



Navigating The Impact Of Covid-19 Pandemic On The Vegetable Value Chain For Sustainable Farming

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Abstract

The COVID-19 pandemic had caused wide disruptions across various sectors, including agriculture and had posed serious threat to global food systems, particularly the vegetable value chain. The disruptions caused by the pandemic such as labour shortages, marketing facilities, loss of income, disruptions in supply chain and shifts in consumer's preference leading to hunger, poverty and food insecurity which is adversely affecting to the livelihood opportunities of the vegetable farmers. A study was conducted to understand the experiences of vegetable farmers with respect to the impacts of COVID-19 pandemic on the vegetable value chain. The study was administered with the vegetable farmers ($n = 240$) in the state of Odisha, India. It is an agrarian state of India where major part of its population depends on agriculture for sustaining their socio-economic livelihood. It constitutes of 10 agro-climatic zones out of which two agro-climatic zones that is north eastern coastal plain and east & south eastern coastal plain were taken for the study. The results from the study clearly show the multifaceted impact of pandemic on the vegetable value chain system. This paper aims to provide an overview of the challenges encountered, adaptations made in the various stages of vegetable value chain highlighting its key components and opportunities. Furthermore, it helps in obtaining valuable insights for policymakers, practitioners and researchers striving to enhance the resilience and sustainability of vegetable value chains amidst global crises.

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Key words: COVID-19, Pandemic, Vegetable value chain, Sustainability

MATERIAL AND METHODS

The present study was conducted in the state of Odisha, India. It is located on the eastern coast of India with diverse agro-climatic conditions and has a significant agrarian economy. Odisha constitutes of 10 agro-climatic zones out of which two agro-climatic zones that is North eastern coastal plain and East & south eastern coastal plain were selected for the study due to their high potential for vegetable production. Apart from that two districts Cuttack and Balasore were selected purposively from each of the agro-climatic regions

and two blocks from each district were taken for the study. Followed by the random selection of two gram panchayat from each district and two villages from each gram panchayat were considered. The Ex-post facto research design was followed. A total of 240 vegetable farmers are selected through propionate random sampling by covering 8 villages of 4 blocks from the 2 districts of the Odisha for the purpose of the study.

INTRODUCTION

The outbreak of COVID-19 pandemic had triggered an everlasting global crisis disrupting societies, economies and livelihoods across the globe. The rise and spread of the pandemic had not only imposed critical health risks but also have profound and far-reaching effects on the various sectors of economy including agriculture. Being the largest agricultural producers globally, India's agrarian sector serves as the backbone of the economy and sustains a significant portion of the population by ensuring food security, employment generation, and rural livelihoods. The pandemic had significant challenges to the agricultural sector encompassing aspects such as labour shortages, supply chain disruptions, market fluctuations, export-import dynamics, financial stress on farmers, and government interventions. The on-going Covid-19 pandemic has placed unprecedented pressure on food supply chains and shocks affecting all segments, including agricultural production, food processing, transportation and logistics (Erokhin & Gao, 2020). The emergence of the COVID-19 pandemic significantly raised human health risks and caused major disruptions to the regional and global food systems. Across the world the Government responded to the threat by restricting the movement of people, goods and agricultural commodities. The pandemic aroused at the time when farmers were getting prepared for the Rabi crop harvest and the lockdown continued till the production time of kharif crops. Due to which the farmers faced numerous challenges in availing labour, extension services as well as obtaining vital input supplies such as fertilizers, seeds, insecticides etc. for the upcoming cropping seasons. The most affected sector of the agriculture is perishable produce such as fresh fruits and vegetables. The unexpected shutdown resulted in the supply chain disruptions especially in the case of fresh vegetables which are high-value perishable crops.

Vegetable value chains are extensively disturbed due to restricted movement of people and agricultural commodities resulting in adverse impact to the livelihoods of the vegetable farmers. Local market places are restricted by time limits and within a certain time frame farmers cannot sell their produce resulting in distress sale incurring loss to the farmers. In order to mitigate the effects of pandemic farmers adopted their own strategies in the agricultural practices including reduced food consumption, diversifying their income sources, limiting the household expenditures, planting fewer crops, reducing their dependence on inputs and cropped area cultivated or increasing labour in agriculture (Mahmud & Riley, 2021; Nolte et al., 2022; Obayelu et al., 2021) to cope with the impacts. Despite the fact that agricultural stimulus packages were published, they did not provide clear incentives for vegetable producers who have huge economic loss on their crop (Alam et al., 2021). The pandemic had changed almost every part of our daily lives from how we work, socialize and consume essential goods. The disruptions caused by COVID-19 have reverberated throughout the vegetable value chain. The intricate network that delivers fresh produce to consumers has experienced disruptions and transformations. This system encompasses every stage of vegetable production, from cultivation to consumption, involving farmers, distributors, retailers, and consumers. It had different effects on the vegetable production, distribution and consumption thereby demanding new ways to tackle the critical condition.

Odisha is the India's ninth largest state in terms of area. According to the 2011 census, it covers a geographical area of 1, 55,707 square kilometres and a population of about 4.19 crores. The agricultural sector of the state significantly contributes about 26% to the State Gross Domestic Product (SGDP) and majority of the workforce about 65% depends upon the agriculture and allied sectors for their day to day living. Odisha is the seventh largest vegetable producer in the country with highest per capita consumption of fresh vegetables. The state has high potential for production of many vegetables such as sweet potato, brinjal, tomato, cauliflower, okra and bottle gourd achieving ranks at national level as per the report of horticulture area production information system (HAPIS) for 2019-20. The pandemic had adverse effect on the vegetable farmers of the state significantly affecting their food, nutrition and livelihood security. It might have longer effects on income of poor people like smallholder vegetables farmers (Sarker MNI et al, 2020). However the onset of pandemic had severely affected the vegetable value chain by disrupting traditional processes and prompting stakeholders to adapt the change. The multifaceted adverse impact faced by various stakeholders

analyse the adaptations made in response to these challenges, and discuss the strategies employed to ensure value chain sustainability amidst of on-going uncertainty.

VEGETABLE VALUE CHAIN

In today's globalized food systems, the vegetable value chain plays a pivotal role in ensuring the efficient and sustainable production, distribution and consumption of fresh produce. It is made up of a chain of actors, from input providers, producers, and processors, to exporters and customers involved in the events essential to transport the agricultural produce from its beginning to its final usage (Kaplinsky & Morris, 2001). It is a series of interconnected activities, from cultivation and harvest to processing, distribution, and retailing, ultimately culminating in consumption by end-users. It involves a complex network of activities from farm to table, involving multiple stakeholders and processes aimed at delivering fresh and nutritious produce to consumers. Every stage of the value chain presents unique challenges and opportunities, influenced by factors such as market demand, technological advancements, environmental conditions, and socio-economic dynamics. The pandemic had a predominant impact over the vegetable value chain such as challenges for production, supply chains and food security highlighting major vulnerabilities and complexities inherent in the global food system. As the world continues to grapple with the on-going crisis and its aftermath, it is essential to prioritize investments for more inclusive systems for sustainable agriculture that can withstand future shocks. Collaboration and innovation will be crucial in addressing the challenges posed by the pandemic for building a sustainable era.

IMPACT OF COVID-19 PANDEMIC ON AGRICULTURAL PRODUCTION

The rise of the COVID-19 pandemic had disrupted agricultural production systems in multiple ways including disruptions in input supply chains, shortage of labour and logistical challenges. Low availability and/or high prices of inputs such as pesticides could weigh on yields and crop production in 2020 and 2021, particularly in developing countries (Schmidhuber, Pound and Qiao ,2020). With lockdowns, travel restrictions and social distancing protocols in order to prevent the virus spread hindered the movement of agricultural workers during the critical periods such as planting and harvesting seasons. Mobility restrictions due to the lockdown had forced many vegetable farmers to stop various production activities reducing their incomes dramatically. Some studies focused on the impacts of the pandemic on agricultural supply chains (Gray 2020). Vegetable farmers also been deeply affected by the changes in demand of agricultural commodities produced, reduced use of farm inputs and problem in financing business activities due to decrease in cash flow. Additionally disruptions in the transportation and logistics severely affected the timely supply of vital agri-inputs such as fertilizers, seeds, pesticides etc. further aggregated problems faced by farmers resulting in crop losses particularly for perishable crops vegetables affecting crop yields and productivity. Reduced access to the market, lower demand and increased production costs have resulted in income loss for vegetable farmers, particularly smallholder farmers and those reliant on export markets. The economic downturn caused by the pandemic has affected rural livelihoods dependent on vegetable farming and related activities, leading to job losses, migration, and social unrest in agricultural communities.

Disruptions in vegetable production and distribution have contributed to food insecurity; particularly in vulnerable and marginalized communities with limited access to nutritious foods. A study had been done to highlight the impact of COVID-19 pandemic on the production activities of vegetables as experienced by the farmers. The percentage expressed are of the response category "Strongly agree." along with the scores obtained according to the 3-point scale (1 = "Disagree", 2 = "Agree" and 3 = "Strongly agree") and the results derived are briefly discussed as follows

Table-1: Impact of COVID-19 pandemic on production activities of vegetables

| Sl.no. | Statements | Strongly agree (SA) | | Agree (A) | | Disagree (DA) | | Total weighted score | Weighted Mean score | Rank order |
|--------|--|---------------------|-------|-----------|-------|---------------|-------|----------------------|---------------------|------------|
| | | f | % | f | % | f | % | | | |
| 1 | The supply chain of agricultural inputs is adversely disrupted. | 166 | 69.00 | 43 | 18.00 | 31 | 13.00 | 615 | 2.56 | IV |
| 2 | The pandemic had adverse effect on the timely availability and accessibility of agricultural inputs (such as seeds / planting materials /fertilizers / pesticides / farm machinery etc.) | 181 | 75.00 | 33 | 14.00 | 26 | 11.00 | 635 | 2.64 | II |
| 3 | The price of agricultural inputs increased significantly resulting in the increased cost of production | 195 | 81.00 | 31 | 13.00 | 14 | 6.00 | 661 | 2.75 | I |
| 4 | Exploitation by the input dealers and other supplying agencies | 172 | 72.00 | 40 | 17.00 | 28 | 12.00 | 624 | 2.60 | III |
| 5 | The quality of agricultural inputs is adversely affected | 154 | 64.00 | 36 | 15.00 | 50 | 21.00 | 584 | 2.43 | V |
| 6 | The pandemic had adverse effect on the cultivation practices and farm intercultural operations | 147 | 61.00 | 38 | 16.00 | 55 | 23.00 | 572 | 2.38 | VI |
| 7 | The demand and availability of agricultural laborer's is adversely affected | 128 | 53.00 | 50 | 21.00 | 62 | 26.00 | 546 | 2.27 | VIII |
| 8 | The wages of agricultural laborer's increased significantly | 132 | 55.00 | 61 | 25.00 | 47 | 20.00 | 565 | 2.35 | VII |
| 9 | The post-harvest management of farm produce is adversely affected | 102 | 42.00 | 67 | 28.00 | 71 | 30.00 | 511 | 2.12 | IX |

From the above Table-1, It has been observed that majority of the respondents (81%) indicated that the price of agricultural inputs increased significantly resulting in the increased cost of production with a mean score of 2.75 and ranked-I, followed by (75%) of the respondents indicated that the pandemic had adverse effect on the timely availability and accessibility of agricultural inputs (such as seeds / planting materials /fertilizers / pesticides / farm machinery etc.) with a mean score of 2.64 and ranked-II, Exploitation by the input dealers and other supplying agencies (72%) with a mean score of 2.60 and ranked-III, The supply chain of agricultural inputs is adversely disrupted (69%) with a mean score of 2.56 and ranked-IV, The quality of agricultural inputs is adversely affected (64%) with a mean score of 2.43 and ranked-V, The pandemic had adverse effect on the cultivation practices and farm intercultural operations (61%) with a mean score of 2.38 and ranked-VI, The wages of agricultural laborer's increased significantly (55%) with a mean score of 2.35 and ranked-VII, The demand and availability of agricultural laborer's is adversely affected (53%) with a mean score of 2.27 and ranked-VIII. Lastly majority of the farmers (42%) experienced that the post-harvest management of farm produce is adversely affected during the pandemic with a mean score of 2.12 and ranked-IX. Overall, the pandemic has highlighted the vulnerabilities and resilience of the agricultural sector, including vegetable production. While it presented numerous challenges, it also leads to innovation and adaptation guiding the path towards more resilient and sustainable agricultural practices of the future.

IMPACT OF COVID-19 PANDEMIC ON AGRICULTURAL MARKETING

The COVID-19 pandemic has posed many challenges to agricultural marketing activities, disrupting value chains, markets, and livelihoods worldwide. Marketing activities such as distribution, promotion, and sale of agricultural products had faced numerous problems due to mobility restrictions and trade, disrupting transportation networks, storage facilities and markets. Measures to contain the spread of the virus in many countries inadvertently disrupted the supply of agri-food products to markets and consumers both within and across countries (OECD, 2020). Agricultural marketing Acts as critical link between producers and consumers constituting a wide range of activities such as transportation, storage, processing, packaging, and retailing.

During the COVID-19 pandemic, logistics in food value chains such as transportation, warehousing, procurement, packaging, and inventory management have been disrupted, adversely impacting the quantity of food available and its quality, freshness, safety, access to markets, and affordability (FAO, 2020). The pandemic had adversely disrupted the agricultural marketing systems affecting producers, traders and processors. Lockdowns and restrictions on public gatherings have led to the closure of traditional market place such as farmer's and wholesale markets which were temporarily closed or operating at reduced capacity, limiting farmers' access to markets and affecting their ability to sell their produce at remunerative prices.

Fluctuations in demand and supply of agricultural produce coupled with disruptions in value chains lead to the price volatility for vegetables. Restrictions on inter-state movement and closure of agricultural produce markets disrupted the flow of agricultural produce from rural areas to urban centres resulting in delays and bottlenecks in the distribution of fresh vegetables, leading to increased wastage and spoilage. Furthermore, disruptions in international trade and export bans imposed and change in demand from importing countries impacted vegetable exports, affecting challenges faced by farmers reliant on export markets. A study had been conducted to illustrate the impact of COVID-19 pandemic on the marketing activities of vegetables as experienced by the farmers and the results obtained are briefly discussed as follows

Table-2: Impact of COVID-19 pandemic on marketing activities of vegetables

| Sl.no. | Statements | Strongly agree (SA) | | Agree (A) | | Disagree (DA) | | Total weighted score | Weighted Mean score | Rank order |
|--------|---|---------------------|-------|-----------|-------|---------------|-------|----------------------|---------------------|------------|
| | | f | % | f | % | f | % | | | |
| 1 | The pandemic had adverse effect on the marketing of vegetables due to closure of weekly markets / rural haats / mandis /supermarkets etc | 178 | 74.00 | 43 | 18.00 | 19 | 8.00 | 639 | 2.66 | II |
| 2 | Disruptions in the distribution and transportation facilities due to lockdown had adverse effect on the marketing of vegetables | 184 | 77.00 | 46 | 19.00 | 10 | 4.00 | 654 | 2.72 | I |
| 3 | The pandemic had adverse effect on the marketing of vegetables due to the perishability of the produce resulting in distress sale | 159 | 66.00 | 35 | 15.00 | 46 | 19.00 | 593 | 2.47 | IV |
| 4 | Shutting down of retail food outlets due to restricted movements of goods and services in lockdown had an adverse effect on the marketing of vegetables | 118 | 49.00 | 50 | 21.00 | 72 | 30.00 | 526 | 2.19 | VIII |
| 5 | Marketing of vegetables is adversely affected due to the limited point of sale & restricted marketing facilities | 166 | 71.00 | 39 | 16.00 | 35 | 13.00 | 611 | 2.54 | III |
| 6 | Lack of adequate cold storage facilities had adverse effect on the marketing of vegetables | 136 | 57.00 | 68 | 28.00 | 36 | 15.00 | 580 | 2.41 | VI |
| 7 | Exploitation by middle men / commission agents , hoarding and black marketing of agricultural produce increased significantly | 123 | 51.00 | 63 | 26.00 | 54 | 23.00 | 549 | 2.28 | VII |
| 8 | Disruptions in the market due to uneven demand and supply of agricultural produce had adverse effect on the marketing of vegetables | 150 | 63.00 | 49 | 20.00 | 41 | 17.00 | 589 | 2.45 | V |

From the above Table-2, It has been found that majority of the respondents (77%) indicated that the disruptions in the distribution and transportation facilities due to lockdown had adverse effect on the marketing of vegetables with a mean score of 2.72 and ranked-I, followed by (74%) of the respondents indicated that the pandemic had adverse effect on the marketing of vegetables due to closure of weekly

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markets / rural haats / mandis /supermarkets etc. with a mean score of 2.66 and ranked-II, Marketing of vegetables is adversely affected due to the limited point of sale & restricted marketing facilities (71%) with a mean score of 2.54 and ranked-III, The pandemic had adverse effect on the marketing of vegetables due to the perishability of the produce resulting in distress sale (66%) with a mean score of 2.47 and ranked-IV, Disruptions in the market due to uneven demand and supply of agricultural produce had adverse effect on the marketing of vegetables (63%) with a mean score of 2.45 and ranked-V, Lack of adequate cold storage facilities had adverse effect on the marketing of vegetables (57%) with a mean score of 2.41 and ranked-VI, Exploitation by middle men / commission agents , hoarding and black marketing of agricultural produce increased significantly (51%) with a mean score of 2.28 and ranked-VII. Lastly most of the farmers (49%) experienced shutting down of retail food outlets due to restricted movements of goods and services in lockdown had an adverse effect on the marketing of vegetables with mean score of 2.19 and ranked -VIII. Thus, the pandemic has underscored the importance of resilient and adaptable agricultural marketing systems in ensuring the efficient distribution of food and agricultural products. Social connections can help organizations to work together efficiently and lead to sustainable food supply chains, while the economy is circular (Kuzma & Sehnem, 2022). To adapt to the challenges posed agricultural marketers had implemented a wide range of resilience-building strategies such as diversification of marketing channels, Inclusion of digital technologies and e-commerce platforms, adoption of contactless delivery and payment methods along with the establishment of partnerships and collaborations across the value chain. Furthermore we can work towards building more equitable and sustainable food systems capable of addressing the challenges of today and tomorrow.

IMPACT OF COVID-19 PANDEMIC ON CONSUMERS ACTIVITIES

The COVID-19 pandemic had triggered a series of disruptions affecting nearly every aspect of our daily life. With lockdowns, social distancing measures, driven by fears of infection and economic uncertainties have reshaped how consumers interact with products and services, leading to significant changes in consumption behaviour's, preferences and purchasing patterns across various sectors, including food and agriculture. The pandemic led to significant shifts in consumer demand patterns, affecting the types of agricultural products in demand and the channels through which they were purchased. Changes in consumer behaviour and preferences led to shifts in demand for vegetables. With the closure of restaurants, hotels, and other food service establishments, demand for perishable agricultural produce such as vegetables declined, Not only was there a collapse in demand from restaurants, hotels, and catering services as well as the closure of some open markets (FAO, 2020), but also a surge in consumer demand for staple foods and non-perishable items faced by supermarkets, neighbourhood grocers and grocery related e-commerce channels (OECD, 2020; Coluccia et al., 2021). The shift towards online shopping and home delivery services further reshaped the retail landscape, impacting traditional food markets and distribution channels. Buying of bulk products in panic at the early stages due to fear resulted in temporary shortages for certain food items and price volatility. With restrictions on mobility and gatherings, consumers have shifted towards online shopping and e-commerce platforms for their everyday needs, including fresh vegetables, groceries and household essentials.

The pandemic has prompted consumers to adopt more cautious and conservative spending habits, characterized by increased savings and reduced discretionary expenditures. It has accelerated existing trends in retail and e-commerce leading to a dramatic shift in consumer shopping behaviour. Consumers were forced to adapt to new ways of living, working, and consuming. The economic impact of the pandemic, including job losses, income reductions, and financial insecurities, has led to shifts in spending and consumption patterns among consumers. Discretionary spending on non-essential goods and services has declined, as consumers prioritize essential items such as food, healthcare, and home necessities. Moreover, changes in lifestyle and mobility restrictions had adversely influenced the consumer's consumption choices. For further understanding the impact of COVID-19 pandemic on the consumer's activities a brief analysis was done and the results obtained are discussed as follows

Table-3: Impact of COVID-19 pandemic on consumers activities

| Sl.no. | Statements | Strongly agree (SA) | | Agree (A) | | Disagree (DA) | | Total weighted score | Weighted Mean score | Rank order |
|--------|---|---------------------|-------|-----------|-------|---------------|-------|----------------------|---------------------|------------|
| | | f | % | f | % | f | % | | | |
| 1 | The pandemic had adverse effect on the food insecurity among the individuals/groups | 179 | 75.00 | 34 | 14.00 | 27 | 11.00 | 632 | 2.63 | III |
| 2 | Increase in the cost of produce had adverse effect on the consumption of vegetables | 197 | 82.00 | 25 | 10.00 | 18 | 8.00 | 659 | 2.74 | I |
| 3 | The shopping behavior among the consumers is adversely affected due to experienced income shock | 183 | 76.00 | 37 | 15.00 | 20 | 9.00 | 643 | 2.67 | II |
| 4 | Change in mindset and consumer's behavioral pattern had adverse effect on the consumption of vegetables | 118 | 19.00 | 55 | 23.00 | 67 | 28.00 | 531 | 2.21 | VI |
| 5 | Change in preference of consumers due to low purchasing parity had adverse effect on the consumption of vegetables | 140 | 58.00 | 47 | 20.00 | 53 | 22.00 | 567 | 2.36 | V |
| 6 | Closure of the hotels, restaurants, cafes, road side vendors, small retailers etc. due to lockdown restrictions had adverse effect on the consumers | 161 | 67.00 | 35 | 15.00 | 44 | 18.00 | 597 | 2.48 | IV |

As evident from the above Table-3, It was concluded that majority of the respondents (82%) experienced that increase in the cost of produce had adverse effect on the consumption of vegetables with a mean score of 2.74 and ranked-I, followed by (76%) of the respondents indicated that the shopping behavior among the consumers is adversely affected due to experienced income shock with a mean score of 2.67 and ranked-II, The pandemic had adverse effect on the food insecurity among the individuals/groups (75%) with a mean score of 2.63 and ranked-III, Closure of the hotels, restaurants, cafes, road side vendors, small retailers etc. due to lockdown restrictions had adverse effect on the consumers (67%) with a mean score of 2.48 and ranked-IV, Change in preference of consumers due to low purchasing parity had adverse effect on the consumption of vegetables (58%) with a mean score of 2.36 and ranked-V. Lastly it was found that most of the respondents (49%) experienced that change in mindset and consumer's behavioral pattern had adverse effect on the consumption of vegetables with a mean score of 2.21 and ranked-VI. In response to the challenges posed by the pandemic, consumers have demonstrated resilience and adaptability, finding innovative ways to cope with the new normal. Significant changes are observed in consumer consumption patterns, Consumer's behaviour, lifestyles and priorities. From shifts in spending patterns to changes in dietary choices, consumers have adapted to new realities in response to the pandemic. Consumers are likely to continue prioritizing health, safety, and sustainability in their purchasing decisions, influencing the development of food and agriculture markets. There is a growing awareness of the interconnectedness of consumption, health and sustainability. Moving forward by understanding these changes and addressing societal challenges will be essential for building a more sustainable, inclusive and resilient future for consumers worldwide.

CONCLUSION

The COVID-19 pandemic had profoundly impacted the vegetable value chain causing disruptions across its various stages. While the pandemic has presented numerous challenges for vegetable farmers and stakeholders it has also highlighted the importance of resilience, innovation and collaboration in ensuring the continued availability of fresh and nutritious vegetables for consumers. In response to these challenges stakeholders along the vegetable value chain have implemented various adaptations. From the adoption of technology to enhance efficiency and traceability to the implementation of stringent safety measures to protect workers and consumers, innovative strategies have emerged to mitigate the impact of the pandemic.

The pandemic has raised major concerns about food and nutrition security and the resilience of agricultural value chains amid lockdowns and border closures (Laborde, Martin, Swinnen, & Vos, 2020; Reardon, Bellemare, & Zilberman, 2020). The vegetable value chain has demonstrated remarkable resilience and adaptability. From diversifying distribution channels to forging partnerships with local communities, stakeholders have embraced innovative strategies to navigate the uncertainties brought about by the pandemic. The crisis has underscored the importance of building resilient supply chains that can withstand future shocks and disruptions.

The COVID-19 pandemic had highlighted the need for structural reforms in agriculture to enhance resilience, competitiveness and sustainability leading to the passage aimed at liberalizing agricultural markets, improving price discovery mechanisms and empowering farmers. Moreover concerns about food security, climate change and resource scarcity have underscored the need for more sustainable and resilient agricultural practices throughout the value chain into optimizing operations and enhancing sustainability. The Indian government announced various relief measures for farmers and agricultural workers affected due to the pandemic including direct income support, loan moratoriums and access to credit facilities through agricultural credit institutions. The government introduced stimulus packages and investment schemes aimed at revitalizing the agricultural sector promoting agri-infrastructure development and strengthening value chains to enhance market access for the farmers.

However, by understanding the challenges, embracing adaptation and implementing forward-thinking strategies stakeholders can navigate through the complexities posed by the pandemic and emerge to be stronger and resilient. Additionally it identifies emerging trends and future directions for sustainable vegetable value chain management offering valuable guidance for policymakers, practitioners and researchers. While the vegetable value chain has demonstrated resilience and adaptability accompanied with the policy reforms, investments in rural infrastructure and support measures to make agriculture sustainable in the post-pandemic era

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