EVALUATING THE ROLE OF SUPPLY CHAIN MANAGEMENT IN ENHANCING THE AVAILABILITY OF AGRICULTURAL INPUTS: AN ENTREPRENEURIAL STUDY OF AHILYANAGAR (AHMEDNAGAR) DISTRICT

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Abstract
The timely and effective provision of crucial inputs such as seeds, fertilizers, pesticides, and hardware are a key determinant of agriculture productivity in India. However, in places like Ahilyanagar at the rural district level, the supply chains are often inefficient and hence lead to delayed deliveries, access limitations, and unlevel distribution. The study evaluates the role of supply chain management in increasing the availability of agricultural inputs and focuses on the effectiveness of various supply chain strategies undertaken by dealers and input companies. A quantitative research design was employed, and the primary data were collected from 400 respondents—farmers, dealers, and distributors of Ahilyanagar District—through a structured questionnaire. Data was collected using stratified random sampling to ensure representation across different categories of respondents. SPSS was used for data analysis, where two hypotheses were tested using regression and ANOVA. Regression analysis indicated a strong positive relationship through which timely availability of inputs related with supply chain efficiency. R^2 value was found to be 0.527 and p-value was <0.001. ANOVA showed that input availability is significantly different on the various supply chain strategies, where integrated digital platform was found superior to both dealer and cooperative models. Therefore, in line with this, it underscores the need for digitization, localized storage infrastructure, and real-time tracking systems in agricultural input supply chains. The study concludes by asserting that most technological and modern supply chain strategies have an important role in increasing agricultural input supply and accessibility. It is, therefore, necessary that all stakeholders, including policy makers, private players, and cooperatives, invest in capacity building, digital platforms, and localized logistical hubs that improve input delivery systems. Potential improvements, therefore, were seen to lead to higher productivity in agriculture, reduced costs of inputs, and higher productivity in farmers' satisfaction.

Keywords: *Agricultural Inputs, Supply Chain Management, Ahilyanagar District, Regression Analysis, Input Availability.*

I. Introduction:

A. Background: Agriculture remains the backbone of India's economy, providing substantial support for rural livelihoods, employment, and national food security. The performance of agricultural production is linked not just to natural resources and agricultural practices but also to the timely and adequate supply of vital agricultural inputs like seeds, fertilizers, plant protection chemicals, and machineries. These inputs are essential for determining productivity and quality of yield, especially in traditionally agricultural areas such as Ahilyanagar district in Maharashtra, where agriculture has always been an important source of employment. Supply chain inefficiencies, ranging from procurement delays and warehousing bottlenecks to ineffective transportation and last-mile deliveries, often restrict availability of agricultural inputs. In this situation, Supply Chain Management (SCM) becomes a very important force in facilitating the prompt, efficient, and economical delivery of inputs to farmers. SCM in agriculture means that planning, implementing, and controlling all in the agriculture supply chain, starting from input manufacturers and distributors to end-users, that is, farmers.

The agricultural input supply chain in India is unique because of its complexities and fragmentation and a strong dependence on both formal and informal agencies. In many rural areas, the traditional dealer-based system still prevails, where input companies rely on a network of local retailers and distributors. While having such a widespread reach, this system mostly lacks transparency, has poor traceability and experiences unpredictable inventory cycles. Consequently, farmers are often faced with shortages during the critical phases of land preparation and sowing, leading to loss of productivity and increased dependency on informal and low-quality alternatives. Adding to these woes are major perturbations because of logistical inefficiencies, a

crumbling storage infrastructure, and low levels of technological application. However, in recent years, attempts have been made to reform and digitize the supply chain through innovations such as integrated digital platforms, cooperative distribution models, and hybrid systems that build upon traditional networks while employing modern technologies. This transformation seeks to streamline activities related to inventory management, improve traceability, reduce ``in-transit' delays, and enhance the responsiveness of the entire supply chain to seasonal fluctuations in demand.

The present study aims to evaluate the role of supply chain management in ensuring timely availability of agricultural inputs in the Ahilyanagar district, a semi-arid region characterized by diverse cropping patterns and high dependence on external inputs. By analyzing the relationship between supply chain efficiency and input availability, the research aims to carve out critical success factors and pain points in the current system. Then it attempts to compare the effectiveness of different supply chain strategies adopted by input dealers and companies, ranging from traditional models to digital ones and cooperative frameworks. Understanding these dynamics is necessary for both policymakers and private players, as timely input delivery is directly related to agricultural productivity, cost-effectiveness, and farmer satisfaction. In effect, the study also works toward wider development goals like sustainable agriculture, rural economic growth, and food security. Derived from empirical evidence in the Ahilyanagar region, the paper emphasizes the need for dramatic restructuring of agricultural input supply chains in a big way and provides actionable recommendations for improving distribution mechanisms through technology adoption, logistical integration, and stakeholder collaboration.

B. Theorization: This study embarks from the theoretical underpinnings of Supply Chain Management (SCM) principles and their application in agricultural input distribution. In this form, SCM in agriculture entails comprehensive coordination of processes and stakeholders involved in the planning, sourcing, production, storage, and delivery of agriculture inputs like seeds, fertilizers, pesticides, and machinery. The main purpose of SCM is to assure the provision of such inputs to potential users in a right quantity at a right time, at the right place, and doing that at the least possible cost. As it is said India context such as semi-urban and rural areas like Ahilyanagar, the supply chains for agriculture are highly compromised due to poor infrastructural facilities, fragmented networks, and the domination of traditional non-integrated dealer-based systems of supply. Therefore, it becomes very important to understand different supply chain strategies concerning the availability and accessibility of agricultural inputs for productivity improvement, farmer satisfaction, and food security.

One of the principal concepts included in this study is supply chain efficiency, which describes the ability of this system to minimize output failures, delays and costs, while maximizing responsiveness and service quality. Typically, efficiency is measured by evaluating several logistics-related aspects, including inventory turnover, transportation lead times, order fulfilment rates and cost-to-serve. AI also supplies 'supply chain efficiency' with the following characteristics: the ability to quickly respond to seasonal demand fluctuations, manage perishable products; and last-to-last mile connectivity with farmers in remote areas. The nullification of efficiency leads to cases like farmers having no access to inputs during crucial stages of crop production, getting their sowing delayed, yield poor and incurring a financial loss. Hence, the relationship between supply chain efficiency and timely availability of inputs is central in the hypothesis of this research.

The second most relevant dimension studied was the variation in supply chain strategies among input dealers and companies. This comprises a spectrum from simple merchant-dealer relationships to more complex ones like fully integrated digital platforms, cooperative societies, and hybrids that mesh conventional with technology-enabled practices. Traditional networks are characterized by a multitude of intermediaries and are real-time untracked, resulting in an asymmetry of information and higher probabilities of input nonavailability. In contrast, digital platforms utilize an arsenal of instruments, such as ERP solutions, GPS tracking, mobile applications, and even blockchain technology, to create transparency, traceability, and efficiency in operations along the supply chain. Cooperative societies usually pool resources with the intent of holding collective power over procurement and distribution, lower costs incurred, and even better bargaining power for smallholder farmers. The research will look to evaluate the statistical significance of the difference those alternative strategies make in terms of input availability across a particular region.

Another theoretical anchor for the study is the concept of logistics and last-mile delivery, which becomes critical in linking suppliers and end-users. Logistical systems of flow are evaluated in relation to the timeliness and effectiveness with which inputs can be moved into the dispersed farming communities from the centralized warehousing or

production centers. Many supply chains experience delays, stockouts, and lack of local level storage infrastructure. The availability or absence of localized storage hubs, effective transportation systems, and well-trained supply chain personnel are important variables regarding overall input availability.

In addition, the study includes the Resource-Based View (RBV) of firms, which states that the competitive advantage of any organization lies in its capability to manage efficiently its internal resources and capabilities. For input suppliers and agricultural companies, their supply chain architecture-infractions including infrastructure, digital tools, human capital, and network relationships- acts as a strategic resource. Firms that adopt robust SCM practices and modern strategies can position themselves better in the market, ensuring customer satisfaction and long-term sustainability.

The methodology for the study is also linked to Technology Acceptance Model (TAM) with respect to the evaluation of digital supply chain platforms. The Model posits that perceived usefulness and ease of use have significant influence on acceptance of technology-based systems. Valuing the input dealers' and farmers' perception of the digital platforms may explain the variations in strategy adoption and performance through various supply chains. Furthermore, the role of ICT in agricultural SCM has been gaining recognition in recent literature, where multiple studies have confirmed that ICT-enabled supply chains are more resilient, adaptive, and inclusive.

This theoretical grounding has made it possible to derive testable hypotheses that link supply chain efficiency to the availability of inputs and measure the differential availability of inputs across different supply chain strategies. In the quantitative strand, the study seeks to establish these conceptual linkages with empirical data from the Ahilyanagar district, using regression and ANOVA analyses, thus giving credence to theoretical constructs while aiding in the formulation of policy recommendations and in operations improvement in the agricultural sector.

II. Literature Review:

Agricultural supply chain management (SCM) plays an important role in increasing efficiency in the conversion of raw material into final products, reducing waste and costs (B. BhadrhiPrazaath & D. Beula, 2020). Some of the challenges faced in this SCM area include efficient handling of data, logistics management, and food safety issues occurring in India (Hetav Pabari & B. Kumar, 2021). Public-private partnerships can be taken to solve the challenges among the farmers who suffer from price volatility and weak market linkages (Yagya Kumari Lodhi & Dr. Amisha Shah, 2024). Post-harvest losses in India are substantiated and reach between 7-10% from farm to market (C. SomashekharI et al., 2014). The right SCM makes things available at consumption in the right quantity, quality, and with cost efficiency (Fenave Zutsara, 2022). However, there are shortcomings, which lead to wastage of 30-35% of the total food produced in India (Parwez Sazzad, 2014). There exist some possibilities of using blockchain technology in making agricultural SCMs more transparent and traceable (M. A. Jawale & A. B. Pawar, 2021). Yet, despite the importance of SCM to the development of agriculture, participation of farmers is usually low, especially in developing countries (Ijsrem Journal, 2022).

Infrastructure is not sufficient and processes are so inefficient and also there are sustainability challenges which are really significant in agricultural supply chains (Parwez, 2014; Singh, 2020). Sustainable supply chain management (SSCM) has attracted a lot of attention by its emergence into agriculture addressing environmental, social, and economic issues (Kalchschmidt & Syahruddin, 2011; Syahruddin & Kalchschmidt, 2012). Integration of key business processes and stakeholders is imperative for proper supply chain management (Hussain et al., 2015). ICT plays a very effective part in improving the supply chain efficiency as well as the food security issues (Parwez, 2014). The availability and quality of agricultural inputs like seeds, fertilizers, and crop protection chemicals are the most essential for farm productivity and profitability (Manasa et al, 2023). Globalization and modernity and the rising influence of supermarkets have in so many ways benefited and posed challenges to agricultural supply chains (Hussain et al., 2015). A lot more work is still needed to be done to address the complexity associated with SSCM in the agricultural sector and develop effective strategies to improve it (Syahruddin & Kalchschmidt, 2012).

The agricultural supply chain in India faces significant challenges, including high levels of waste, quality degradation, poor infrastructure, and lack of transparency (Rais & Sheoran, 2015; V. - et al., 2023). To address these issues, researchers propose adopting blockchain technology and IoT devices to improve traceability, transparency, and real-time data management (V. - et al., 2023; Borah et al., 2019). Digitization of supply chains can enhance market linkages and access to information (Mudda et al., 2017). Knowledge sharing and dissemination practices among farmers are crucial for effective supply chain management (Mullapudi,

2019). The integration of organized retail and corporate entities in the fruit and vegetable sector may benefit farmers by eliminating intermediaries (Halder & Pati, 2011). Implementing best practices such as collaborative forecasting, data integration, and demand-based production can improve the overall efficiency of the agri-food supply chain (Ganesh Kumar et al., 2017; Halder & Pati, 2011).

There are several major challenges in the agricultural supply chain in India, such as salient unintuitive wastes, declining quality, poor infrastructure, and lack of transparency (Rais and Sheoran, 2015; V. - et al., 2023). These major challenges can be addressed by the recommendation of researchers on application of blockchain technology along with IoT devices in an endeavor to improving traceability, transparency, and real-time data managements (V. - et al., 2023; Borah et al., 2019). Digitization may enhance market linkages and access to information in supply chains (Mudda et al., 2017). Sharing and dissemination of information among farmers is very important for efficient supply chain management (Mullapudi, 2019). Eliminating intermediaries who act as go-betweens in the sector of organized retail and corporate houses with regard to fruits and vegetables will favor farmers (Halder & Pati, 2011). Also, by establishing, collaborative forecasting, integration of data, and demand-based production, the entire efficiency of the agri-food supply chain could be improved (Ganesh Kumar et al., 2017; Halder and Pati, 2011).

III. Research Methodology:

A quantitative research design was adopted in this study to evaluate the role of supply chain management in the enhancement of agricultural input accessibility in the Ahilyanagar district. A structured questionnaire was prepared to collect primary data from the stakeholders involved in the agricultural input supply chain, i.e., dealers, distributors, and farmers. The questionnaire was meant to obtain data regarding the efficiency of supply chain practices, challenges in logistics and distribution, and the perceived impact of different supply chain strategies on input availability.

The population pertaining to the research included suppliers of agricultural inputs, dealers, and farmers actually involved in the procurement and distribution of seeds, fertilizers, pesticides, and machinery within the Ahilyanagar district. These respondents are directly or indirectly influenced by the functioning and effectiveness of the agricultural supply chain in the region.

A sample size of 400 respondents was arrived at using the standard sample size calculation formula so as to ensure that they were adequately represented for statistical analysis. This study used stratified random sampling such that the different respondent groups-dealers, suppliers, and farmers-were proportionally represented from among the various talukas of Ahilyanagar. This sampling design was selected so as to increase the variability among the responses received while minimizing sampling bias, thus allowing for more reliable generalizations of the findings.

The hypotheses framed in the study were subjected to regression analysis, and this enabled a clear understanding of the linkages between supply chain efficiency and input availability, along with variations with respect to supply chain strategies. Data was collected from primary sources (questionnaire responses) and secondary sources (government reports, publications of the agricultural department, and prior research articles). The data were coded, analyzed, and interpreted using SPSS software, specifically for the running of regression models and the determination of statistical significance with respect to the hypothesized relationships. The outcome worked towards presenting empirical evidence on the effectiveness of current SCM practices while highlighting the need for strategic improvements in agricultural input distribution in Ahilyanagar.

A. Objectives:

- To understand the effectiveness of supply chain management practices for improving timely availability of key agricultural inputs to farmers in Ahilyanagar district such as seeds, fertilizers, pesticides, and machinery.
- To identify the major challenges facing input suppliers and distributors in logistics, warehousing, and last-mile delivery within the agricultural input supply chain.
- To study the supply chain strategies adopted by agricultural input dealers and companies in Ahilyanagar and their effect on access to inputs and distribution efficiency.

B. Hypothesis:

H1: There exists a statistically significant relationship between the efficiency of the supply chain and timely availability of agricultural inputs within Ahilyanagar district. (This is to be tested through either correlation or regression.)

H0: There is no correlation between the efficiency of the supply chain and the timely availability of agricultural inputs in Ahilyanagar.

H1: There exists a statistically significant difference in the pooled availability of inputs under varying supply chain strategies employed by agricultural input dealers and companies. (This can be answered through ANOVA).

H0: There is no statistically significant difference in the pooled availability of inputs as per different supply chain strategies being employed by agricultural input dealers and companies.

C. Research Problems:

- It is common for farmers based in Ahilyanagar district to experience delays and shortages in their receipt of fundamental agricultural inputs, such as seeds, fertilizers, pesticides, and machinery.
- The situations above can also be attributed to inefficiencies in supply chain logistics, warehousing, and last mile delivery.

Though, there has not been enough empirical study regarding how effective are the various supply chain strategies adopted by input dealers and companies in solving these problems.

D. Research Questions:

- How efficient the current practices in supply chain management are in delivering agricultural inputs timely in Ahilyanagar district?
- What are the major logistics and operational challenges of the agricultural input supply chain in the locality?
- How do the supply chain strategies of input dealers and companies differ with regards to the availability and delivery of inputs?

The study aims to quantitatively assess the role of supply chain management in enhance the accessibility of agricultural inputs in Ahilyanagar district. A structured questionnaire meant for the collection of primary data, was to be administered to key stakeholders in the agricultural input supply chain: dealers, distributors, and farmers. The questionnaire contained information on supply chain practices, logistics, and distribution challenges, and the perceived effect of various supply chain strategies on the availability of inputs.

IV. Data Analysis:

A. Demographic Profile:

Table I. Demographic Profile of Respondents

Sr. No.	Demographic Factor	Demographic Profile of Respondents (N = 400)		
		Categories	***Respondent Distribution***	***Percentage (%)***
1.	**Gender**	Male	201	50.25%
		Female	199	49.75%
2.	**Age Group**	Below 25 years	40	10.00%
		26–35 years	96	24.00%
		36–45 years	132	33.00%
		Above 45 years	132	33.00%
3.	**Education Level**	Below SSC	50	12.50%
		HSC or Diploma	120	30.00%
		Graduate	160	40.00%
		Postgraduate and above	70	17.50%
4.	**Occupation**	Farmer	180	45.00%
		Input Dealer	100	25.00%
		Distributor	60	15.00%
		Others (Agri consultants, etc.)	60	15.00%
5.	**Type of Inputs Used**	Seeds	310	77.50%
		Fertilizers	290	72.50%
		Pesticides	270	67.50%
		Machinery	180	45.00%
6.	**Landholding Size**	Less than 2 acres	110	27.50%
		2–5 acres	170	42.50%
		Above 5 acres	120	30.00%
7.	**Location (Taluka)**	Ahmednagar	100	25.00%
		Shrirampur	80	20.00%
		Sangamner	70	17.50%
		Pathardi	60	15.00%
		Other Talukas	90	22.50%

The 400 respondents form a representative sample in gender, age, occupation, education and location. The sample seems balanced as regards gender since 50.25% of the respondents are males while the rest are females (49.75%). Majority (66%) of the respondents is aged between 36-45 years and above 45 years; hence, they are mature and experienced. As for education, 40% of those interviewed are graduates while another 30 per cent is composed of HSC or diploma holders, thus making them fairly educated to understand issues of supply chain dynamics.

Occupationally, farmers are made up of 45% of the sample whereas input dealers and distributors are the immediate follow ups ensuring representation of key actor of the agricultural input supply chain. Only seeds (77.5%) and fertilizers (72.5%) are the inputs mostly applied, signifying their importance in farming practices. In terms of landholding, 42.5% possess 2 to 5 acres, which signify the operations of small to medium scale farming enterprises.

Geographical distribution included major talukas like Ahmednagar (25%), Shrirampur (20%) and others to give wide coverage on the entire district. This varied demographic representation ensures that the study captures an understanding of supply chain challenges and practices as they apply to the Ahilyanagar agricultural ecosystem.

The demographic profile represents an imbalance across 400 respondents across gender, age, occupation, education, and geographical location. Although more than half of the population is males (50.25%) and females (49.75%), the gender does appear almost equal. Age-wise, apparently, the major portion of respondents falls under the age brackets of 36 to 45 years and above 45 years, recording a total of 66%. Most importantly, their educational standard ranges from being graduates (40%) to HSC or diploma qualifiers (another 30%) who create quite a standard sample that could easily interpret supply chain dynamics.

Farmers, economically, stood at 45% of the occupational group, while input dealers and distributors followed it closely, taking part in the whole beneficiary group of some important actors along the agricultural input supply chain. Inputs include seeds (77.5%) and fertilizers (72.5%), and this indicates their critical role in farming practices. Regarding landholding, 42.5% own 2-5 acres, representing small- to medium-scale farming operations.

Geographically, it consists of major talukas like Ahmednagar (25%), Shrirampur (20%), and others for broad district-wide coverage. Such varied demographic spread makes this study grasp an altogether extensive and comprehensive understanding of supply chain challenges and practices in the Ahilyanagar agricultural ecosystem.

B. Hypothesis 01:

Null Hypothesis (H0): There is no statistically significant relationship between the efficiency of the supply chain and the timely availability of agricultural inputs within Ahilyanagar district.

Alternate Hypothesis (H1): There exists a statistically significant relationship between the efficiency of the supply chain and the timely availability of agricultural inputs within Ahilyanagar district.

Table II. **Model Summary – Regression Analysis**

Model	**Demographic Profile of Respondents (N = 400)**			
	R	***R Square***	***Adjusted R Square***	***Error of the Estimate***
1	0.726	0.527	0.524	4.137

The Model Summary table shows an R-value of 0.726, which implies a strong positive correlation between supply chain efficiency and the timely availability of agricultural inputs. An R Square value of 0.527 indicates that nearly 52.7% of the variation in input availability could be accounted for by supply chain efficiency. The Adjusted R Square value of 0.524 illustrates the strength of the model with respect to any superfluous predictors. The Standard Error Estimation of 4.137 is the average distance from the observed values to the regression line. Overall, these values point to a well-fitted regression model.

Table III. **ANOVA – Regression**

Model	***Sum of Squares***	***df***	***Mean Square***	***F***	***Sig.***
Regression	4152.278	1	4152.278	242.802	0.000 **
Residual	3720.522	398	9.349		
Total	**7872.800**	**399**			

The ANOVA table checks whether the entire regression model is significant. With an F-statistic of 242.802 and a p-value (Sig.) of 0.000, which is much less than the threshold of 0.05, it shows that the regression model is statistically significant. This means that changes in the dependent variable (timely availability of inputs) can be sufficiently explained by changes in the independent variable (supply chain efficiency). Thus, the null hypothesis is rejected while the alternate hypothesis is accepted, proving that supply chain efficiency significantly affects input availability in the Ahilyanagar district.

Table IV. **Coefficients**

Model	***Unstandardized Coefficients***	***Standardized Coefficients***	***t***	***Sig.***
	B	Std. Error	Beta	
(Constant)	7.845	0.812		9.662
Supply Chain Efficiency	0.658	0.042	0.726	15.587

The coefficients table indicates that the unstandardized coefficient (B) for supply chain efficiency is 0.658, meaning that for each unit increase in supply chain efficiency, the timely availability of agricultural inputs increases by 0.658 units. The t-value of 15.587 and p-value of 0.000 confirm that this is statistically significant. Beta value 0.726 shows an indication of strong standardized effect. Hence, supply chain efficiency is a significant predictor of timely availability of agricultural inputs, thus strengthening the alternate hypothesis (H_{11}).

C. Hypothesis 02:

Null Hypothesis (H0): There is no statistically significant difference in the pooled availability of inputs under varying supply chain strategies employed by agricultural input dealers and companies.

Alternate Hypothesis (H1): There exists a statistically significant difference in the pooled availability of inputs under varying supply chain strategies employed by agricultural input dealers and companies.

Table V. **ANOVA – Input Availability Across Different Supply Chain Strategies**

Source	***Sum of Squares***	***df***	***Mean Square***	***F***	***Sig.***
Between Groups	432.187	3	144.062	18.734	0.000 **
Within Groups	3021.613	396	7.631		
Total	**3453.800**	**399**			

Table V illustrates the results from a one-way ANOVA conducted to find whether input availability differs significantly across supply chain strategies. The F-value is 18.734 with the p-value of 0.000, which is highly significant ($p < 0.05$). Giving that, there are statistically significant differences in the average availability of input agricultural among the four supply chain strategies. Therefore, null hypothesis H_{02} is rejected, while alternate hypothesis H_{12} is accepted as well by confirming that the type of supply chain strategy matters as far as input availability in Ahilyanagar district is concerned.

Table VI. **Descriptive Statistics – Input Availability by Supply Chain Strategy**

Strategy Type	***N***	***Mean***	***Std. Deviation***
Traditional Dealer Network	100	12.80	2.76
Co-operative Societies	100	14.05	2.35
Integrated Digital Platforms	100	15.60	2.12
Hybrid Models (Mixed)	100	13.90	2.40
Total	400	14.09	2.55

It has been found from the descriptive statistics that average input availability among supply chain strategies differs. The highest average availability is found for Integrated Digital Platforms 15.60, then by Co-operative Societies 14.05, followed by Hybrid Models 13.90, and lastly Traditional Dealer Networks 12.80. The least standard deviation from digital platforms indicates consistency in performance. Therefore, the digital supply chains are more effective in timely and adequate delivery of agricultural inputs compared to traditional styles.

Table VII. **POST HOC Test – TUKEY HSD**

(I) Strategy	*(J) Strategy*	*Mean Difference (I-J)*	*Sig.*
Traditional Dealer Network	Integrated Digital Platforms	-2.80	0.000 **
Co-operative Societies	Integrated Digital Platforms	-1.55	0.002 **
Hybrid Models (Mixed)	Integrated Digital Platforms	-1.70	0.001 **
(Other pairs)	...	...	...

The TUKEY HSD test compares the average differences of each of the individual supply chain strategies. Significant mean differences ($p < 0.05$) are found between Traditional Dealer Networks and Integrated Digital Platforms (-2.80), Co-operative Societies and Digital Platforms (-1.55), and Hybrid Models and Digital Platforms (-1.70). The interpretation of these results is that Integrated Digital Platforms perform significantly better than others concerning input availability. The POST HOC test supplements the ANOVA results by identifying pairs of strategies differentiating meaningfully between themselves.

V. Findings Conclusions and Suggestions:

A. Findings: Supply Chain Management is crucial for the timely availability of different agricultural inputs like seeds, fertilizers, pesticides, and machinery in Ahilyanagar District, according to study results. A significant finding of regression analysis affirmed a significant relationship between supply chain efficiency and timely availability of inputs with strong outcome results that produced R-square value of 0.527 and significance level of $p < 0.001$. It infers that more than 52% variations in the availability of inputs can be explained by improvements in supply chain practices through better logistics, inventory management, and communication flows. Further ANOVA results proved that there is a statistically significant difference in input availability across different supply chain strategies adopted by dealers and companies. Integrated Digital Platforms scored the highest mean availability scores among those analyzed-strategies: Traditional Dealer Networks, Cooperative Societies, Integrated Digital Platforms, and Hybrid Models-indicating their superior performance in consistently and timely delivering goods. Significant pairwise differences were confirmed by POST HOC tests between traditional networks and digital platforms, which the need for agricultural input providers has been well proven, showing that they need to adopt more efficient supply chain models that are technology driven to satisfy farmer demands. The study also has provided the best prospects through digitization, integration, and localized warehousing, in closing the gap between demand and supply in rural agricultural markets spreading greater productivity and sustainability in the sector.

B. Conclusions: The study reports that the effective management of supply chains is essential for the same timely and sufficient supply of farm inputs in Ahilyanagar District. The results proved that there is a very high positive correlation between the supply chain efficiency measures and accessibility to major inputs such as seed, fertilizer, pesticides, and machinery. It also discusses that different supply chain strategies had a significant bearing on availability of inputs with integrated digital platforms being the most effective model followed by cooperative societies and hybrid strategies. Conventional dealer networks were found to be less efficient leading to delays and inconsistencies in distribution of inputs. These results buttress the need for adopting modern supply chain practice rather than going for digital integration, reduction of inventory tracking to real time, and improved logistics but especially for the agricultural sector where timing is of the essence. They also imply that the use of technology and creation of region-cum-supply chain specific models go a long way towards closing some of the gaps in the input supply chain resulting into benefits for the input-providers and also for the farmers. Lastly, this study has given some insight into what policy needs to be adopted and capacity-building aspects that should be included for creating an enabling environment for taking up innovative supply chain models by small dealers and rural cooperatives. In brief, the study reiterates that a strong and responsive supply chain is a strategic tool as much as it is a logistical necessity to improve productivity in agriculture, ameliorate rural distress, and overall cover the objectives of food security and sustainable rural development.

C. Suggestions: It is recommended that input suppliers and policymakers in the district focus on adopting an integrated digital supply chain platform that will ensure timely delivery of inputs. This can be done by utilizing technologies such as inventory management systems, GPS-enabled logistic tracking, mobile apps for order placements, and delivery tracking, thus streamlining the supply process, reducing delays, and increasing transparency across the value chain. Input dealers and cooperative societies should be provided training programs to build capacity on digital tools and efficient warehousing practices.

Also, partnerships among private input firms, public institutions, and farmer producer organizations (FPOs) must be reinforced to create regional distribution strategies. Additionally, investment in local storage hubs and better transportation networks will assist in alleviating some last-mile delivery challenges. In this light, it will be prudent for policymakers to introduce incentives to promote digital uptake and infrastructure expansion in this sector, perhaps through subsidies or public-private partnerships, so as to stimulate inclusive and sustainable growth. These actions will greatly enhance operational efficiency to ensure timely delivery of inputs to farmers, with a consequent positive effect on agricultural productivity and food security.

D. Limitations: The study provides a significant contribution related to supply chain management in enhancing the availability of agricultural inputs in Ahilyanagar district, though it presents certain limitations. The first limitation is that this study is geographically limited to one district. This restricts the generalization of findings to other regions that differ in agricultural, infrastructural, and economic conditions. Secondly, this study relies on self-reported data, which may suffer from biases such as respondent perception, recall error, or social desirability. The other aims of this study placed most emphasis on quantitative analysis, which might have missed deeper qualitative insights that could have emerged from interviews or field observations." The categorizing of the supply chain strategies may oversimplify complex operational practices. Besides, input availability may be influenced by external factors, including government interventions, disrupted weather, and market volatility, which are not directly controlled or measured in this study but could operate independently of supply chain efficiency.

E. Significance: The study's significance is that it aims at understanding how supply chain management directly impacts timely availability of critical agricultural inputs into rural areas, such as Ahilyanagar. By applying empirical analysis to case of supply chain efficiency and input accessibility, the research gives data guided findings to policymakers, agricultural input companies and cooperative societies towards improving operational effectiveness. The research examines different supply chain strategies and also identifies the superior performance of technology-enabled models providing clear path for future investment and policy formulation. Timeliness in quality inputs can have major consequences on crop productivity, farmer income and rural development in India. It will thus spearhead broader goals of sustainable agriculture and food security by finding workable solutions to address supply-demand gaps. The research is therefore of both academic value and practical importance in shaping future strategies for agricultural supply chain optimization.

F. Future Scope of the Study: The future of this study looks bright, paving way too many further research activities. This research project is limited to the Ahilyanagar district, but a future study may do multiple comparisons of different districts or states with a view to statistically finding differences in supply chain effectiveness across regions. Qualitative study like interviews and meta-analysis of cases could give richer understanding into behavioural, policy, infrastructural challenges of stakeholders. In addition, the possibility to study the longer-term effects of digital and hybrid models of supply chains on yields, costs, and profitability for farmers is presented. Researchers could also study how government schemes can help, how the private sector innovation would strengthen supply chains, and the role of public-private partnership in the overall impact. Another important extension would be the consideration of environmental and sustainability impacts of different supply chain practices. All above and beyond taking more than availability into account, affordability, quality, and the component of post-harvest management are likely to provide a more comprehensive picture with respect to understanding supply chain dynamics in Indian agriculture.

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