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Examining Select Issues in Indian Agriculture Supply Chain amidst COVID-19 Disruption: SAP-LAP Approach

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ABSTRACT

Purpose: The study aims at critically analysing the supply chain of Indian agriculture sector to understand the problems and solutions required amidst the disruption caused by the spread of Coronavirus pandemic. Strategic actions have been recommended for developing a resilient agriculture supply chain.

Design/Methodology/Approach: Firstly, through literature review the Indian agriculture supply chain landscape is first understood. Next, through SAP-LAP (Situation-Actor-Processes, Learning-Actions-Performance) approach, an attempt has been made to examine the present situation of Indian agriculture supply chain amidst the spread of the pandemic and effect of government decisions for farmers. Each of the aspects have been studied in the context of supply side, demand side and logistics side to obtain a comprehensive view.

Findings: The analysis of SAP-LAP factors for Indian agriculture sector supply chain points towards interesting findings. First and foremost, the SAP or Situation-Actor-Processes aspect points towards the lack of flexibility amongst actors for a resilient agriculture supply chain which got worsened by the lockdown measures. Next, the LAP or learning-actions-performance aspect suggests the ways in which flexibility can be built at the supply, demand and logistics end through various resilient practices such as collaboration, coordination, ICT, ground level inputs etc.

Originality/Value: The present study is an attempt towards understanding the consequences of the spread of COVID-19 pandemic on the supply chain of Indian agriculture sector. Through SAP-LAP framework a relatively transparent view of the Indian agriculture supply chain system is obtained for theoretical and managerial problem solving. The study, hence, adds to the pool of knowledge about agrarian supply chains along with risk and resilience measures to ensure continuity at the desired level of connectedness and control over structure and functions.

Paper Type: Case Based Study

KEYWORDS COVID-19 | Supply Chain | Agriculture, SAP-LAP

Introduction:

Marketing channels for fruits and vegetables in India vary considerably by commodity and state, but they are generally very long and fragmented.COVID-19 or coronavirus disease broke out in the Chinese city of Wuhan in late 2019 and has since spread in several parts of the globe. The disease has infected over 3 million people around the world and has caused death of several thousand thereby becoming a health emergency across several geographies. To ensure containment of the virus and prevent its further spread in the population, governments around the globe have sealed their borders and have imposed strict lockdowns in their countries. India, with almost 30, 000 cases (till April 28, 2020), is also under strict lockdown starting March, 2020. During the lockdown there is complete ban on public transport, commercial establishments, offices etc. Citizens are supposed to remain at their homes and follow social distancing.

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With complete lockdown and prohibition on several goods and services, the agriculture supply chain grapples to solve several supply sides and the demand side issues. At the demand side, making food grains and other supplies available to the citizensand also for export is an immediate supply chain challenge. The demand for food grains, fruits and vegetables is arising not only from rural and urban households but also from industries which requires them for further processing. However, with limited availability, these industries are unable to manufacture the finished goods in the requisite quantities.In India, making the grains available to the Public Distribution System (PDS) shops and its safe delivery to the beneficiary is also a problem which grapples the government. On the global front as well, people are panic in buying food which has caused several countries to halt the exports of agriculture supplies.

The issues faced by the supply chain both from the demand and the supply side is affecting the export and import of agriculture items in India. India stands at the top position in cultivation, export and consumption of several of the agriculture produce. Several actors are working together to ensure that the supply chain is working efficiently. However, availability of labour, transport bottlenecks, shortage of raw material, closure of courier services is hampering the imports and exports of India. Are the efforts undertaken by the authorities amidst the disruption sufficient and what are the bottlenecks to the efficient operation of the supply chain that is affecting the trade of agricultural items? To answer these managerial questions, this paper attempts to analyse the planning and implementation framework followed to meet the supply and demand amidst COVID-19 disruption.

Methodology

The focus of the present paper is to study the supply chain of Indian agriculture sector which has been currently impacted owing to the disruption caused by the global pandemic of COVID-19. In the beginning, a literature review is conducted to understand the agricultural supply chain. The official reports from the government institutions were also studied to comprehend the system. Based on this understanding an attempt is made in this paper to suggest ways to reduce the negative effects of the disruptions. An attempt has also been made to support the qualitative analysis with suitable observations relevant for this study. The SAP-LAP framework has been then used to conduct the study. SAP-LAP provides a comprehensive framework to deal with three basic entities of any management problem. These three entities are the 'situation' which has to be tackled, 'actor' or 'a group of actors' who deal with the 'situation' and a 'process' or 'a set of processes' through which the situation is being tackled. The interaction between the situations, actors and process or 'SAP' leads to derivation of the learning issues which can be solved through recommendations resulting in improved performance (LAP) as per the requirements of the current scenario. The SAP-LAP model is said to be more useful than other models in the management literature as it aids in problem solving by bringing managerial creativity into the activity (Suri and Sushil, 2012). It is also useful as it synthesizes both hard and soft systems thinking by bringing symbiotic aspects of both learning and action coupled with performance.

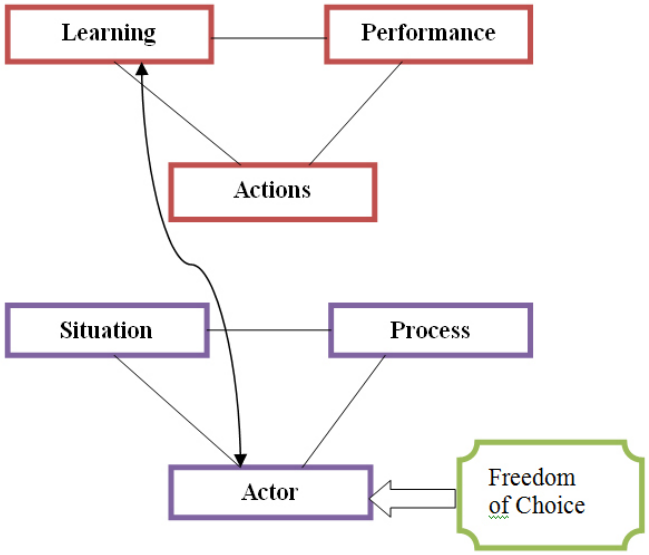

Figure 1: SAP-LAP Framework (Source: Sushil, 2000)

The COVID-19 Disruption- World and India

COVID-19 is an infectious disease caused by the recently discovered coronavirus known to cause illness in animals and humans. The virus and the resulting disease were unknown to scientists before its outbreak and spread in the Chinese city of Wuhan in December 2019. The disease spread rapidly to other parts of the world infecting over 3 million people and killing several thousands. Initially, the disease wreaked its havoc in China hence creating problems for organisations that have their tier 1 and tier 2 supply chains. However, by the time the numbers reduced in China, they had already grown in other parts of the world. After China, Italy was the worst affected country in terms of number of deaths. As the disease spread to other parts of the world, the governments started taking preventive measures in their countries by isolating themselves and imposing lockdowns. Looking at the severity of the virus and the speed with which it had been spreading, the WHO declared COVID-19 as a pandemic in March, 2020.

Amongst all the kinds of disruptions that a supply chain faces, the disruption caused by the pandemic has several characteristics. These are unpredictable scaling, simultaneous disruption propagating in the supply chain and that of the disease and simultaneous disruption of supply, logistics

and demand infra-structure. The epidemic disruption starts small but scales fast and some of the examples of epidemic disruptions are SARS, Ebola, Swine flu and the most recent COVID-19 (Ivanov, 2020).

In India, the government took proactive measures and isolated itself. The government imposed strict lockdown regulations across the nation with complete ban on public transport, commercial activities etc. The government has advised citizens to remain at home and refrain from moving in large clusters. Only the supply chains of essential items like food, agriculture, pharmaceuticals, fuel etc. have been allowed. The government has released several financial bailout packages to help the poor and homeless who are dependent on the wages earned daily. It is also working with the police and local NGOs to ensure that these people are comfortable and receive sufficient food grains. Functioning of e-commerce companies have also been limited to only essential goods like food and medicines. Besides this, the government along with the export promotion councils is working towards normalising the import and exports of agriculture items.

In the middle of the crisis, the silver lining for India came from the fact that India is being looked upon as a strong alternative replacing China in several global supply chains. In various industries like automobile, pharmaceuticals, apparels, agriculture etc. India has prowess to lead the world. Since most of the multinational companies had their suppliers in China and in view of spreading their risks, manufacturers may want to shift part of their supply chains to India. Indian companies which earlier used to source their raw materials from China may also like to re-think the way they sourced their materials and would want to localise their supply chains. India also has considerable potential in several sectors and with schemes like Make in India, India has the ability to give tough competition to China in terms of exports.

Agriculture is also one such sector which has proved to be a strong point of Indian exports. Besides quenching the appetite of Indian consumers, it has also proved to be a boon for several countries which were dependent on the exports of agricultural supplies from India. India stands as a top cultivator, exporter and consumer of several agriculture supplies. Amidst the crisis, unlike other countries, India is continually supplying its agriculture produce to the world amidst fear of shortages caused by panic buying. However, with bumper harvest of rabi crops in coming months and uncertainty due to the spread of the disease, the food supply chains in India are surely put to test.

Indian Agriculture Supply Chain

The agriculture sector, along with other related sectors, is one of the biggest sectors in terms of the number of people who obtain their livelihood from it. Upto 70 per cent of the population of India is involved in agriculture and related sectors with agriculture involving 58 per cent. The farm sector contributes 16% to the country's $2.6 trillion GDP (Hindustan Times, 2020).India's large chunk of population is engaged in farm activities. India is also a net exporter of agricultural and allied commodities. The agricultural and allied exports Rs 2.73 lakh crore (2018-19) and the sector has always been positive in balance of trade. Agricultural exports help farmers/producers/exporters to take advantage of wider international market and increase their income. The vast agriculture sector plays a pivotal role for the Indian economy in terms of the number of people it employs and also in terms of the value added to the economy. Being one of the largest agricultural producers (by value) in the world the agriculture sector shows many opportunities. A number of transformations in terms of penetration of organised sector, growth in contract farming, mechanisation of agriculture, easy loan facilities, availability of agro-chemicals and high yielding seeds, pose great opportunities for this sector in coming years. With agriculture playing such an important role in improving the economy of the nation, growth and development of its value chain for local and international markets can be helpful in poverty reduction in India. This is particularly helpful not only during normal course of operations but also during times of problems such as the one with which India is currently fighting with. The agriculture value chain will include a sequence or a chain of value adding activities with each segment having one or more forward or backward linkages. It entails identifying the actors and activities played by these actors that bring the agriculture product from farm to fork for its final consumption, where at each stage value is added into the product. A basic framework describing the agriculture value chain has been depicted in the figure 2.

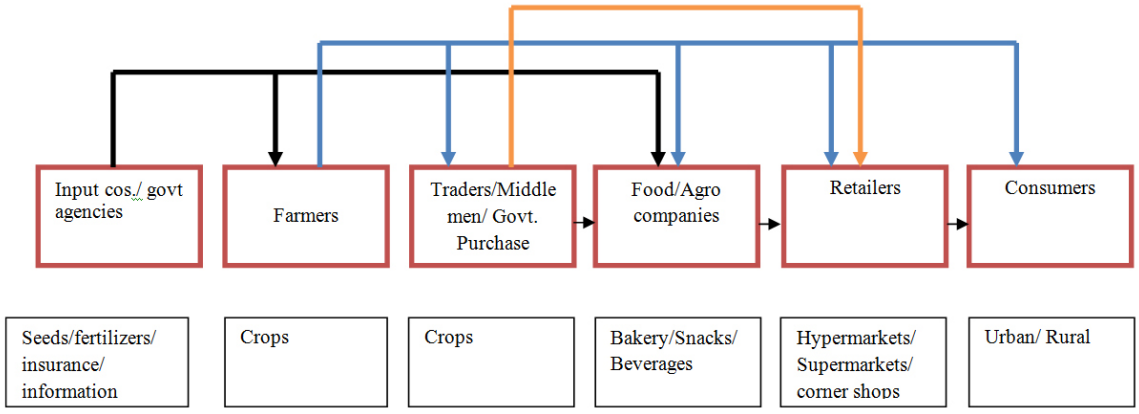

Figure 2: A Simplified Model of Agriculture Value Chain in India (Source: CUTS International, 2016)

Following are the members in an agricultural supply chain

Input resources:

The agriculture value chain starts with input companies or government agencies that provide the input resources such as market information/knowledge, finance and credit services, planting material/ water, soil health checking, fertilizers and pesticides. These inputs are given to the farmers and also to the food/agro companies that make bakery goods. The information provided by the organisations in the first step is utilised by the farmers in their farm production work such as cultivation rearing, harvesting and selling produce in the local spot market.

Farm Production:

The farmer cultivates the crop, harvests it and sells it in the local spot market. Here, it is sold by the farmer either to the middlemen, government agency, food/agro companies or retailers. The primary sector chain starts from here where the farms produce is given to farmer groups

Produce Bulking-Preconditioning and Produce Marketing:

The primary sector chain starts with farmer groups buying farmer's produce which in turn are sold to wholesale buyers. These wholesale buyers provide pooling and packing facilities and send it to wholesale markets for loose retail and then for consumption.

Processed Products Manufacturing and Product Marketing:

The secondary sector chain starts with the feedstock going for milling, extraction, processing etc. The processed material is sent to agro processing industries from where it is send to distributors to be sent to retail shops. The retailers could be owners of hypermarkets such as Big Bazaar or corner shops/ local vendors from where the end consumers buy them. Besides sending to retail shops, the wholesale markets also buy processed material to be sold into the market.

Amidst the current disruption, the focus of the government is to safeguard the lives of each and every citizen and make available the basic amenities to its citizens. However, people living on agriculture and allied activities, mostly those losing their income from informal employment at this lockdown period, have to be provided with alternative avenues (cash transfers) till the economy bounces back (when this health crisis is successfully overcome). The small and medium enterprises, running with raw materials from the agriculture and allied sector or otherwise, also need special attention so that the rural economy doesn't collapse.

SAP Analysis (Supply Chain During COVID-19 disruption)

An attempt is now made to relate specific characteristics/ limitations of the conventional planning and implementation framework with associated gaps and their implications on e-governance using the S-A-P framework. The synthesised Situation, Actor and Process analysis brought out in Tables 1–3 respectively is based on insights developed through literature review of agriculture supply chain and the current problems faced in agriculture as reported through official channels.

Table 1: Situation Analysis

S. N.	Situation Type	Current Situation	Implications
1.	Logistics Situation	☐ Due to Covid-19, imposed restriction on public travel causing difficulty in grass root level connectivity for farmers ☐ Delay in permits for transportation of essential items ☐ Tardy processes for issue of phytosanitary certificates for exports and imports	☐ Increased pressure on railways for maintaining supply of essential items amidst limited workforce ☐ Loss in farmer's income as they are unable to bring their produce to the market ☐ Minimised trade may result in negative balance of trade in agriculture
2.	Demand side Situation	☐ Limited availability of food grains and other items like fruits, vegetables, pulses etc. to final consumers ☐ Shortage of raw materials to industries for finished products	☐ Shortage of food supplies leading to price rise and panic buying
3.	Supply side Situation	☐ Limited availability of labour due to restriction in movement ☐ Bottlenecks in Inter-state transport ☐ Shortage of raw materials ☐ Limited access to mandis and other markets	☐ Confusion amongst farmers regarding reaping of the harvest ☐ Untimely arrivals of raw materials lead to inventory problems ☐ Difficulty to farmers in bringing produce to markets ☐ Extra efforts to be taken by buyers for procurement of supplies

Table 2: Actors Analysis

S. N.	Actor Type	Actors Involved	Effect on Actors
1.	Logistics Actors	Agriculture export promotion council, Government of India, logistics partners, Indian Railways and related ministries,	▫ Making transportation of essential goods hassle free ▫ IR acting as isolation centers ▫ Used its outreach to distribute food and rations in far flung regions
2.	Demand Side Actors	Retailers, end consumers, industries	▫ Limited times for which the shops can be opened amidst strict curfew ▫ Untimely fulfilment of inventory ▫ Panic buying
3.	Supply Side Actors	Farmers, government agencies buying supplies from farmers	▫ Difficulty in reaping of ripened fields due to lack in clear guildelines ▫ complexity in selling of products due to non-functional APMC Mandis ▫ trouble procurement of supplies by government agencies to make it available to PDS

Table 3: Processes Analysis

S. N.	Process Type	Processes	Implications
1.	Logistics Processes	▫ Operating parcel cargo trains; and transporting critical medical equipment and Personal Protection Equipment (PPE) ▫ IR using its outreach to distribute food and rations in far flung regions. ▫ Digital modes for issuing certificates for faster transportation	▫ It has played a crucial part in maintaining the supply of essential items and helping livelihoods ▫ It has bridged the gaps in the supply chain for far flung areas of India ▫ Ensuring faster transportation to meet supply and demand side through digital issuing of certificates
2.	Demand Side Processes	▫ Control rooms to monitor situations ▫ Government announcing free food and supplies to the poor with no source of livelihood ▫ States to get 3months supply of PDS quota	▫ This shall help the government and various authorities to understand and tackle the dearth of resources ▫ However, the private retailers still work on their own to manage their supply chains
3.	Supply Side Process	▫ Railways for making grains available to other states ▫ Giving preferential treatment to agricultural supplies ▫ Monetary benefits to farmers ▫ Procurement by NAFED and FCI, AMUL ▫ ICAR guidelines for harvesting and threshing, storage and marketing	▫ The Indian Railways are being used to make available the necessary raw materials for farmers. ▫ Amidst the harvesting season, the government is providing preferential treatment to agricultural supplies ▫ The procurement shall ensure that despite Mandis not being operational, farmers are still able to sell their produce

The knowledge and understanding of the present situation and processes is required by the actors. It can be inferred from the above discussion that most of the actors are bound by the spread of the disease and the resulting lockdown declared by the government. This constraint gives them limited freedom of choice and flexibility to perform tasks to their benefits.

Based on the SAP framework,other framework i.e. the LAP framework is created which includes Learning, Actions and Performance. The learning obtained would direct the possible actions to be taken for handling the impending situation, which will result into the performance of the system. The feedback from the performance will on the one hand provide additional learning, whereas on other hand it will identify the control actions that need to be taken. With the new learnings and actions, the situation, actor, and process might change to a new level. Such a dynamic interplay of SAP and LAP will act as the basis of ongoing managerial inquiry.

Learning Issues (LAP Issues)

The synthesised Learning, Action and Performance analysis brought out in Tables 4-6 respectively. It is based on insights developed through literature review of agriculture supply chain and the current problems faced in agriculture as reported through official channels.

Table 4: Learning Analysis

S. N.	Learning	Details of Learning
1.	Logistics Learning	□ Ensuring safety of transportation as a possible means of transfer of disease □ Making raw materials available to farmers □ Procurement of supplies from farmers
2.	Demand side learning	□ Kirana stores also closed preventing last mile availability of supplies and replenishment □ Warehouse stocked but goods not being able to move out
3.	Supply side Learning	□ Major state-regulated farm markets run by bodies known as agriculture produce marketing committees have erratic operations □ There is short supply of labourers for harvesting season □ Postharvest of Rabi crops, theprocurement of raw materials for next season is blurred

Table 5: Actions Analysis

S. N.	Actions	Details of Actions
1.	Logistics Actions	□ Guidelines to be followed for phytosanitary certificates □ Roadways buses for connecting authorities to the ground
2.	Demand side Actions	□ Reach ground level government authorities for availability and checking of menace at ground level □ Transportation of public distribution system (PDS) items to last mile delivery agents, by both rail and road, has to be ensured by respective Government agencies.
3.	Supply side Actions	□ Employ locally available labourers □ Availability of machines from private and government sector to offset the limited availability of workers □ Reach out to ground level government authorities and divide regions for monitoring □ Relaxation of the norms by Agricultural Produce Market Committees (APMCs)

Table 6: Performance Analysis

S. N.	Performance	Detail of Performance
1	Logistics Learning	□ Faster and rapid availability of certificates will ensure faster delivery to other supply chain partners □ A portal can be created for obtaining online based orders/ pass for movement of transport carrying essential items. The RFID based FASTags can be utilised for easy movement. The online based pass can be scanned through barcode while RFID tags give information about the genuinely of the transport assuring easy and timely logistics.
2	Demand side learning	□ The government authorities collaboration with the ground level authorities is essential to maintain law and order and communication □ The running of PDS and sufficient availability of grains to PDS shall ensure last mile availability of grains to the poorest
3	Supply side Learning	□ The machinery can be provided to the farmers for fast harvest without much need of labourers. The locally available labourers should be utilised while adhering to government guidelines. □ The division of regions of government authorities and providing them IT based solutions for coordination will help in mapping and making supplies available □ The ease of norms shall allow farmers to sell their produce beyond the designated *mandis* will certainly ease the burdens of farmers

The key learning issues from the SAP are to be identified synthesizing into overall learning issues. This will lead to key suggested actions to improve the situation, actor and process respectively. Finally, the impacts of these actions on the performance of the situation, actor, and process are explored. Based on the SAP-LAP analysis, the strategic recommendations are provided in the next section.

Strategic Recommendations

The above discussion leads to emergence of certain specific lessons in the Indian context, which are summarized as follows:

- To ensure that the food grains are sufficiently available for exports and for public consumption, it is necessary that it is available in timely manner. For this, quicker clearances and issuance of phytosanitary certificates is necessary. Digital modes may be utilised to this end. Robots with artificial intelligence techniques may be utilised for rapid completion of processes.

- The railways play a major role in making both the supply and demand end meet. With halt in passenger operations and providing its coaches as isolation centers, the railways has played twin role. However, it is necessary for the railways to utilise this opportunity to make its freight operations more efficient so as to increase the volume of freight transportation. This shall attract global supply chains which are, till now, deterred because of inefficient transportation systems.
- Owing to limited availability of passes for transportation of essential items, it has been observed that trucks are stranded for several hours at the national highways. This can be solved by utilizing FASTags for identification of vehicles. The process can be augmented through online based permissions from a government portal checked through bar code
- Ease of norms for farmers to sell their produce beyond the designated mandis can surely reduce the burden on farmers as they shall not travel far off to mandis and will be able to sell in nearby markets
- The private sector can provide help by providing machinery to farmers so as to offset the dearth of labourers at these places. The farmers can also utilise locally available labourersand the government can provide guidelines for these farmers to ensure safety and social distancing
- The ICT based tools can be utilised extensively for coordination and collaboration among the government officials on ground. This can be helpful in ensuring availability of food supplies and matching of supply and demand
- Besides the government authorities, the other smaller humanitarian supply chains can also be facilitated with ICT based tools to ensure availability of food supplies. An efficient collaboration and coordination with these supply chains can also ensure that there is no supply and demand mismatch
- The supply chains working on the ground should also ensure regular opening of the PDS shops and ensure that there is sufficient disbursement of food grains to the needy
- At the ground level, the farmers need inputs for their farm operations which can be fulfilled by the collaboration and coordination of various government authorities and the small humanitarian supply chains.

The government agencies have sufficient supplies to feed the nation, however the severe distortions in the supply chain may lead to supply demand mis match. Such a mismatch may paint a picture of the country running out of supply which is not the case. Hence, the above mentioned strategic recommendations have to be utilised not only for the present problem but also for ensuring proper supply chains in future.

Research Implications and Conclusion

The COVID-19 disruption has taken the entire nation by storm. With rising number of cases, it is essential for the citizens to maintain social distancing by staying at home. The fear created by the pandemic has resulted in panic buying of food which has put the country's agriculture supply chain to stress test. The agriculture supply chain, which had already been grappling with inefficiencies, might find it difficult to cope with this stress. However, the government proposed several interventions based on which it can be assumed that there will be no mismatch between the demand of food and supply of food. However, it is not sufficient just to assume but it is necessary to test if these measures certainly help the agriculture supply chain or not. To this end, the SAP-LAP study had been performed where the current situation, the actors involved and the processes to tackle the situation were assessed. Based on this analysis, the learning (or the issues encountered), plausible actions that can be taken and its performance results are analysed. Strategic recommendations are then provided based on the extensive analysis for the various actors involved directly or indirectly. It has been concluded that use of ICT, help from private sector, coordination and collaboration with humanitarian supply chains etc. can be utilised to make the Indian agriculture supply chain a robust one to fight the disruption.

This analysis is based on the current scenario where agriculture supply chains are facing the wrath of a global pandemic. The information has been derived from the official government reports and data. In future, this study can be enhanced by actual ground level data by interviewing various supply chain players involved in the Indian agricultural supply chain. Such a study shall be helpful in obtaining the clear understanding of the ground reality and actual perspective of the supply chain players.

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Annexure 1

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Reviewers Comment

Reviewer Comment 1:
The article gives a complete picture of the Indian agriculture supply chain management during the covid-19 pandemic using SAP-LAP approach. The use of the SAP-LAP model has been rightly used and has added the needed emphasis to the study. The recommendation provided by the author are pragmatic in nature and can be adopted by the policy makers.

Reviewer Comment 2:
The authors have done thorough research and study on the theme and then SAP-LAP analysis is done to deal with the three main basic entities. The authors have a clear overview of COVID-19 19 disruption in the world and India and about the Indian agriculture supply chain. Recommendations provided in the study are relevant for the policy makers and existing players. Though the paper is based on an appropriate theme, inclusion of more references could be commendable.

Reviewer Comment 3:
The author has drawn the attention of the readers by using summarized tables and figures. The adoption of SAP-LAP model has amplified the impact of study. The study paves way for future research at grass root level to understand the ground realities of the problems faced. The paper over all gives a clear view of the issues faced in the agribusiness supply chain management and suggests expedient solutions to the same.

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Source: https://scholar.google.co.in/citations?user=S47TtNkAAAAJ&hl=en

Conflict of Interest: Author of a Paper had no conflict neither financially nor academically. To execute the research the self-funding model has been created for collection of data and preparation of a questionnaire.

Editorial Excerpt

The article has 7% of plagiarism which is accepted percentage as per the norms and standards of the journal for the publication. As per the editorial board's observations and blind reviewers' remarks the paper had some minor revisions which were communicated on a timely basis to the authors (Nishtha, Nitin & Ashish)and accordingly all the corrections had been incorporated as and when directed and required to do so. The comments related to this manuscript are noticeably related to "**Examining Select Issues in Indian Agriculture Supply Chain amidst COVID-19 Disruption: SAP-LAP Approach**" both subject-wise and research-wise. In India, the agriculture supply chain has been affected due to the disruption caused by spreading of COVID-19. Due to the rapid spreading of COVID-19, Indian Government took certain measures including strict lockdown decisions. The article through a SAP-LAP approach has been made to examine the present situation of Indian agriculture supply chain. The use of SAP-LAP model was a very constructive move to examine the entire case of agribusiness supply chain management. The analysis is based on the current scenario where agriculture supply chains are facing the wrath of a global pandemic. The article concludes with strategic actions recommended for developing a resilient agriculture supply chain. The author recommends future scope of study to get a ground level view of the players in different level of supply chain management. After comprehensive reviews and editorial board's remarks the manuscript has been categorised and decided to publish under "**Case Based Study**" category

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I am grateful for the insightful comments offered by the anonymous peer reviewers and the editorial team of GJEIS.The generosity and expertise of one and all have improved this study in innumerable ways.

Disclaimer

The opinions expressed in this paper are those of the author and do not reflect the views of the GJEIS. The author has made every effort to ensure that the information in this paper is correct, any remaining errors and deficiencies is solely the responsibility of the author.

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