

National Seminar on Effect of Ecopreneurship on Environment Protection & Sustainable Development

Impact of COVID-19 on Indian Agriculture System and Revival Strategies

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Abstract

Introduction: The COVID-19 pandemic significantly disrupted the Indian agricultural system, impacting both food production and supply chains. Lockdowns and mobility restrictions led to labour shortages, reduced demand from commercial food services, and wastage of perishable commodities like milk, fruits, and vegetables. Despite a strong buffer stock and a record harvest in 2019-20, challenges such as locust infestations and poor logistics further strained the system. This study examines the vulnerabilities exposed by the pandemic and highlights key resilience strategies for recovery.

Methodology: The study carried out a systematic literature review in order to consolidate the literature on COVID-19 impact on agriculture, distinguished by a well-documented, replicable and clear search mechanism driven by a theoretical interpretation of the related phenomenon. The conceptual framework was applied in the literature search, using the search terms 'covid-19', 'agriculture', 'resilience', 'vulnerability' and 'risks' in all fields in the CA Web of Science database. Academic databases released across the year including 2020 were searched to cover the full spectrum of scientific papers. After

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excluding sources not related to covid-19 and duplicate articles, 50 documents were selected for analysis from the 343 sources found, and a snowballing technique added 30 further relevant papers. The analysis applies a vulnerability and resilience framework.

Results & Discussion: India became a hotspot for the virus, next to the USA, infecting 9.6 million or 14.6% of global infection as of 6 December 2020, resulting in a decline of 23.9% gross domestic product in quarter 1 of FY 2020-21. Analysis of official time series price data covering 284 days from 01.11.2019 to 10.08.2020 showed that wholesale and retail prices of pulses, wheat flour and milk were 1-5% higher a month post-lockdown, while prices of edible oils and staple cereals were 4-9% lower because of removing import restrictions and government interventions like free distribution of food grains. Vegetable prices rose, with tomato prices increasing by 77-78% in a week and 114-117% a month post-lockdown. Four hazard categories are identified with their associated risks: farmers and rural communities facing deaths, diseases, health problems, stress and trauma; goods and services facing losses of agricultural products and waste of food; the environment facing negative impact on soils, ecosystems and losses of flora and fauna; and economic development of the agriculture sector facing export and import breaks, economic crisis, bankruptcy, loss of income, unemployment, poverty and inequality.

Conclusion: The COVID-19 pandemic has a big negative influence on the agriculture sector. Food safety and security were greatly threatened due to restrictions on mobility, interaction of people and reduced purchasing power, with the most vulnerable groups of population affected most. The analysis of literature in the risk-vulnerability and resilience of agriculture systems showed that the resilience of food systems needs to be enhanced by implementing technical and economic measures, all of which must first safeguard the health and food supply security of the world population. Technical measures aiming to improve the functional performance level of the infrastructure in the agriculture sector are necessary to enhance physical resilience.

Keywords: COVID-19; Indian Agriculture; Food Supply Chain; Vulnerability; Resilience; Labour Shortages; Food Security; Revival Strategies; Systematic Literature Review; Price Volatility.

1. Introduction

COVID-19 pandemic has created a huge impact on the Indian agricultural system extensively; it originating from Wuhan, China has eventually spread through the whole world and emerged into a pandemic. India has already become a hotspot for the virus, next to the USA, infecting 9.6 million (14.6% of global infection) as of December 6th, 2020 which has resulted in a decline of 23.9% gross domestic product in quarter 1, FY 2020-21. A pandemic shock can have a greater significance on economies due to lost human lives compared to a weather shock such as drought or flood or a trade embargo. Undoubtedly, all these shocks affect agricultural systems; however, pandemic shocks affect all the sectors of an economy.

The pandemic disrupts demand and supply of food impacting the global supply chain; while droughts tend to be localized affecting only the associated sector or stakeholders. Huge buffer stocks of rice and wheat supplemented by a record harvest in 2019-20 crop season enabled the Indian food system to tackle the pandemic. Besides the pandemic creating a panic situation, locust infestation from East Africa to India had a catastrophic effect on agriculture. At the same time tonnes of food grains were wasted according to a government report, at the Food Corporation of India (FCI) storage structures, since May 2020. The COVID-19 induced lockdown exacerbated food loss at production, marketing, distribution and wastage at household consumption level. For instance, due to lack of demand and logistics, food commodities such as milk, vegetables and fruit, were wasted at farm level while distribution of milk by the Anand Milk Union Limited (AMUL) — the largest milk cooperative in India — was also affected.

There are many other world-wide efforts aiming to control the pandemics by restraining movement and interactions of people causing negative economic effects linked also with functioning of agriculture systems responsible for food supply (Siche, 2020;

Timilsina et al., 2020). The covid-19 creates many threats to sustainability of agriculture sector which is very sensitive because of food supply security needs. There are also many secondary damaging outcomes of the covid-19 pandemic on sustainability of agricultural systems across the world. There is huge decrease in demand for eatery and commercial food services, labour restrains, handling and production capacity of food and other agricultural products that have influence on farmers output reduction (Brewin, 2020; Ceballos et al., 2020; Cranfield, 2020; Poudel & Subedi, 2020). Quarantine measures reduced labour availability for such important farming activities like sowing vegetable crops, picking fruits etc. (Bochtis et al., 2020; Adhikari et al., 2021; Bisht et al., 2020; Cortignani et al., 2020). With the deepening of economic crisis cause by world pandemic, these impacts might be even more serious for agricultural sectors.

The consequences of the world covid-19 pandemic on agriculture sector around the world require immediate and long-term actions. First of all, it is necessary to analyse and comprehend the immediate consequences of current pandemic on agricultural and food systems in order to develop necessary actions, therefore, the risks, vulnerability, resilience and systemic shifts of agricultural systems to adapt to the current situation need to be better understood (Boughton et al., 2020; Cattivelli & Rusciano, 2020; Darnhofer, 2020; Diesner, 2020; Gunther, 2020; Henry, 2020).

Therefore, in this paper the consequences of the world covid-19 pandemic on agriculture and food systems were investigated by applying vulnerability and resilience approach. These concepts 'vulnerability' and 'resilience' are the major theoretical concepts that are dominating. The main input of this paper is systematization and grouping of the main measures to enhance resilience of agriculture systems in the face of covid-19 pandemic based on recent scientific studies published in 2020.

2. Impact of COVID-19 on the Indian Agricultural System

Survey findings indicate that the pandemic has affected production and marketing through labour and logistical constraints, while the negative income shock restricted access to markets and increased prices of food commodities affecting the consumption pattern. Our analysis using the official time series price data of 284 days spanning from 01.11.2019 to 10.08.2020 of major food commodities indicated that the wholesale and retail prices of pulses, wheat flour and milk was 1-5% higher a month post-lockdown; prices of edible oils and staple cereals (rice and wheat) were 4-9% lower because of removing import restrictions and government interventions like free distribution of food grains. Vegetable prices rose with tomato prices increasing by 77-78% in a week and 114-117% a month post lockdown.

3. Review of Literature

We carried out a systematic literature review in order to consolidate the literature on covid-19 impact on agriculture.

The word disaster refers to an abrupt and unpredicted catastrophe notwithstanding of number of people, countries or the entire world effected. The current world covid-19 pandemic can be treated as disaster or happening having huge potential to create many losses. This can be defined as well as a hazard or the overall cradle of danger. The definite expose of specific valuable things for people to a hazard is defined as a risk. The risk is usually being treated as the probability of loss. Therefore, the covid-19 pandemic is a disaster and a realization of hazard.

Vulnerability is being characterized as the degree to which a system or its constituent may respond harmfully in the face of hazardous event or disaster. The vulnerability

concept allows to evaluate the risks connected to the physical, social and economic consequences resulting from disaster to the system or its components (Proag, 2014).

Concepts of resilience in scientific literature (Moench, 2009) can be grouped according hard and soft resilience definitions. The hard resilience can be described as the direct strength of systems when they are placed under the definite pressure under disaster. Therefore, in case of disaster, resilience can be defined as an inverse of fragility. The rising of resilience of a system can be achieved by implementing enhancement measures aiming at reduction of probability of system collapse in the face of disaster. So, with the increase of resilience of the system, the level of damage for a certain intensity of the hazard, tend to reduce. The concept of soft resilience is linked to the capacities of the systems to absorb and recover from the hazardous events without encountering ultimate deviations in the systems functions or/and arrangement. This is linked to adaptive capacity of the system therefore defines the capacities of the system to adapt to the consequences of disaster.

As both concepts of resilience are valid in case of covid-19 impacts on agriculture, in this paper the hazards and risks created by covid-19 to agricultural systems need to be defined, following the analysis of exposure of agricultural systems to physical, social or economic hazards and related vulnerability of agricultural systems to these hazards. The resilience of the agricultural systems then will be addressed by assessing absorptive, adaptive and restorative capacities of the agricultural systems in the context of covid-19 pandemic based on various studies recently conducted around the world.

4. Objectives of the Study

The specific objectives of the study were to assess the impact of COVID-19 on:

- Agriculture and allied sector production, farm gate prices, supply and demand of agricultural inputs, etc.
- Marketing of agricultural produce of farmers.
- Banking activities in terms of access to credit, recovery and digital transactions.
- Activities of SHGs, NBFC-MFIs, FPOs, Farmers Club and MSME sector in rural areas.
- To suggest policy measures for agriculture and rural sector to ameliorate the adverse situation prevailing in the post COVID-19 situation.

5. Limitations of the Study

- It aims to capture just general and fast effects of the covid-19 disaster on agricultural systems in the widest sense.
- The future research is necessary to investigate how various market disruptions of food supply affect small and larger scale farms, dependent on the volatile market prices and supply chains disruptions.
- The negative effects on food security need to be investigated further to define necessary changes in food systems to increase their resilience.

6. Methodology

Collecting, preparing and analyzing information: This method is distinguished by a well-documented, replicable and clear search mechanism that is driven by a theoretical interpretation of the related phenomenon and enhances the efficacy of the analysis process. To classify essential publications, we applied our conceptual framework in literature search as well. For finding documents related to covid-19 impact on agriculture in terms of risks, vulnerability and resilience of agricultural systems, we have identified the following search terms and their combinations: 'covid-19', 'agriculture', 'resilience', 'vulnerability', 'risks' in all field in CA Web of Science database. We searched

for these academic databases released across the year, including 2020, to cover the full spectrum of scientific papers. Except sources not related to the covid-19, as well as excluding duplicate articles in individual searches, we selected 50 documents for analysis from the 343 sources found. In order to find as many studies on these issues as possible, a snowballing technique was applied in the next step. While analyzing the content of publications found during the search, those appropriate for analyzing this article were also reviewed. Additionally, 30 relevant papers were found. The main findings of literature review performed are provided in results section.

7. Data Analysis and Interpretation

Based on literature review, the analysis of covid-19 pandemics effects on agriculture sector can be grouped into farms resilience, agriculture goods supply and demand, labour regulation, food security and safety, overall economic and social consequence and international trade issues (Cranfield, 2020; Darnhofer, 2020; Jámor et al., 2020; Siche, 2020; Villulla, 2020; Zarei & Rad, 2020). The analysis of these covid-19 effects is performed based on risk, vulnerability, resilience framework defined above.

The covid-19 can be treated as disaster associated with hazards and risks. Though, a disaster is a apprehension of hazard, there is no universally concept and agreement among scholars about the scale of hazard to be qualified as a disaster, however covid-19 pandemic can be treated as disaster taking into account overall negative impacts and risks occurred around the world and the number of deaths. Thus, based on universal definition of hazard following conceptual framework provided above for our analysis, the main hazards and risks linked to covid-19 impacts on agriculture sector are given in Table 1 based on scientific literature review.

Table 1: The main hazards and risks linked to COVID-19 impacts on the agriculture sector

Hazards	Risks	References
Farmers and rural communities	Deaths, diseases, health problems; stress and trauma for people and their family and relatives	Abrams & Szeffler, 2020; Hossain et al., 2020; McDonald et al., 2020; Poudel & Subedi, 2020; Singh et al., 2020
Goods and services	Losses of agricultural products, waste of food	Brewin, 2020; Cortignani et al., 2020; Harris et al., 2020; Henry, 2020; Richards & Rickard, 2020
Environment	Negative impact on soils, ecosystems, losses of flora and fauna	Huynh et al., 2020; Lal, 2020b; Lal et al., 2020; McDonald et al., 2020; Rahim & Rahim, 2020; Saadat et al., 2020; Zambrano-Monserrate et al., 2020
Economic development of the agriculture sector	Food export and import break, economic crisis, break in agriculture sector development; bankruptcy of enterprises, loss of income, unemployment, poverty, inequality	Ahmed et al., 2020; Barcaccia et al., 2020; Barichello, 2020; Martin, 2020; Mitaritonna & Ragot, 2020; Neef, 2020; Nicola et al., 2020; Phillipson et al., 2020

8. Findings

- Survey findings indicate that the pandemic has affected production and marketing through labour and logistical constraints.
- The negative income shock restricted access to markets and increased prices of food commodities affecting the consumption pattern.
- To enhance the resilience of unofficial food supply chains using agrobiodiversity and such social innovations as the authorization of social groups in providing cooperation of urban and rural communities.
- Though restrictive measures against the increase of covid-19 infection have serious negative effect on workforce in agriculture sector and food safety, the study by Bochtis et al. (2020) assessed the influence of covid-19 on agricultural labor in US and suggested several strategies to address these risks.
- The occupations in agriculture sector having the highest risks were identified and measures to protect workers were identified for these professions. Several control measures were identified as very relevant to increase the resilience of agriculture sector and safeguard farmers were proposed like physical distancing, protection equipment and hygiene.

- The reduction in food security during covid-19 contagion is caused by reduced capacity of special agencies that provides important food social safety nets for vulnerable groups of population.

9. Conclusion

The covid-19 pandemic has a big negative influence on agriculture sector. Food safety and security were greatly threatened due restrictions on mobility, interaction of people and reduced purchasing power of people. The most vulnerable groups of population were affected mostly. Therefore, the measures taken by governments to stop the spread of the Corona-19 virus, first of all influenced negatively global food supply systems.

The analysis of literature in the risk-vulnerability and resilience of agriculture systems in the face of covid-19 showed that the resilience of food systems needs to be enhanced by implementing technical, economic and measures. All these policies and measures first of all need to safeguard the health and food supply security of world population. Technical measures aiming to improve the functional performance level of the infrastructure in agriculture sector are necessary to enhance physical resilience. Organizations and institutions in agriculture sector need to take necessary recovery efforts, considering the absorptive, adaptive, and restorative capabilities of the agricultural systems.

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