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Cost Efficiency in Agriculture Supply Chain through Modal Shift

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ABSTRACT
Agriculture is the backbone of our economy. Agriculture products produced at one place should get distributed to the end customer. Despite technological advances, road transport is mostly used for distribution of agricultural products. Distribution of these products through waterways could be cost effective, lesser consumption of energy and reduced carbon emission. This paper explores the cost efficiency mode of supplying agricultural produce across the country and tries to examine whether shift in mode of transport in the agriculture supply chain can reduce the logistics cost and distribute the produce on time, as the shelf life of most of the agriculture produces is less. The author uses a blend of conceptual and empirical research for the study. The outcome of the study is that, most of the consignors' desire to have a freight forwarder who can consolidate the products and transport it through waterway mode as its proved to be cost effective and greener.

I. INTRODUCTION:

Agriculture is the backbone of our economy, more than 60% of the employment in India depends on agriculture or agriculture related industry. Agriculture and its related sectors contribute more than 20% of the GDP of the country. Agriculture produce are produced around the country, certain states grow vegetables, pulses and rice in abundance, these agriculture products could make money only if it is properly distributed to the end customer, failure to supply to the consumer not only increases the food insecurity but also farmers return on investment and hard work may go for a toss. If the agricultural products are not distributed on time, there is a possibility of producesgetting wasted as the shelf life is very low in most of the agricultural products. Proper agricultural supply chain is required to mitigate wastages of agricultural produces. Shifting the cargo from rail or road mode to waterways not only reduces the cost of transportation but also has a low energy consumption and reduced carbon emission. This paper explores the cost efficiency mode of supplying agricultural produce across the country and tries to examine whether the shift in mode of transport in the agriculture supply chain can reduce the cost of logistics. Primary data and Secondary data has been used for the study and the secondary data has been collected from various government and private sources and websites. The author uses a blend of conceptual and empirical research for the study.

II. LITERATURE REVIEW:

This paper analyses the digital twins which can alter supply chains and the entire system of agriculture production, reducing wastage of food, undernourishment and controlling carbon foot print.Though, the prospective of these innovative technologies is yet to be recognized. This paper tries to consider the potential of digital twins through six agriculture supply chain stages and also to highlightthe importantoperational barriers. (Tzachor et al., 2022)

This paper tries to examine the agriculture supply chains to classifypotentialareas of intervention that increases logistics and management of the complete supply chains by facilitating know-hows and devices in so called 4.0 perspective. This paper finds technological innovations such as expanding distribution logistics etc.(Saetta & Caldarelli, 2020)

This paper makes an attempt to identify the bottle-necks of road transportation of agriculture produce in the west district of Ghana, after the harvest the transportation of agriculture produces is difficult to transport through the Ghana districts as it has a low quality road that takes more time in transportation of cargo.(Morgan et al., 2019)

This paper focuses on agriculture supply chain during COVID, due to pandemic there were huge shortage of facilities, labourers, services etc., with all this challenges the agriculturist manage to

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supply there produce to the end consumers and stakeholders. This paper recommends, the policymakers to formulate a strategy for agriculture supply chain during the catastrophes. (Kumari et al., 2022)

This paper envisages the importance of information technology in agriculture supply chain. To reach the agriculture produces to the end stakeholder, information technology can come handy in solving problems relating to supply chain.(Parwez, 2014)

This paper makes an attempt to depict the logistics process in agriculture & food Supply Chain, the following is merit considered i.e., the quality of food and safety is prime concern, the second one is to optimize the cost of logistics. (Gebresenbet & Boso, 2012)

This paper examines and defines sustainable SCM meaning where the logistics cost is minimum and impacts minimum on environment and society, the paper further explains how multimodal has a positive impact on the supply chain of the agriculture & foodstuffs. (Kresnanto et al., 2021)

This paper focuses on food storage and transportation of food products the paper focuses on various techniques of food storage and facility required and done with modern technology comparing with the old school of thought, this paper further explains how to transport the food products safe for human consumption by using proper storage technology. (Hammond et al., 2015)

This paper speaks on food security in the mountain regions of the country especially in Ladakh, growing food is highly complex process in the mountain, most of the Himalayan regions depends on food subsidy by the government and the supplies from lowland and plains. Marketing of food products from the mountain also seems to impossible mission. This paper completely speaks on the food supply chain in the mountain regions. (Dame, 2018)

Developing Logistics System in Agriculture Supply Chain:

The vegetables, pulses, rice and horticulture produce has to be distributed through the length and breadth of the country, enormous management skills are required to transport the agriculture produce to other states, normally the road transport is a preferred mode for all the agricultural products to transport to end customer. This study is focussing on different methodologies that can be adopted to reduce the logistics cost of transporting the agriculture produce to the consumer.

From the unstructured interview and data collected by the author it is understood the road mode of transportation is cheaper upto 500 kms from 500 to 1200 kms rail mode becomes cheaper compared to road mode, if the distance of shipping the cargo is more than 1200 kms, waterways is the cheapest mode of transportation. During the study it is found the modal shift is possible provided the following factors are merit considered i.e., the distance, the quantity of agriculture produces to be transported, aggregation of products, location of the end customer, harvest season, nature of agriculture product, the shelf life of agriculture produces etc.,
Potato, onions and tomatoes are taken as case for reference: -

Table-1
Indian Production of Potato (2021-22)

Sl.No.	State	Production	000 Tonnes Share(%)
1	Uttar Pradesh	15892	29.65
2	West Bengal	12600	23.51
3	Bihar	9125	17.02
4	Gujarat	3780	7.05
5	Madhya Pradesh	3582	6.68
Source: National Horticulture Board (NHB)			

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Table-2 Indian Production of Onion (2021-22)			000 Tonnes
Sl.No.	State	Production	Share(%)
1	Maharashtra	13301.70	42.73
2	Madhya Pradesh	4740.60	15.23
3	Karnataka	2779.50	8.93
4	Gujarat	2554.70	8.21
5	Rajasthan	1447.90	4.65
Source: National Horticulture Board (NHB)			

Table-3 Indian Production of Tomato (2021-22)			000 Tonnes
Sl.No.	State	Production	Share(%)
1	Madhya Pradesh	2970.00	14.63
2	Andhra Pradesh	2217.00	10.92
3	Karnataka	2077.00	10.23
4	Tamil Nadu	1489.03	7.34
5	Orissa	1432.29	7.06
Source: National Horticulture Board (NHB)			

From the above tables one could see, the potato, onions and tomatoes are grown in abundance in Uttar Pradesh, Maharashtra and in Madhya Pradesh, these states have a highest share of percentage in producing these vegetables, it has to distributed to various places inside the country, largely these are transported only by road mode, if the agriculture produces is aggregated and transported from Maharashtra to the southern states through coastal shipping or from Uttar Pradesh to Bihar and West Bengal through National Waterways-1 (NW-1) which connects from Prayagraj to Haldia through Bhagaplur in Bihar, the cost of transporting these agricultural produces becomes more economical and also can reduces traffic congestion on roads which in turn can reduce the carbon emission significantly.

Table-4 Food items/Agriculture products moved on National Waterways-1 (in tonnes)		
2019-20	2020-21	2021-22
5134	105743.47	162372.71
Source: MoPSW, GoI		

From the above table one can infer that the traffic of food items/agriculture products in NW-1 are increasing year on year, which means the agri-products has started shifting mode from road to waterways. This modal shift can considerably reduce the transportation cost.

III. CONCLUSION:

It is understood from the literature review and by the unstructured interview transporting agriculture produces through waterways is the cheapest mode in the agriculture supply chain. But the following facets has to be considered, if the distance is very short and the quantity to be transported is less (less than 100 to 200 MT), the consignor prefers to transport the agriculture produces only through road mode because it wins at speed. Whileinterviewingthevarious stake holders it is understoodthat the consignor wishes to have a freight forwarder who can consolidate all the agriculture produces at a given point of time andthenship the cargo through waterways, may be from the ports in eastern corridor to the southern ports or from the ports from the western side of the country to the ports in south India,they feel the cost of transportation could work outmuch cheaper.

Considerable quantity of agriculture products has shifted mode from road to waterways in the Uttar

Pradesh West Bengal corridor through NW-1. In practice the freight forwarders are yet to explore the consolidation of agricultural produces for distribution through waterways.

By and large the waterway transport is more reliable, cost effective, lesser consumption of energy and greener compared to other modes.

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