial assistance to farmers, granting subsidies on inputs, and stabilizing the market can alleviate the economic strain on producers and mitigate significant price fluctuations. Investing in agricultural infrastructure, research, and technology can enhance the resilience of the wheat sector to future shocks and disruptions. The decline in the producer price of Wheat resulting from the COVID-19 outbreak underscores the varied impacts of the crisis on agricultural markets. The decline in wheat prices can be imputed to a confluence of supply chain disruptions, changes in consumer behaviour, and broader economic challenges. Effective and targeted policy actions and activities are essential for assisting wheat producers, ensuring market equilibrium, and safeguarding food sovereignty in response to the ongoing challenges posed by the pandemic. Consistent examination and monitoring of market dynamics are crucial for making data-driven policy decisions and strengthening the resilience of the agriculture industry. The model proposes a straightforward and unambiguous correlation between the inflation of food prices and the price per tonne of

Wheat for producers. This analysis suggests a direct correlation between increased levels of food inflation and higher wheat prices. The expenses associated with the inputs and outputs of wheat cultivation have risen. Producers are encountering rising costs for inputs such as fertilizers, pesticides, fuel, and labour. The production expenses per metric ton for Wheat are considerably higher. Producers are striving to raise their selling prices, resulting in an upward adjustment of the producer price of Wheat. The rise in food inflation has led to a sharp increase in the demand for agricultural commodities, namely Wheat, due to lockdown measures, transit restrictions, and changes in consumer behaviour. The limited availability of goods due to the wheat shutdown may lead to a surge in demand, thus causing an increase in the price of Wheat. Food inflation arises from the opportunistic conduct of specific manufacturers seeking to capitalize on increased market demand. Moreover, the increase in food prices is mainly caused by external reasons such as disruptions in the supply chain, unfavourable weather conditions, or geopolitical events. These limitations restrict the availability of agricultural products and result in higher prices. The model indicates an inverse relationship between the export value and the producer price of Wheat per tonne. This analysis suggests a negative correlation between greater export values and domestic wheat prices. The influence of international demand for exports on the accessibility of domestic supply and the levels of prices. When there is an increase in the demand for Wheat, domestic farmers allocate a greater proportion of their production for export, reducing the amount of Wheat available for domestic consumption. The decline in local supply and increased demand from international markets are causing domestic prices to rise. When there is a drop in export demand, domestic producers allocate a larger portion of their production to the local market. As a result, there is an increase in the quantity of commodities available domestically, leading to a subsequent decrease in domestic pricing. Changes can influence fluctuations in local market prices and export value, affecting market expectations. The increase in export values indicates a robust global demand for Wheat, leading local farmers to expect heightened competition for domestic supplies and perhaps higher domestic prices. The decrease in export values results from a decrease in foreign demand, which has led domestic enterprises to modify their pricing tactics to stay competitive in the worldwide market. As a result, costs within the country decrease. Fluctuations in currency exchange rates, alterations in trade regulations, and geopolitical events can affect the values of wheat exports and domestic prices. Fluctuations in currency exchange rates can impact a country's ability to compete in the global market for exporting Wheat, affecting both the quantity and

value of wheat exports. Trade rules, such as tariffs, quotas, or export limits, can impact the value of exports and local prices by modifying the movement of goods in global markets. Geopolitical tensions or trade disputes can hinder the smooth progress of business and generate uncertainty, resulting in variations in export values and impacting local pricing. The identified inverse correlation between the export value and the production price of Wheat has significant ramifications for several stakeholders in the agriculture industry. Wheat growers encounter difficulties in effectively handling price volatility and adapting production levels to align with changes in export demand. Higher export values can earn additional revenue from exports. Nevertheless, they can also reduce accessibility and elevate domestic pricing, impacting local consumers and jeopardizing food security. The model predicts a straightforward and unambiguous correlation between the production value and the producer price of Wheat per tonne. Based on the model, an increase in investment in wheat production will lead to a rise in the domestic price of Wheat. The identified positive correlation pertains to the influence of production investment on supply changes. Augmented investment in wheat cultivation results in elevated yields, enhanced quality, and increased efficiency in industrial operations. Increasing output and improving productivity per input unit leads to a higher wheat supply in the market. The demand for Wheat is relatively stable, but the supply is growing slower. The increased availability of Wheat has a detrimental impact on pricing, leading to decreased expenses for farmers. There is a higher demand for Wheat than supply, increasing costs. The main cause of this is the scarcity of Wheat in the market, which is a consequence of the heightened output value. Engaging in wheat production can have a significant impact on market expectations and the volatility of prices. Increased levels of investment indicate a strong belief in the future profitability of wheat production, causing producers to expect higher demand or better pricing in the market. Producers' pricing choices are influenced by expectations, resulting in higher producer prices. Producers can increase their potential to demand better prices in the market by investing resources in the production infrastructure, technology, and research to improve Wheat's quality and value-added features. External factors such as weather conditions, input costs, and market competition influence the correlation between the value of wheat output and pricing. Optimal meteorological conditions have the potential to enhance agricultural output and mitigate production uncertainties, resulting in increased production values and the possibility of decreased prices in instances of excess supply. Fluctuations in input expenses, such as those related to fertilizers, herbicides, and machinery, directly impact

production values and thus influence wheat pricing. The presence of competition from other wheat-producing regions or substitute products might impact the degree to which an increase in production value leads to higher prices in the local market. The correlation between food inflation and wheat prices has substantial ramifications for multiple stakeholders in the agricultural industry. Rising prices for Wheat can be advantageous for growers as they help to counterbalance increasing production expenses and enhance profitability. Yet, the ability of producers to transfer increased costs to consumers is contingent upon variables such as market rivalry, the price elasticity of demand, and governmental regulations about food prices. Consumers saw elevated food prices due to inflationary forces, including the surge in wheat prices. Escalating food expenses can burden households, especially those with limited income and susceptible demographics, resulting in reduced buying capacity and corresponding alterations in consumption habits. Moreover, the rise in food costs could worsen inflationary forces in the economy, affecting overall price levels and shaping decisions about monetary policy. This study has determined that each parameter substantially influenced the Producer price when the COVID-19 pandemic occurred worldwide. This finding confirms the suitability of this model within the context of the commodity market analysis. These elements affect the producers' pricing and eventual selling intents. The study findings suggest that the pandemic has disrupted production and export due to labour and logistics constraints. Furthermore, the adverse effect on income has limited the ability to reach markets and caused a rise in prices of food commodities, leading to alterations in consumption patterns. The epidemic caused substantial emotional, social, economic, and bodily harm to all persons involved in the agriculture industry. The international community has responded to the crisis by capitalizing on its opportunity and adopting various programs and necessary changes. This study suggests that boosting investment in several sectors, including AI-powered agricultural production systems, social safety nets, family farming, buffer stock trading, staggered procurement, and secondary agriculture, can contribute to the revitalization and prosperity of the economy in the aftermath of the epidemic. Ensuring continuous agricultural input provision is crucial for achieving food security goals through increased crop yields. It was acknowledged that agricultural activities should be lean by furnishing safety kits, incentives, and health insurance to farm labourers while extending financial and marketing aid to farm proprietors. During the pandemic, the wheat market witnessed a decline in the producer price of Wheat due to the cumulative influence of food inflation and the COVID-19 epidemic. After

examining the connections between specific economic factors, Wheat and COVID demonstrate the strongest and most reliable cross-correlations. The study highlights the significance of production value, export value, and food inflation on the producer price of Wheat as key macroeconomic factors that impact the future price of agricultural commodities. Notably, these factors' influence and effects became stronger during the pandemic. The continuous increase in the volatility of Wheat agricultural commodities indicates a higher level of uncertainty and risk, requiring a crucial adjustment of risk management strategies. The cross-correlations among the producer price of Wheat, production value, export value, and food inflation suggest the possibility of spillover effects within variables. However, macroeconomic factors such as production value, export value, and food inflation significantly impact both during and after the epidemic, emphasizing the need for ongoing monitoring. Expanding domestic output through comprehensive policies that enhance rural area development, ensure farmers' access to resources, and implement measures to manage market risks can reduce volatility. The results also suggest that fluctuations in exchange rates have amplified the effects of the pandemic. One method to mitigate market risk is to leverage the agricultural exchange to create more permitted grain storage facilities. This study highlights the relationship between global disruptions, fluctuations in the market, and safeguarding a nation's food security within a broader academic context. Several limitations in this study can stimulate future research efforts. Firstly, this study did not include a comparison analysis of the research participants to particularly investigate whether the prevalence of COVID-19 has affected the consumer price of Wheat. In the future, scholars may study this topic. Moreover, has the COVID-19 pandemic impacted the import value of Wheat? This study did not consider the impacts of these attributes. In the future, scholars may thoroughly investigate the diverse classifications of economic variables. Moreover, this study primarily investigates the impact of COVID-19 on the producer price of Wheat in the commodity market. Furthermore, the researcher greatly investigates customer perspectives to examine and compare the modifications that have transpired after the epidemic. Finally, it is crucial to acknowledge that different countries or regions may have contrasting viewpoints on producer prices. In the future, the researcher will conduct comprehensive analyses of diverse scenarios in numerous locations to provide agricultural insights to the local government, schools, and related professionals, empowering them to make informed decisions. The data will help identify regions where agricultural commodities are at risk during complex catastrophes due to several causes and assist

policymakers in developing strategies to reduce these risks. This work recognizes the possible limitations in its methodology, primarily related to using the Ordinary Least Square regression model. The model's responsiveness to the estimation process's starting conditions and reliance on data introduces uncertainty in the outcomes, especially when the length of the data set changes, or further variables are included. Moreover, the model's assumption of sudden and immediate shifts between regimes may not accurately represent regime changes' gradual and incremental nature. These remarks strengthen the need to acknowledge and resolve the inherent limitations in the methodology of this study.

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## **10 Abbreviation**

1. FAO- Food and Agriculture Organization of the United Nations
2. FAOSTAT- Food and Agriculture Organization Statistics
3. OLS- Ordinary Least Square