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Development of Agro-Supply Chain Elemental Management (ASCEM) model for the efficient implementation of E-commerce

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Abstract

Purpose: India is an agricultural land and one of the prominent exporters of agricultural products. The weather system throughout India is different from more cultivable options. During the Covid-19 pandemic, the retail supply chain is born due to the need for the hour. As per the saying, 'need is the mother of invention', many local, regional and product-based supply chains were implemented by farmers during the lockdown period. However, there is a need for E-commerce to boost any kind of supply chain productivity.

Methodology: Hence, this paper presents a new Agro-Supply Chain Management

Model which can take the Agro-products to various E-Commerce platforms directly from the farmer's place. For this, the proposed research promotes MSME/SHG options for various agricultural and dairy product marketing with identification of microelemental model.

Findings: As per the research sample analysis, the direct impact factors are distribution channel node and further to that marketing channel proved to be a positive impact on Agro-SCM model.

Practical Implications: The proposed research execution provides a value-chain option as an Agro-supply chain elemental management (ASCEM) model. The core aim is to establish a practical framework to support any pandemic situation in the future.

Originality: This article has contributed to Agricultural-Supply Chain Management at micro and macro-level. Also, with reference to the post Covid-19 scenario, a new agricultural supply chain model is suggested for optimum and seamless gain for SMEs, women self-help groups, etc.

Keywords: Agriculture, Farmer skill development, supply chain management, Food supply chains

1. 1. Introduction

Food supply chains (FSC) hook up closely reliant suppliers and customers across the entire world, frequently by way of just-in-time supplies. Several of these types of important supply chains tend to be interrupted, or perhaps are vulnerable to be interrupted, through the COVID-19 outbreak (Gray, Richard S., 2020). Coming from an economical perspective, the significant aim of collectivization in farming was to accomplish considerably more productive contribution of strategies with the aid of acquiring economies of size and so to allow agriculture to offer to the industrialization of the overall economy through increasing the relocation of approaches in-line with Preobrazhenskii's principles of elementary accumulation of capitulars in a socialist industry (Schmitt, Günther, 2021). The COVID-19 outbreak has placed unparalleled stress on food supply chains. Specified the even increasing measure of

internationalization, all those supply chains rather frequently expand around foreign boundaries. In the short term, different countries have mainly been functioning to hold those supply chains undamaged and functioning properly so that anxiety shopping is cooled off and changes in usage patterns coming from home isolation can be let in (Kerr, William A., 2020). Utilized to seeing healthy call for the supply, veggie as well as fruits producers were in for an impolite arising in the event that COVID strike. Seeing that those products are essential for agricultural shift and nutrition, diverse industry strategies, just like e-platforms as well as liaison with upstream value chain characters like processors as well as exporters, must be focused to decrease problem at the time of shocks and surpluses after lockdown that will wreck values and maximize farmers' deficits (Kumar, Anjani, Arabinda K. Padhee, and Shalander Kumar, 2020).

1.1 1.1 Indian B2B Scenario

In Indian outbreak circumstances, Haryana's preexisting industry facilities are given permission to be the state to maintain inventory at secure rates, restraining influences on little holder production. As customers, growers in Haryana encountered lot more interruptions than those in Odisha, because of decreased availableness of foods in the marketplaces, whereas growers in Odisha gained from more different cropping activities and improved regional resource of foods after transportation limitations (Ceballos, Francisco, Samyuktha Kannan, and Berber Kramer, 2020). Farmers' organizations (FOs), such as groups, cooperatives, self-help as well as women's communities, are prevalent in developing countries and then furnish solutions that are extensively considered as yielding to profits and efficiency for modest suppliers (Bizikova, Livia, et al.,2020). Ecommerce is a renowned worldwide accomplishment means, and it is also getting a reputation in the Indian Farming community in the mode of B2B e-commerce. The electronic National Agricultural Marketing (eNAM) motivation of the Government of India is growing as a practical alternative to the remarkably fragmented as well as ineffective supply chain dealing with farming promotion in India. This B2B E-commerce base presents more sales alternatives to growers, maximize immediate access to marketplaces, diminish intermediation expenditure and encourage prevalent methods, technological backup, and top-notch grading during an enhanced supply chain (Chaudhary, Sanjay, and P. K. Suri, 2020).

2. 2. Literature Review

According to Zeng, Yiwu, et al. (2019), e-commerce acts as a highly effective way to treat concerns pertaining to merchandise blood circulation and advertising. In the latest years, by the joint results of numerous beneficial circumstances, agricultural at e-commerce in China possesses joined a fresh time of quick advancement. In several rural spaces, ecommerce is definitely broadly included with regional quality farming sectors, providing delivery to a staff of professional e-commerce towns specialized in the special solution development. Reliability issue is usually of wonderful importance in the food sector. According to Chen et al. (2020), regular food supply chain can be lengthy and so includes various stakeholders, and it is certainly very difficult for shoppers to get complete info on agri-food items. In China, food security difficulties manifest regularly; therefore, people' have confidence on agri-food products is usually relatively low. In fact, affiliated agrifood chain research has got recommended that traceability is normally an essential to accumulate organization involving Chinese individuals. In practice, it is not really very well used. Aiming present agricultural policies with UN-Sustainable Development Goals is usually essential for the changeover towards a cleaner and planet friendly food formation, specifically for a geographically as well as demographically varied region like India. In this framework, the writer concentrated on ascertaining the main interpersonal and external difficulties influencing agriculture in India, even though analyzing the probable of useful policy restructure in improving expansion within this sector
(Priyadarshini, Priya, and Purushothaman Chirakkuzhyil Abhilash, 2020). According to Chen, Jiguang et al. (2021), contract farming can enhance the farmers' income and relieve low income. Nevertheless, if farming is usually expensive to create, there will get an inequality-widening type of agreement harvesting in which deal farmers happen to be even more productive than non-contract farmers, and so the income variation among farmers will broaden.

Normally, certainly, there will come to be an inequality-reducing type in which commitment farmers are much less reliable than non-contract farmers. International trade theory has got transformed significantly in the previous 10 years. Its concentrate has gone on imperfect competition, and its policy medications include known as into query the common no cost trade "ethic." With ideal rivals, trade policy can stay first-best policy just for a big country to increase its conditions of trade, and actually after that, 100% free trade is usually more suitable from a globe point of view (Thursby, Marie C., and Jerry G. Thursby, 2019). Agriculture continues to be at this time the

anticipated tool of advancement for the "agriculture-based countries", those countries with a substantial contribution of agriculture to GDP growing and so an excessive talk about of their awful in the rural sector (de Janvry, Alain, 2020). The Green Revolution, whereby efficiency growth is usually accomplished in staple crops simply by the ownership as well as influence of large glorious range seed products and fertilizers, is definitely the preliminary stage in farming modernization. It offers come positively attacked to accomplish food protection and can be a learning floor for the following changes in agriculture as well as rural areas (Carter, Colin, 2019).

3. 3. Research Methodology

Many times, we read news that due to high production rate and lower market rate, farmers often protesting and/or demolishing their agro-products. This happens due to the large supply chain management cost as compared to the production cost. India occupies agricultural lands mostly in rural regions. Further, hypotheses formulation was tested with IBM SPSS for the calculated sample size of 400 participants.

3.1 3.1 Research Design

The proposed study used a descriptive statistic model for hypotheses testing and data validation. The quantitative methodology is executed by means of participants' survey.

3.2 3.2 Hypotheses Formulation

H0: Agro-supply chain elemental management (ASCEM) model cannot be used for both urban and rural supply chain management.

H1: Agro-supply chain elemental management (ASCEM) model can be used for both urban and rural supply chain management.

H0: Agro-supply chain elemental management (ASCEM) model cannot be used for Ecommerce implementation.

H1: Agro-supply chain elemental management (ASCEM) model can be used for Ecommerce implementation.

4. 3.3Data Collection

The data collected from Maharashtra state for 12 months from 2022 to 2023. The sample size is calculated by Yamane formula for random and regression sampling. The five scale likert scale is used for data clustering and segregation. The participants for the study were agricultural industry experts, project managers, farmers, self-help groups, and professors. Following Table 1 to Table 4 shows the demographic variables.

Please refer to Table 1 at the end of the paper
Please refer to Table 2 at the end of the paper
Please refer to Table 3 at the end of the paper
Please refer to Table 4 at the end of the paper

4.1 3.4 Micro-level study elements

Proposed research presents the new micro agro-supply chain management model and various identified elements are as shown in Table 5.

Please refer to Table 5 at the end of the paper.

As per above Table 5 elemental model, it is necessary to execute the Agro-Supply Chain model. The core difference between Supply Chain Management and Agro-Supply Chain Management is both are distributing the products in a cleaner and transparent way, but in the case of Agro-SCM, there are chances of spoilage of products. So, the challenge is to take fresh products to market via micro-channel setup.

Figure 1 shows the Inter-related E-commerce element matrix for the proposed model.

Please refer to Figure 1 at the end of the paper

This micro element analysis can save the cost of the whole model by assigning multiple responsibilities from production till market distribution, clustered transportation facilities; MSME/SHG can further initiate food processing micro-plants so Agro-SCM can be clubbed to Food-SCM.

5. 4. Results Discussion

Proposed methodology tested for a randomized sample (n=30). Total group size is 90, with an additional 10 tolerance sample. The centrality is calculated as information and between group centrality to predict the market SCM elements.

5.1 4.1 Hypotheses Testing

Based on the respondent data, statistical analysis conducted by means of ANOVA test:

H0: Agro-supply chain elemental management (ASCEM) model cannot be used for both urban and rural supply chain management.
H1: Agro-supply chain elemental management (ASCEM) model can be used for both urban and rural supply chain management.

	df	**Mean Square**	**F**	***Sig.**
Between Groups	6	1.869	2.174	0.001
Within Groups	394	1.056		
Total	**400**			

*The result of the significant level is 0.001 hence the null hypothesis is rejected and positive hypothesis is accepted.
H0: Agro-supply chain elemental management (ASCEM) model cannot be used for Ecommerce implementation.
H1: Agro-supply chain elemental management (ASCEM) model can be used for Ecommerce implementation.

	df	**Mean Square**	**F**	***Sig.**
Between Groups	1	0.358	1.022	0.003
Within Groups	399	0.105		
Total	**400**			

*The result of the significant level is 0.003 hence the null hypothesis is rejected and positive hypothesis is accepted.
Thus, both the positive hypotheses imply that proposed model can be used for Ecommerce Agro-SCM implementation. Figure 2 shows the sample calculation and
positive responses ratio.
Please refer to Figure 2 at the end of the paper
Figure 3 shows the information centrality power nodes and percentage indexes.
Please refer to Figure 3 at the end of the paper
Power information centrality implies the most responsible nodes of the Agro-SCM element group. These further needs to be calculated for between group correlation indexes. For between groups, node analysis refers Figure 4 below.
Please refer to Figure 4 at the end of the paper
The most optimum group centrality with power centrality impact is node 17, 18 and 19, which implies that the Agro-SCM distribution channel can be set up at these locations. Similarly, further we can omit these nodes and repeatedly can conduct tests to identify the lower-level node of Agro-SCM for marketing channel, etc.

6. 4. Conclusion

Looking at the pandemic situation, the proposed Agro-SCM model can be considered for efficient E-commerce management by setting up micro-channel model. Farmers groups can sell products online by implementing scientific way to reduce agro-product wastage by further development of Food-SCM by food processing. The optimum cost gain can be achieved by considering such micro-elements. This model can be very useful for further improvements in hybrid SCM model by development of macro-micro-mega SCM models. The execution of the strategy in the Indian framework contributed to the inference that couple of conditions, specifically modest incorporation between the nationwide farming industry and modest farming industry facilities, was the very crucial ones. The designed model attained as an end result of this research expects to help the farming guideline as well as decision-makers to boost the capabilities of the farming supply chain in India.

Besides that, several necessary suggestions have been provided to boost the functionality of the farming supply chain management.

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Table 1: Variable - Age

Age	**Frequency**
18 – 25	62
25 - 34	108
35 - 44	156
45 - 55	74
Total	**400**

Table 2: Variable - Gender

Gender	**Frequency**
Male	253
Female	147
Total	**400**

Table 3: Variable – Agro-product/SCM knowledge

knowledge	**Frequency**
Low	78
Moderate	256
High	66
Total	**400**

7. Table 4: Variable - E-commerce experience

Experience	**Frequency**
1 to 5 years	122
6 to 10 years	186
11 to 15 years	89
More than 15 years	3
Total	**400**

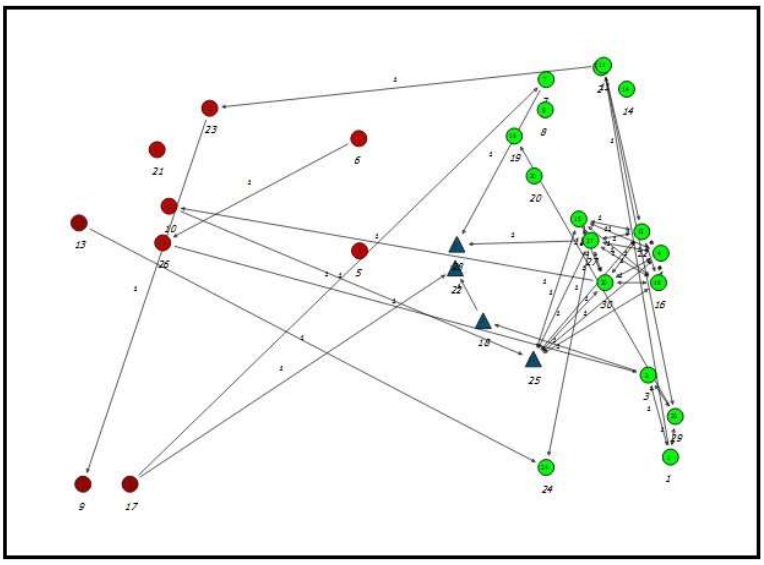
Table 5: Identified micro-level elements for agro- SCM, marketing and distribution

8. E-Commerce model

Sr. No.	Phase	Elements
1.	Cultivation	• Soil Testing • Product selection • Market survey for product
2.	Geography	• Market to production distance • Product demand and supply ratio • Natural resources
		□ Irrigation system infrastructure
3.	Worker's availability	□ Inter-related element to Geographical nature
4.	Micro-Market Identification	□ Survey for micro-economics □ Sub-elements identification for market demand and supply (interrelated element for Geographical nature)
5.	Distribution Channel	□ Rural distribution channel (Cluster Farming) □ Urban distribution for micro-level products

6.	Accounting	Pre-and Post-supply chain observations and profitability improvement sub-elements identification MSME registration or Self-Help Group (SHG) education to understand accounting, profit gain ratio Future demand prediction

Figure 1: Inter-related Ecommerce element Matrix for Agro-SCM (Green: Production Site, Blue: Micro-Distribution, Red: Market Prediction)



9. Figure 2: Total Sample n=30*P, P=no. of group's representation and tolerance n=10

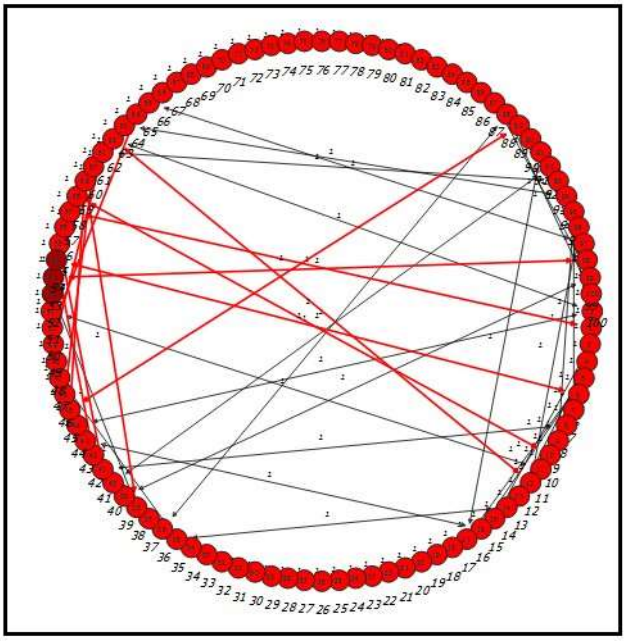


Figure 3: Calculated Power Information Centrality

Node	Label	IC	IC'	%IC
1	1	0.493	0.013	1.269
2	2	0.489	0.013	1.259
3	3	0.486	0.012	1.249
4	4	0.485	0.012	1.247
5	5	0.484	0.012	1.245
6	6	0.488	0.013	1.255
7	7	0.487	0.013	1.254
8	8	0.487	0.013	1.254
9	9	0.487	0.013	1.254
10	10	0.487	0.013	1.254
11	11	0.487	0.013	1.254
12	12	0.491	0.013	1.263
13	13	0.486	0.013	1.251
14	14	0.489	0.013	1.259
15	15	0.488	0.013	1.255
16	16	0.487	0.013	1.253
17	17	0.476	0.012	1.224
18	18	0.354	0.009	0.911
19	19	0.289	0.007	0.743
20	20	0.249	0.006	0.641
21	21	0.223	0.006	0.574
22	22	0.206	0.005	0.529
23	23	0.194	0.005	0.499
24	24	0.186	0.005	0.479
25	25	0.182	0.005	0.468
26	26	0.181	0.005	0.465
27	27	0.182	0.005	0.468
28	28	0.186	0.005	0.480
29	29	0.194	0.005	0.500
30	30	0.206	0.005	0.531

Figure 4: Calculated Power between (Groups) Centrality

Node	Label	BC	BC'	%BC'
1	1	117.651	0.024	2.425
2	2	109.571	0.023	2.259
3	3	146.603	0.030	3.022
4	4	125.332	0.026	2.584
5	5	176.950	0.036	3.648
6	6	129.628	0.027	2.672
7	7	153.194	0.032	3.158
8	8	90.601	0.019	1.868
9	9	103.768	0.021	2.139
10	10	163.747	0.034	3.376
11	11	113.271	0.023	2.335
12	12	157.752	0.033	3.252
13	13	139.429	0.029	2.874
14	14	277.430	0.057	5.719
15	15	177.762	0.037	3.664
16	16	240.187	0.050	4.951
17	17	771.774	0.159	15.910
18	18	630.958	0.130	13.007
19	19	552.625	0.114	11.392
20	20	474.291	0.098	9.777
21	21	395.958	0.082	8.162
22	22	317.625	0.065	6.548
23	23	239.291	0.049	4.933
24	24	160.958	0.033	3.318
25	25	87.125	0.018	1.796
26	26	58.119	0.012	1.198
27	27	97.661	0.020	2.013
28	28	170.709	0.035	3.519
29	29	249.042	0.051	5.134
30	30	327.375	0.067	6.749