

## Resilience in Agriculture: Navigating Supply Chain Disruptions in a Post-Pandemic World

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### SUMMARY

The COVID-19 pandemic has cast a spotlight on the vulnerabilities of global food supply networks, triggering a reassessment of agricultural resilience, particularly in India where nearly half the workforce is engaged in the sector. As the pandemic disrupts consumer behavior and supply chain logistics, short-, medium-, and long-term policy responses are critical for preserving food safety, nutrition, and the livelihoods of farmers. Agricultural resilience, defined as the capacity to anticipate, prepare for, respond to, recover from, and adapt to shocks and stresses, is explored through key components such as adaptability, diversity, resource efficiency, risk management, technological innovation, and infrastructure. Resilience in agriculture emerges as crucial for sustainability due to climate change impacts, market volatility, globalization, technological changes, and community well-being. Case studies on e-training adoption in Odisha, India, and Nestlé's supply chain visibility initiatives illustrate practical strategies. By urging supply chain executives to prioritize resilience, embrace digitalization, diversify suppliers, and employ advanced chain management systems for real-time data analysis. Strategies for mitigating risks, building customer relationships, and continuous supply chain adaptation are proposed to enhance resilience in the post-pandemic world and navigate the challenges of a rapidly changing global landscape.

### INTRODUCTION

Global food supply networks are facing issues as a result of the COVID-19 epidemic. Scholars have examined a range of food supply chain concerns impacted by the COVID-19 pandemic since its start, including effects on consumer behaviour and organisational and logistical adjustments to food supply chains. These repercussions have also been felt by the food and agriculture sectors. The Indian economy greatly depends on the agriculture and related sectors. It employs around half of the workforce and contributes almost one-sixth of the country's total income. The actions implemented in numerous nations to stop the virus's spread were designed to obstruct the flow of agricultural goods to customers both inside and outside of their borders. Short-, medium-, and long-term policy responses will largely determine how this affects food safety, nutrition, and the livelihoods of farmers, fishermen, and other participants in the food supply chain. In the short run, epidemics present serious problems for the food system, but they also present a chance to confront obstacles and quicken the transformation of the agriculture and food industries to strengthen resilience.

**Table. 1. Share and growth of GVA of agriculture and allied sectors in total economy (Ministry of Statistics & Programme Implementation, 2023).**

Year	Share of GVA of agriculture and allied sectors in total economy (%) at current prices	Growth of GVA of agriculture and allied sectors (%) (at 2011-12 prices)
2018-19	17.6	-
2019-20	18.4	-
2020-21	20.3	4.1
2021-22	19.0	3.5
2022-23	18.3	3.3

**What is a resilient supply chain?**

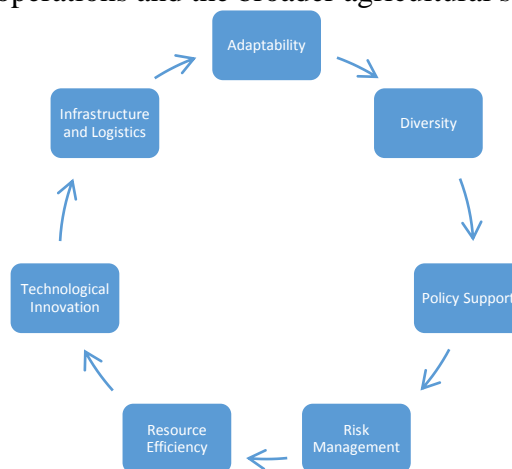
A resilient supply chain gives itself the means to withstand tests and react quickly and efficiently to obstacles. Although risks in global supply chains are unavoidable, you may still take the appropriate precautions to lessen them. The two key pillars of resilience in your supply chain are mitigation and planning. Prepare for the disruptions so that you have the resources to deal with them as soon as they unavoidably arrive, rather than rushing to find solutions and suffering significant losses (Mehrhoff, 2022).



**Fig. 1. Strategies for supply chain resilience**

**Understanding Agricultural Resilience**

In the context of agriculture, resilience refers to the ability of agricultural systems to anticipate, prepare for, respond to, recover from, and adapt to various shocks and stresses. These shocks and stresses can include natural disasters, climate change, market fluctuations, disease outbreaks, and other unexpected events that have the potential to disrupt normal farming operations and the broader agricultural supply chain.



**Fig.2. Components of resilience in Agriculture**

**Key components of resilience in agriculture include:**

**Adaptability:** The capacity of agricultural systems to adjust and modify practices, technologies, and strategies in response to changing conditions, such as climate variability or shifts in market demand.

**Diversity:** The presence of diverse crops, livestock, and farming practices within an agricultural system, which can help buffer against the negative impacts of specific threats or disruptions.

**Resource Efficiency:** The ability to optimize the use of resources, including water, soil, and inputs, to ensure sustainable productivity and mitigate the impact of resource scarcity or price fluctuations.

**Risk Management:** Implementation of strategies and measures to identify, assess, and manage risks associated with various factors, such as pests, diseases, extreme weather events, and market volatility.

**Technological Innovation:** The integration of advanced technologies and innovative practices to enhance productivity, improve decision-making, and provide early warning systems for potential disruptions.

**Infrastructure and Logistics:** Having robust and flexible infrastructure, including transportation, storage, and processing facilities, to facilitate smooth operations and minimize the impact of supply chain disruptions.

### Why is resilience crucial for the sustainability of the sector?

Resilience in the context of agriculture is crucial for the sustainability of the sector due to the numerous challenges and uncertainties it faces. Agricultural resilience refers to the ability of farming systems to withstand shocks, adapt to changing conditions, and recover from disturbances while maintaining essential functions and productivity. Here are key reasons why resilience is vital for the sustainability of agriculture:

#### Climate Change Impact:

Agriculture is highly susceptible to the impacts of climate change, including extreme weather events, shifts in temperature and precipitation patterns, and increased frequency of droughts or floods. Resilient agricultural systems can better cope with these changes and adapt their practices accordingly.

#### Market Volatility:

Agricultural markets are subject to price fluctuations, changing consumer preferences, and global economic conditions. Resilient farmers and supply chains can adapt to market dynamics, diversify their products, and explore alternative markets to mitigate the impact of price volatility.

#### Globalization and Supply Chain Disruptions:

Agriculture is increasingly interconnected on a global scale. Resilient supply chains can better withstand disruptions, whether caused by geopolitical events, pandemics, or transportation challenges. Localization and shorter supply chains can also enhance resilience in the face of global uncertainties.

#### Technological changes and Supply Chain Transparency:

Rapid advancements in technology and shifts in socioeconomic factors can impact farming practices. Resilient farmers embrace technological innovations, adapt to changing market demands, and have the capacity to integrate new practices into their operations. Supply chain transparency, in essence, means that a business knows exactly what is happening at every stage of its supply chain, and communicates clearly stated, factually backed information about its supply chain operations internally and externally.

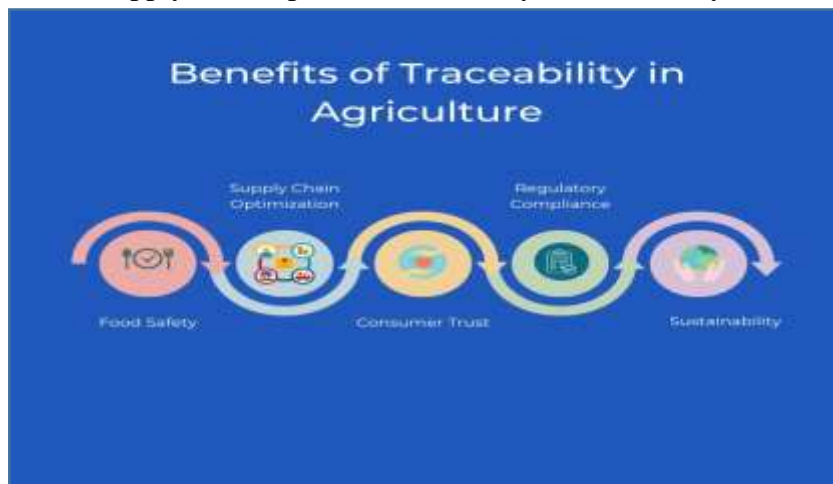


Fig. 3. Benefits of traceability in Agriculture

#### Community Well-being:

Resilience in agriculture extends to the well-being of farming communities. Strong social networks, community support systems, and access to education and healthcare contribute to the overall resilience of the agricultural sector.

#### Global Food Security:

As a fundamental component of global food security, resilient agriculture ensures a stable and consistent food supply. The ability of agricultural systems to bounce back from disruptions helps prevent food shortages and maintains the nutritional needs of growing populations.

#### Case study:

#### Enhancing Farmer Resilience in Agricultural Markets Through E-Training: A Case Study on E-NAM Adoption in Odisha, India

The case study was conducted in 3 districts of Odisha (Puri, Cuttack and Jajapur), emphasizing on how e-training enhances farmers' resilience, enabling effective adoption of technologies like e-NAM.



Fig. 3. e-NAM

This approach has transformative potential, reducing transaction costs and enhancing market access, especially in developing economies.

### Recommendations

Suggest broad-scale implementation of similar e-training programs across more regions and mandis. Policymakers should invest in digital literacy programs to empower farmers, ensuring sustained success of technology-driven interventions in agriculture (Samantaray, 2023).

### Nestlé: Enhancing Supply Chain Visibility for Sustainable Food Production

Due to strict standards, emphasis of controlled agronomic practices and a ban on preventive agrochemicals, Nestlé sought a solution to aid farmers in meeting these requirements. Nestlé adopted AGRIVI 360, transforming its supply chain with real-time transparency and full traceability, setting a benchmark for sustainability and responsible practices. Nestlé and AGRIVI 360 showcase the crucial role of supply chain transparency in achieving sustainability goals, ensuring compliance, and fostering a future-ready food production ecosystem.

### Next steps in supply chain resilience

Global supply chains have been gradually going digital over the past few years, but COVID-19 and its effects have sped up this process, requiring supply chain managers to redesign and reengineer their networks more quickly. The majority of supply chains in the past were created with cost efficiency in mind, but future supply chains will need to strike a balance between resilience, agility, cost-effectiveness, and speed with a focus on customer pleasure, according to Gartner. Supply chain executives are now under pressure to push their supply chains' digital agendas and strengthen their resilience to withstand future disruptions.

Mitigating, preventing, and fixing problems in the supply chain will require a mix of strategic planning, adopting new technologies, expanding the number of suppliers, and making the system more resilient. We need to diversify our dependency on not just one supplier in that geographical area but create a network with different suppliers within and outside of that area. In this modern technological era, to set up advanced chain management systems that can track and analyse data in real time to reduce the risk and take steps, build a strong relationship with customers to find the risk together, plan to mitigate the risk, and review and update the supply chain according to local and global aspect. To put these strategies into action, we can face the challenges and improve the supply chain in the post-pandemic world.

### CONCLUSION

The COVID-19 pandemic has underscored the urgent need for resilient agricultural supply chains. As global disruptions persist, India's reliance on agriculture necessitates strategic policy responses to safeguard food security and the well-being of its workforce. Embracing the pillars of mitigation and planning, coupled with the adoption of transformative technologies, will be pivotal in fortifying the sector. The case studies of e-training adoption and Nestlé's supply chain visibility highlight actionable approaches. Looking ahead, a resilient, agile, and technologically advanced supply chain is imperative for navigating uncertainties and ensuring a sustainable future for global agriculture.

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