

SUPPLY CHAIN INSIGHTS OF MODERN AGRICULTURAL MACHINERIES AND ITS CONTRIBUTION TO THE TRANSFORMATION OF THE AGRICULTURAL SECTOR OF BANGLADESH

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Abstract: This study investigates the role of supply chain management (SCM) in facilitating the growth and transformation of the agricultural sector of Bangladesh through modern agricultural machineries, focusing on the case of ACI Motors. Despite agriculture employing a significant portion of Bangladesh's population, a productivity gap persists due to limited mechanization. ACI Motors recognized this issue and introduced various advanced farm equipment, including tractors, harvesters, and transplanters, sourced primarily from international partners. The research employs both qualitative and quantitative methods, including interviews and a survey of 125 ACI Motors employees. Findings reveal that a well-structured SCM framework—covering planning, import operations, inventory control, and distribution—enables ACI Motors to efficiently deliver machinery across the country, contributing substantially to modernization in agriculture. Statistical tests confirm that dealers are important but not the sole key players in the supply chain, and indicate a positive relationship between ACI Motors' operations and the sector's mechanization drive. While challenges such as small landholdings, low purchasing capacity, and policy constraints persist, the study demonstrates how robust SCM practices can address these barriers. Overall, the paper underscores the significance of SCM in advancing farm mechanization for sustainable agricultural development in Bangladesh.

Keywords: Supply chain management; Agricultural mechanization; ACI motors; Modern agricultural machineries; Distribution network; Tractor import

1 INTRODUCTION

Although the service sector generates almost half of the economic earnings, two-thirds of Bangladeshi people engage in agricultural activities. More than 50 percent of the population is working in this sector, and approximately 70 percent of people depend on agriculture for their living [1]. A substantial proportion of the poor depends on agriculture as a key source of earnings and employment. The indirect need for agriculture is replicated through employment in agro-based services and rural enterprises [2]. However, over the last three decades, the average growth of the farming sector has increased by approximately 3.2 percent as compared to 7.5% in the manufacturing sector and 6.2% in the services sector. For the last two decades, the overall average employment in farming has remained around 70 percent as compared to 12.4% in manufacturing and 23.5% in services [3]. The average share of farming as a proportion of GDP growth for the past decade ranged from 17.5 percent (2009) to 12.68 percent (2019) [4]. In comparison, the share of the manufacturing sector steadily increased from 25.3 percent (2009) to 29.65 percent (2019), while the share of the service sector remained constant-53.2 percent in 2009 and 58.8 percent in 2019 [4].

This shows a large gap in the agricultural sector. because the agricultural sector is not sufficiently updated [5]. ACI Motors realized the actual scenario and incorporated their business plans according to the needs of these sections. In 2007, they started their businesses by selling modern agricultural machinery [6]. This was a big step for them, and they obtained very successful results at that time. This also helps them grow their businesses. Although they started their business as modern agricultural machinery, they are now selling many types of agricultural machinery. ACI introduces different types of machinery, and modern agricultural machinery is one of the best-selling agricultural machines [7]. They imported most of the products, but after completing their B2B transactions, they followed a structured Supply Chain module, which helped them incorporate their all-business plan properly. They can deliver products to customers effectively. Thus, modern agricultural machinery is now the market leader in Bangladesh, with a 31% market share [8]. If we compete with other countries, Bangladesh's agricultural business will move rapidly with its excellence. Thus, it is necessary to ensure the growing progress in this industry [9]. We need to provide fruitful results for farmers, which will be more effective for cultivation. Keeping in mind ACI motors with this thinking. They began operations with a range of agricultural machinery products. They have introduced many products. For example, tractor-power tiller diesel engines, combine harvesters, rice transplants, and a guaranteed supply of quality machinery will help farmers obtain better service and fruitful results for their cultivation [10]. All of these brands have received tremendous responses from farmers. Currently, farmers are happy to use these products. Using this product, they obtained better results than before. ACI Motors imports most of its products from China, India, and other countries, and distributes these products throughout our country with very strong supply chain management [11]. That is why a few farmers get their products and receive after-sale services. Real-life business situations are always very difficult and very competitive. Moreover,

every business must face intense competition [12]. ACI motors also face significant competition. However, they are still doing very well in the market because of their strong business bases. This was followed by a strong supply chain procedure. They are successful at every step of the supply chain [13]. This took a very short time. To purchase the product, import the product and hand over the product to the customer. They also take preorders for many products. Some products, such as tractors, tillers, and rotators, are more expensive because they cannot buy in cash, which is why ACI Motors gives them credit facilities and can purchase the product by credit [14]. They can pay payments in installments during this period.

The main purpose of this study is to clearly understand and determine the ins and outs of complete operations of supply chain management, what it covers, and how it works at ACI Motors, along with knowing the current state of supply chain management from a global viewpoint, focusing on best practices. There are also some specific purposes are getting an idea about the key activities and the insights of supply chain management (i.e., demand and supply planning, procurement (import machinery), transportation and logistics, distribution, understanding the employee's perceptions about the supply chain module of Modern Agricultural Machineries [15], know how to distribute an uninterrupted flow of products from the suppliers to a satisfied customer, understand about the strategic aspects to develop an integrated supply chain management and also the apparatus that can drive top performance and make the supply chain sustainable [16], To know the significant barriers in implementing a combined supply chain and also to find out effective solutions to overcome those, understand the contribution of modern machinery (Modern Agricultural Machineries) to the transformation of the agricultural industry of Bangladesh [17] And there were also some limitations such as Lack of accuracy of the secondary data depends upon the accuracy of the secondary source as cross checking was not possible, Collecting primary data from the related people, Lack of proper knowledge and depth of understanding of the employee of ACI motors, Insufficient sample size to measure statistics, Lack of past research studies on the subject, Limited data access to analysis, Limited time and limited access to data [18].

2 LITERATURE REVIEW

In the past decade, the common system of buying and logistics functions has transformed into a broader strategic approach to resource and distribution management, known as SCM. This section reviews SCM evolution and the factors that are prejudiced against it. By identifying these factors, we obtained important insights into SCM. Different meanings of SCM have been offered during the last 20–30 years; however, none of these definitions are widespread. The absence of an all-inclusive meaning in SCM is, to some extent, because of the way the idea of a store network has been created. The idea of a production network has been considered from various perspectives in various writing assemblages. Such a multidisciplinary birthplace makes it difficult to consider the all-inclusive meaning of SCM. Despite the hindrances to make a widespread meaning of SCM, Researchers endeavored to combine two definitions, one for inventory network and one for SCM, by broadly looking at different meanings of the terms 'inventory network' and "Supply Chain Management". Their definitions are:

A Supply chain is a 'set of at least three elements straightforwardly associated with the upstream and downstream progression of items, administrations, funds, and data from a source to the client' [19].

Supply chain management is "the systematic, vital coordination of the customary business capacities and the strategies across these business capacities inside a specific organization and across organizations inside the production network, to improve long-term execution of the individual organizations and the production network overall" [19].

Supply chain management (SCM) early accentuation was the quick and solid stock of crude materials and completed items for clients. Therefore, the proficient activity and constant progression of sustainability 2020, 12, 6972 4 of 27 items and data along the chain was a regular test. Moreover, organizations were searching for approaches to limit squander, not for social or natural reasons, but for monetary reasons. Moreover, conventional inventory networks write apparent providers as nonstrategic, and the central organization's methodology includes utilizing the organization's buying control. Thus, a typical meaning of SCM incorporated the "store network exercises related to the change and stream of merchandise and enterprises, including business specialist data streams from the wellsprings of materials to the end clients'.

During the 1950s and the 1960s, the idea of SCM was obscure, and in this period, new item improvement was moderate and included distinctly in the firm's own innovation and limits. Stock padded bottleneck activities to keep a fair line low, bringing about colossal interest in work-in-measure (WIP) stock [20]. Moreover, issues with buying were disregarded by chiefs around the time, since buying was considered a support for creation [21]. Expanding creation was the principal objective of this period; little accentuation was on helpful and key purchaser-provider associations. As indicated by Tan (2001), offering innovation and ability to clients or providers was considered excessively hazardous and inadmissible

The supply chain management concept arose during the 1990s, as organizations turned out to be more specific and looked for providers who could give minimal effort and top notch materials [22]. One of the principal articles utilizing the expression "store network the board" was created by Houlihan (1985), who repeated the fundamental attributes of supply chain management. First, it sees the production network as a solitary substance instead of divided capacities liable for zones such as buying, assembling, dispersion, and deals. Also, the trademark construes the necessity for key dynamic; "supply" is a common target of each capacity in a chain; and is of key significance on account of its effect on expenses and piece of the overall industry. It then provides an alternative perspective on inventories. Inventories are

utilized as an adjusting instrument for the last hotel, not the first. Finally, Supply chain management requires another way to deal with mixed frameworks.

The presentation of Enterprise Resource Planning (ERP) during the 1990s gave rise to the development of the SCM and purchaser-supplier relationship. While EDI - Electronic Data Interchange frameworks were concerned primarily with buy – authoritative coordination, ERP frameworks were concerned mostly with intra - hierarchical mix. The advancement proceeds in the 21st century with the improvement of more complex IT frameworks (web-based arrangement frameworks), which are concerned about both hierarchical joining and intra-authoritative mix. In addition, the relationship purchaser – Supplier in this period has gone one-venture forward, from typical association to long-haul relationships and key coalitions. Makers and retailers misuse provider qualities and innovation for new item improvement, conveyance channels, cost decrease, and so forth.

The most recent pattern of development in SCM is the development of frameworks for supplier relations over public limits and into different lands [23]. GSCM is the most recent idea acquainted with SCM literature. Firms are much larger than they used to be. They have accomplished economies of scale, and with the foundation of exchange progression strategies, they internationalize their organizations to track down the minimal welfare of sources of information and developing business sectors to sell their items. The idea of SCM is not sufficient to be productive and serious in the new climate, which is why new ideas and executive methodologies (for example, GSCM) are arising. An incorporated supply chain provides an extensive upper hand to individual entertainers participating in the chain. In created economies, there is a change from firm – firm rivalry to chain – chain rivalry [24]. Some authors have divided the advancement of supply chain management into stages [25].

With the highest population (of countries with a substantial landmass) and per-capita rice usage in the world, the Government of Bangladesh (GOB) has historically encouraged agricultural intensification and mechanization as a means of increasing production and moving toward rice self-sufficiency [26]. To aid in this process, the GOB voluntarily relaxed import restrictions and tariffs on agricultural machinery and implemented subsidy schemes to offset fixed costs for 2WTs, irrigation pumps, and threshers. The GOB introduced watering pumps in the 1960s. Following the GOB's voluntary liberalization of the machinery market and easing of import tariffs from 1988 to 1995, their supply was later supported by the private sector.

The GOB also initially promoted four-wheel tractor-based mechanized tillage, which is arguably scale-inappropriate given Bangladesh's average farm size of around 0.53 ha, which is usually further fragmented into multiple fields. However, public irrigation and the employment of larger tractors for land preparation pose significant logistical and budgetary challenges. Bangladesh began liberalization measures eight years after gaining independence in 1979, with the GOB eventually withdrawing state-led industrialization assistance. Tractors are widely recognized as the most essential agricultural power source, and the impact of tractor power on agriculture is substantial. In recent decades, the use of modern technologies has resulted in a rapid increase in farm production. Tractors and farm machinery are good examples of modern technology.

Most literature reviews show the importance of supply chain management for any company or section. Supply chain modules have changed over the past few decades. For the development of any business organization, they need to ensure a very effective supply chain module. Previous researchers mention that in this globalization period, the market is too competitive, so to gain competitive advantage in the market, proper supply chain management can play a very important role; on the other hand, the paper also includes some literature on agricultural machinery and its impact on the transformation of the agricultural industry in Bangladesh.

3 THEORETICAL DISCUSSION

Supply chain is one of the most important portions in any business module. As we know, that supply chain is the vast procedure which start from the raw materials and end to the final consumers. Different researchers described Supply chain differently. A Supply chain is a "set of at least three elements straightforwardly associated with the upstream and downstream progression of items, administrations, funds, and data from a source to the client" [19]. In a competitive market, single initiatives acting alone cannot fully reach all management goals. As clients demand growth and become more detailed firms must need to take some initiatives to manage responsibilities across the supply chain in order to progress service and lower costs for the organization. The problem is that different firms naturally operate under diverse management philosophies and pursue different goals. Successful relations require managers to reconsider the way they manner business with suppliers and customers so that the profits of combined and attentive supply chain strategies can be reached.

As ACI motors imported tractor and sell the tractors in the Bangladeshi market so ACI motors do not involved all the portion of supply chain. They basically purchase to tractors from the mother company which is located in India and imported the tractors after that they sell the tractors in Bangladesh's market through their Supply chain module. As a big company ACI motors must follow many supply chain modules according to the market scenario. These are some theoretical studies given below which they are following and some of them they can follow to make easy their Supply chain module.

3.1 Supply Chain Roadmap

A supply chain roadmap must map out the entire system which is needed in terms of supply chain module. This is an advanced theory that can only be proficient through serious research and analysis from the view of supply chain. Supply chain roadmaps are complex because you and your 3PL will be defining exactly how your supply chain must run from the start, trying to take every variable into account of this module.

This supply chain roadmap theory can be effective for ACI's supply chain module. As they are covering a large supply chain network all over the country this can help them to sort out the entire scenario.

Normally, a supply chain roadmap emphasizes (Figure 1):

- Alignment
- Managing risk
- Value added
- Metrics

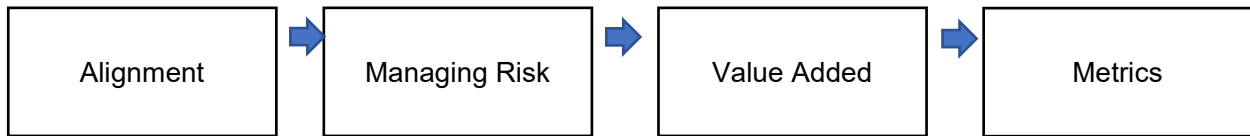


Figure 1 Supply Chain Roadmap

3.2 Illustrating Supply Chain framework and ARA-model in Partner Selection

Gadde-Snehota (2002) distinguish three dimensions of involvement that affect outcomes in supplier relationships:

1. The activities carried out can be more or less tightly coordinated
2. The resources can be more or less adopted
3. The individuals may interact more or less intensely

In the supply chain management framework, the operative procedure includes customer addition, internal integration and supplier addition. Within client integration you can build up collaboration with clients of choice. Internal integration links performed work to customer requirements and finally supplier addition links external work with internal work process. The technology and planning integration refer to information systems that support the variety of effective configurations. Measurement integration refers to measurement systems. Finally, affiliation integration refers to the ability to grow and maintain shared psychological framework with clients and suppliers. [27-28]

The SCM outline by Lambert & Cooper (2000) is interesting and inspiring as it describes the consistent with the nature SCM and the need to continue through several steps in order to achieve a supply chain (Figure 2).

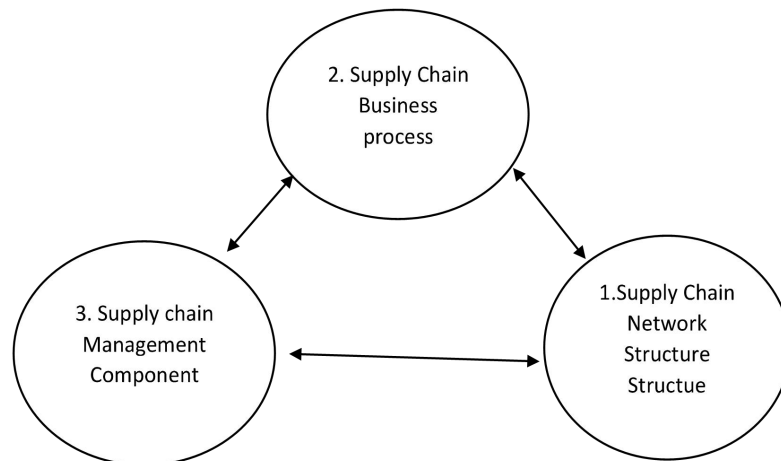


Figure 2 Achieve a Supply Chain Steps

In this theory we need to understand some queries which can be make the supply chain module effective here:

1. Who are the key supply chain members with whom to link processes?
2. What processes should be linked with each of these key supply chain members?
3. What level of integration and management should be applied for each process link?

4 RESEARCH METHODOLOGY

This specific study is primarily a primary study in which the researcher collected data from the internet and database sources through a survey and used some secondary data. This study is based on both qualitative data collection through interviews and quantitative analysis through survey. Primary data were collected through Face to Face interviews of the Supply chain manager, assistant managers and the related employees of ACI motors Limited to complete the survey for

the deeper insight. The research is based on the technique of judgmental sampling. Research work requires sample design. Research work requires sample design. The sample design process in the report consists of institution selection, study year selection and study duration. And as the study show both qualitative and quantitative findings, So the paper consists vast information from the secondary sources of data. Some of data collected from many web sites, company's annual report, Different research articles and supply chain related various web sites. Tool uses for Data Analysis: Hypothesis Testing (One sample t-test). After problem recognition and a detailed context analysis, a questionnaire was created. The pre-processing of the data obtained the trends and the interaction between the variables were discovered through a descriptive analysis. A survey of approximately 25 Employees who are working at ACI motors and they also directly or indirectly related with the supply chain of Modern Agricultural Machineries. Throughout the employees will provide the database for this study. The sample will be collected basis on ACI Motors's Supply chain modules and its contribution to the agricultural sector of Bangladesh. After a detailed analysis of similar works, factors related to Supply chain activities of ACI motors. Questions and answers were planned to explain perception of the employees About the supply chain module of Modern Agricultural Machineries and its contribution to the transformation of the Agricultural sector of Bangladesh. The final questionnaire was distributed among the employees of ACI motors who are directly or indirectly related with the business of Modern Agricultural Machineries and its supply chain. Respondents came from different team to seek varied viewpoints. After pre-processing the data, a descriptive review of each of the factors gathered from the survey was performed to get an understanding of the data and to discover patterns and associations between the factors.

Data Analysis and Interpretation:

All the data that are presented through charts & tables are also presented through graphical presentation. These graphs are interpreted by analyzing the scenario that acts as an indicator for different analysis.

Hypothesis for analysis and study:

Hypothesis 1: ACI motors has a structured supply chain module. (One sample t-test)

Hypothesis 2: Dealers are only key players in the supply chain of ACI motors. (One sample t-test)

Hypothesis 3: ACI motors Contribute to the transformation of Bangladesh's Agricultural sector by selling Agro-machineries. (One sample t-test)

5 RESULTS AND FINDINGS

The survey has done based on 125 responded from ACI motors limited. The respondents are working at ACI motors and everyone is related with the business off Modern Agricultural Machineries. They all are more or less concern about the Supply chain module of ACI motors, some of them are directly working with the supply chain department of ACI motors and some of them are indirectly working but all of them have to work with the supply chain team. The overall scenario show that all the employees are very much positive about the Supply chain module of ACI motors. From the responds we see that ACI motors has a clear Supply chain module. And they are doing better in terms of Supply chain than other competitors. As they imported Tractors from the mother company of Sonalika so they are not going to produce parts in terms of Modern Agricultural Machineries but they are concerned about the production of Modern Agricultural Machineries for the demand of the customers. And ACI motors basically started their supply chain portion after importing the products. Basically, after imported tractors they store the products to the warehouse and from the warehouse they provide the product to the dealer's point and own showrooms. By these methods their supply chain teams covered whole Bangladeshi market. And most of the employee highly believe that the supply chain module of ACI motors is very fast and better than other competitors. And that is why now Modern Agricultural Machineries holding the market leading Positions with 31% market share. And they are not only concern about just selling the products and earning profit. ACI motors always think about our agricultural sector. The main vision of ACI motors is covered with the thinking about to contribute our agricultural sector. And from their very beginning they have been contributing in our agricultural sector by selling agricultural machineries like Modern Agricultural Machineries which is a big step to transformation of the agricultural sector of Bangladesh.

5.1 Hypothesis 1: ACI Motors Has a Structured Supply Chain Module (Table 1)

Ho: ACI motors has an unstructured supply chain module

Ha: ACI motors has a structured supply chain module.

Table 1 One sample T-Test (Hypothesis 1)

One sample T-Test (Test Value 3)	T- Value	Df	Sig. (2-Tailed)	Mean Difference	95% Confidence Interval of the Difference	
ACI motors has a structured supply chain module	46.85	124	.000	4.120	Lower 3.94	Upper 4.30

Interpretation: Here the one sample test result, $.000 < .05$, so the null hypothesis is rejected And the alternative hypothesis is accepted.

So, we can say that, ACI motors has a structured supply chain Module According to the respondents ACI motors has a structured supply chain module, from the very first they are following a structured Supply chain module and for a long

time they are maintain a very strong supply chain module. That is why more or less most of the employees knows about their supply chain module and ACI motors effectively follow their Supply chain module for a long time.

5.2 Hypothesis 2: Dealers are Only Key Players in the Supply Chain of ACI Motors (Table 2)

Ho: Dealers are not only key players in the supply chain of ACI motors

Ha: Dealers are only key players in the supply chain of ACI motors

Table 2 One sample T-Test (Hypothesis 2)

One sample T-Test (Test Value 3)	T- Value	Df	Sig. (2-Tailed)	Mean Difference	95% Confidence Interval of the Difference	
Dealers are only key players in the supply chain of ACI motors	1.000	124	.327	.200	Lower -.21	Upper .61

Interpretation: Here the one sample test result, $.327 > .05$, so the null hypothesis is not rejected and the null hypothesis is accepted.

So, we can say that, Dealers are not only key players in the supply chain of ACI motors Here the respondents think that not only dealers play the key role in the supply chain module. Dealers are always playing an important role for the supply chain of ACI motors. They tried their best to increase the sales. But they are not only the key players of ACI motors. In terms of their Supply chain. Here dealers are just helping Hand of the supply chain department but the major role player is here the supply chain department including SCM managers, employees and related peoples. They are play the key role in the distribution channel of Modern Agricultural Machineries. They also helped dealers to get the product on time and dealers finally sale the products to the final customers. So here dealers are play a very important role for the sales.

5.3 Hypothesis 3: ACI Motors Regularly Contribute to the Transformation of Bangladesh's Agricultural Sector by Selling Agro-Machineries (Table 3)

Ho: ACI motors do not contribute to the transformation of Bangladesh's Agricultural sector by selling Agro-machineries

Ha: ACI motors Contribute to the transformation of Bangladesh's Agricultural sector by selling Agro-machineries

Table 3 One sample T-Test (Hypothesis 3)

One sample T-Test (Test Value 3)	T- Value	Df	Sig. (2-Tailed)	Mean Difference	95% Confidence Interval of the Difference	
ACI motors Contribute to the transformation of Bangladesh's Agricultural sector by selling Agro- machineries	12.273	124	.000	1.160	Lower .96	Upper 1.36

Interpretation: Here the one sample test result, $.000 < .05$, so the null hypothesis is rejected

And the alternative hypothesis is accepted

ACI motors, from their very beginning they are trying to ensure that their business should help to transform the agricultural industry of Bangladesh. Their most of the products are Agro-Machineries. And from the very beginning ACI motors realized that our agricultural sector has a huge gap in terms of using modern machinery. So, there are a lot of opportunities to do something for this industry and that is why ACI Motors started selling agricultural machinery and they are getting very positive responses from all. That is why here most of the respondents agree with the statement. So, after analyzing the respondent's response there is a positive relationship that ACI motors Contributing to the transformation of Bangladesh's Agricultural sector by selling agricultural machineries.

6 MODERN AGRICULTURAL MACHINERIES IN BANGLADESH

ACI Motors started its journey in 2007 with a goal to provide the farmers of Bangladesh a means to easily cultivate their land mechanically. For this purpose, they have introduced the popular Modern Agricultural Machineries, the fastest growing brand in India. Its special design which is suitable for cultivation in Bangladeshi land or haulage work in village narrow roads made this a popular choice when deciding to buy tractors for the farmers of Bangladesh. Building on the success of Modern Agricultural Machineries, ACI motors has now ventured into new product offerings like power tillers, harvesters & other machineries. ACI motors offers different types of tractors of varying prices with a wide range of purchase systems with credit. There is a service center for Modern Agricultural Machineries all over the country, with enough dealer points which carries parts for the tractors. So, farmers never have to worry about after sales

service. In June, 2017, ACI motors passed a special milestone with sales of Modern Agricultural Machineries exceeding 100 crores in one month

Major Players and Market Share:

The main competitors of ACI Motors in the Tractor sector are the Metal Private Limited and Karnafuli Private Ltd. Metal Private Limited was the first company to introduce tractor in Bangladesh. They are the sole distributor of Indian tractor brand, TAFE. Metal Private Limited has created a well-established brand reputation for TAFE and has a very strong network all over Bangladesh. It was the market leader for a long time until 2016 when Sonalika replaced it. Since the launch of Sonalika in 2007, slowly TAFE was losing market share, as well as Sonalika tapped into potential markets. Finally, in 2021, ACI Motors' Tractor "Sonalika" achieved 31% market share becoming the market leader. Karnafuli Private Ltd is the distributor of Indian Mahindra tractors in Bangladesh. Nitol-Niloy Group has also been operating in the market for a long time selling different brands like CASE Of all customer inquiries generated from any particular area, about 6 to 10% customers are lost because they did not buy Modern Agricultural Machineries in favor of some other brands. But these are all customers that were initially interested in Modern Agricultural Machineries but later changed their mind. The other major brands of Tractors that are in the market are Tafe, Mahindra, Swaraj, Eicher, New Holland, Case, John Deere, Power track. Since other vehicles like trucks, pickup can be used instead of tractors if the intended use is haulage, then truck & pickups are its competitors in some markets.

7 SUPPLY CHAIN MANAGEMENT MODULE OF MODERN AGRICULTURAL MACHINERIES

Supply chain management has a vital task to carry out inside the association since it includes the duty regarding anticipating and fulfilling end Customers' interest back through to the provider and sets out open doors for the acquisition expert to add to the association's prosperity. The target of the production network is to make the most incentive for the whole inventory network organization, including the end client. Fruitful inventory network the executives includes the coordination of exercises inside the firm and between individuals from the supply chain.

Inside the Organization, supply chain management alludes to a wide scope of useful territories. These incorporate Supply Chain Management-related exercises like inbound and outbound transportation, warehousing, and stock control. Sourcing, acquisition, and supply the board fall under the supply chain umbrella, as well. Gauging, creation, arranging and planning, request handling, and client care are all essential for the interaction too. Inventory network Managers have an imperative task to carry out in overseeing cost, as they are in a situation to screen and impact the entire expense base across the business and the production network.

The Commercial Department of ACI is quite possibly the most crucial useful division of the Company which manages the supply chain management exercises of ACI. To keep every one of the organizations running immaculately, the committed and dedicated workers of this division keep decent contact with the clients, both public and worldwide. The Commercial Department is reliably completing the best costs for the items that they buy, guaranteeing tremendous measure of cost reserve funds for the organization. It offers powerful polished methodology and aptitude in the whole business exercises of ACI.

ACI motors has been following a very effective procedure of supply chain management. for their tractor business they design three step supply chain modules. These are

1. Pre- purchase activities for decision making
2. Import the tractors (Transaction Period)
3. Post import Activities

7.1 Pre-Purchase Activities

ACI motors basically purchase the tractors from the mother brand of Sonalika which is located in India. and they imported the tractors from here every month. But before importing the product and dealing with the mother company ACI motors go for a market survey. The department of supply chain remains accountable for availing all raw materials products at the proper time and schedule, in the proper amount, at proper regional sector, and of route in right proper manner. Business or advertising branch accountable for that organize forecasts marketplace demand of an existing product taking some related variables like promotion, seasonal, occasional effect into consideration. Usually the ROFO (Rolling Forecast) is ready for the next six months for forecasting the upcoming scenario. Here, Commonly used method to forecast demand are Historical Data Analysis (for remaining goods) , Sales Trend Analysis and Analysis of Time Series (for existing goods) , Market Survey Studies, The Collective Opinion also called as Sales Force Polling, Use of Economic Indicators – Regression Analysis and Economic Model, Controlled Experiments – Test Marketing, Judgmental Approach, Depending on the type of goods, the method of forecasting demand varies.

When ACI motors can realize the need of the product and find out that the product will be valuable in the market that time they go for those products. And in terms of Modern Agricultural Machineries they have done a vast market research and find out ins and out of this product and the market demand of tractors in the agricultural sector after that they go to marketize the product for a long time. and finally, from 2007 they successfully did really well in this market.

7.2 Contingency Planning

Having multiple listed and accepted suppliers for the products is really contingency making plans in the supply chain. something unexpected might also appear in any time and there need to be sufficient safeguarding monitoring so that the

sudden can be managed that time, that is why the required uninformed substances product must be sourced as a minimum multiple dealer. The supply chain branch of ACI confined does contingency making plans for ensuring the products on time.

7.3 Importing Tractors

Import Process: Import process in Basically starts with commencing Letter of credit score. After a success letter of credit, documents recognized to it are collected & dispatched to the actual dealer. Suppliers set up the process of shipments of that ordered tractors and also ship vital documents to the importer and where the bank was involved. There are some principal works to do sequentially – finalizing and forwarding, custom clearance, obligation evaluation, transportation and shipping to warehouse (Figure 3).

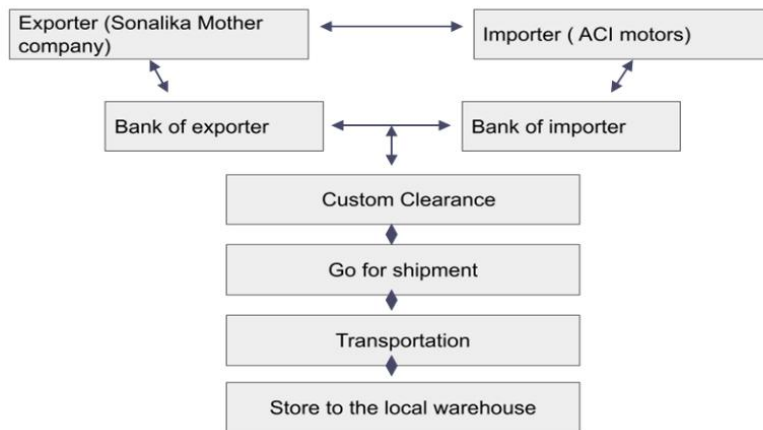


Figure 3 Importing Process of Modern Agricultural Machineries

Here the main function is ensuring the proper transaction and completing the Letter of credit by the Banks. otherwise, the transaction will not be counted. and for a long time ACI motors doing this task very well and operation fruitfully their business operations.

7.4 Post Import Operation, Inventory Management and Supply Chain Management

After shipping the products from India, the company has cleared all the issues of the transactions. and after that the company stores the tractors to the company’s warehouse where the internal engineers check all the tractors very carefully to find out the problems. If they got any defective products, they inform the mother company for those defected tractors. And ACI motors supply to the market only those tractors which are fit for the markets. In this stage of the supply chain the total responsibilities of the supply chain module are handled by ACI motors. they have to maintain the showroom of the tractors, dealers and related all participants including 120 territories. The supply chain module of this stage as follows (Figure 4):

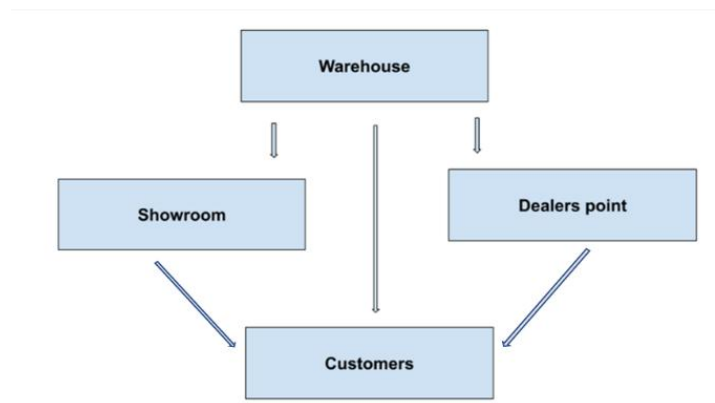


Figure 4 Post Import Operation

So, from the diagram we can see that ACI motors basically stored All the tractors in their warehouse initially, after that according to the market demand they released the product. They display the tractor in their showrooms and also, they sell the tractors through their dealer channel. Here the main purpose was to ensure the product all around the country. And ACI motors captured the whole Bangladesh's Tractor market through its vast channel. customers can purchase the tractors very easily. And the supply chain module also ensures the product within a very short time period.

7.5 Inventory Plan

To reduce a company's extra cost and unnecessary expenses, warehousing management is concerned about capacity, diminishing labor cost, dispatching authority with on time conveyance, stacking and dumping offices with legitimate territory, stock administration framework and so forth Expanded correspondence between individuals from the buying and stockroom divisions helps in improving the degrees of stock. The company has following effective inventory management in terms of its supply chain where they are minimizing the cost from every portion of the business.

7.6 Transportation and Logistics Plan

Logistics management is one of the vital portions of every supply chain. Logistics is the management of the criteria of things between the point of origin and the point of purchasing in order to meet requirements of customers or corporations. According to the Council of Supply Chain Management Professionals (previously the Council of Logistics Management). Logistics is the way toward arranging, carrying out and controlling strategies for the productive and successful transportation and capacity of merchandise including Service and related data from the starting place to the mark of utilization to adjust to client necessities and incorporates inbound, outbound, inner and outside developments. By maintaining low transportation costs through optimization of the transportation model, ACI making significant savings and still they are finding way to reduce their cost during their supply chain, which will help them to get more profit. The movements to deliver finest value. This is gained by collaborating with suppliers and retailers, along with other logistics providers.

7.7 Distribution Channel

Distribution system of ACI Motors is a very complex and vast affair because the supply is not to meet an immediate demand –it is to recharge stock at the quick client area, which thus will be utilized to satisfy requests. Be that as it may, the intricacy of the appropriation network introduces itself as a chance – on the grounds that the completely powerful and efficient distribution system of ACI motors which can be a strong comparative advantage.

ACI has its own distribution channel for selling tractors. It sells its tractor through its own showroom & authorized dealer. There are 8 show rooms along with over 62 authorized dealers that carry Modern Agricultural Machineries. Marketing officers visit the field all time looking for new customers and try to generate sales. Once a sale has been confirmed and all the paperwork is finalized, the tractor is brought to the customer from the nearest showroom or dealer point.

The products of ACI motors are served both directly and indirectly to the customers; via Dealers point and also from different showrooms. From the local warehouses of ACI, products go to various Dealers point and different showrooms. ACI motors has employed salespersons who convince the dealers to put ACI Motors products on display or sell to the dealer and their own shops. From the shops the ACI products finally go to the end user consumers. The organization keeps up deliberately deals with communities in 24 unique areas the nation over. It has built up a high-level dissemination framework through its in excess of 300 talented and prepared labor and a huge armada of more than eighty vehicles and through its 18 deliberately found warehouses. The maximum saleable quantity depends on the capability and efficiency of depots. Each depot is assigned to sell a minimum 70,000 quantities of products to distributors within two months.

The distribution system is capable of dealing with a proceeding with volume of assorted scope of items from the different organizations. The organization's conveyance places are exceptionally smoothed out, modernized and computerized. We are equipped for keeping a virus chain for some particular scope of items like antibodies and insulin. The mix of this high-level capacity and multidimensional abilities made it conceivable to handle hundreds of products efficiently.

8 CONTRIBUTION OF MODERN MACHINERIES TO THE TRANSFORMATION OF THE AGRICULTURAL SECTOR OF BANGLADESH

There was a time when the farmers cultivated a large area but, as a result, they got very few crops. On the other hand, in developed countries, they obtain a very good number of crops based on their land. This is because they used modern agricultural machinery. The use of modern machinery always yields high productivity at a low cost. It helps reduce many types of expenses during cultivation and the formulation of crops. Bangladesh is also using these types of modern machinery, which has resulted in a huge transformation of our agricultural sector. ACI motors quickly sell these effective machineries from their very fast. They sell tractors, harvesters, diel engines, and many other products that

work directly in the agricultural sector. Therefore, to transform our agricultural sector into the modern world, we must use these types of modern machinery to cultivate our land. This will be effective and productive. Mechanization is recognized as a key tool for increasing global production. As our market is significantly reliant on growing agricultural produce, the additional promotion of farm mechanization is essential.

Agricultural mechanization is known to deliver a number of economic and social benefits to farmers. The primary economic benefit is enhanced yield, which is a consequence of a greater level of mechanization. Impending water scarcity crisis along with the need to ensure food security in the country, the benefits of Agricultural mechanization make it a crucial module of determining the future of Bangladeshi agriculture

Input savings: Studies have shown a direct relationship between Agricultural mechanization (farm power availability) and farm yield. Farm mechanization is said to provide a number of input savings:

- Seeds (approximately 15-20 percent)
- Fertilizers (approximately 15-20 percent)
- Increased cropping intensity (approximately 5-20 percent)

Increase in efficiency: Aside from the above stated inputs, Agricultural machinery also helps in cumulative the efficiency of farm labor and reducing labor and workloads. It is estimated that Agricultural mechanization can help reduce time by approximately 15-25 percent. Moreover, it helps in enlightening the harvest and reducing the post-harvest losses and improving the quality of cultivation. These profits and the savings in inputs help in the decrease of production costs and permit farmers to earn more income.

9 CHALLENGES IN AGRO-MACHINERY INDUSTRY

The adoption of mechanization in the Bangladeshi agricultural sector is increasing but is imbalanced. The country has prioritized the mechanization of water pumping for irrigation. At present, approximately 55 percent of the total cultivable area is irrigated, mainly by pumped groundwater. The second priority was to mechanize the tillage operations using power tillers. Currently, approximately 80 per cent of the total tillage operations are performed with power tillers and tractors. The use of power tillers for tillage operations is higher than that for tractors because the average landholding is quite small. In addition, rapid growth of mechanization has been observed during threshing operations. The availability of farm power was increased from 0.3 kW/ha in 1960 to 1.17 kW/ha in 2007. Considering the increasing trend of farm power availability, it is expected that the power available at the farm level will continue to increase at a higher rate, as many major agricultural operations are yet to be mechanized. However, the adoption of farm mechanization in Bangladesh is hindered due to inherent problems such as small and fragmented land holdings, low buying capacity of farmers, lack of quality machines for farm operations, inadequate knowledge of machinery usage and lack of extension of information and building awareness in farming communities Which are Small and fragmented land holdings, Low buying capacity of farmers, Farm machinery quality, Inadequate knowledge and skill, Lack of extension of information and building awareness, Machinery imports and tariff policies

10 CONCLUSION

Changes in the supply chain management world are happening too fast and multinational, as the ACI is fighting endlessly to compete with the vast technical competencies to be in the leading position of the game. Customers have been the main fuel for the growth of ACI Motors' business, and these customers could be retained by ensuring a proper distribution channel and availability of expected products at the right time by maintaining a proper supply chain. ACI motors have been doing well in the market for tractors for a long time, and they are now in the market leading position with a 31% market share. Most departments contribute very effectively, but the supply chain management department makes a significant contribution. They have been following vast and effective supply chain modules for a long time. and the distribution channel working with the flow, which is why the growth rate of modern agricultural machinery is high. ACI motors imported tractors from the mother company in India, and all tractors were manufactured here. ACI motors have effectively dealt with these problems for a long time. ACI motors ensure the value of both customers and partners (Mother company of Sonalika). Political and government effects on the entire business infrastructure completely and create more opportunities for conglomerates like ACI to do their importing portion, which will lead the way to enlarge our business globally. Hopefully soon ACI motors will opt for setting up its in-house fully active supply chain module by observing the rising need of its customers and more admiration as a local brand

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

FUNDING

My deepest gratitude goes to all the co-authors and respondents who participated in this research, for their valuable information, insightful direction which improved the paper significantly and their encouragement and support during the entire research.

REFERENCES

- [1] Md A Rahman, N Fatema, S Aktar, et al. Livelihood Sustainability Status and Challenges of South-western Coastal Area of Bangladesh. 2020. DOI: 10.31014/aior.1991.03.04.226.
- [2] J-J Dethier, A Effenberger. Agriculture and development: A brief review of the literature. *Economic Systems*, 2012, 36(2): 175. DOI: 10.1016/j.ecosys.2011.09.003.
- [3] R S Varkey, P K Panda. *Inter-sectoral Growth Linkages and Their Implications for Agriculture: Evidence from Indian States*. SAGE Publishing, 2018. DOI: 10.1177/0976399618805628.
- [4] A Zafar, S Mustafa. *SMEs and its Role in Economic and Socio-Economic Development of Pakistan*. 2017. DOI: 10.6007/ijarafms/v7-i4/3484.
- [5] C P Dhakal. *Agriculture Sectors and Its Contribution to National Economy in Nepal*. 2022. DOI: 10.3126/njmr.v5i2.46074.
- [6] W B Musinguzi. *Mechanization for Small-holder Farmers in Uganda – An Innovative Approach* by Busitema University, 2018. DOI: 10.1109/weef-gedc.2018.8629723.
- [7] V Ummadi, A Gundlapalle, A Shaik, S M R B. *Autonomous Agriculture Robot for Smart Farming*. Cornell University, 2022. DOI: 10.48550/arXiv.2208.
- [8] M G F Chowdhury, M S Hossain, M A Sattar, et al. *A study on the agricultural mechanization in selected farms of Thakurgaon Sugar Mill*. 1970. DOI: 10.3329/bjar.v35i1.5879.
- [9] F Azad. *Supply chain analysis of organic vegetable export from Bangladesh: Is contract farming a feasible solution?* 2022. DOI: 10.35649/kubr.2021.16.1.5.
- [10] P N Reddy, J G Angadi. *Mechanization Gap and Assessment of Farm Mechanization Requirement for Each Operation in Different Crops*. Excellent Publishers, 2018. DOI: 10.20546/ijcmas.2018.712.151.
- [11] *Journal of Advanced Agricultural Technologies*. *Journal of Advanced Agricultural Technologies*. 2015. DOI: 10.12720/joaat.
- [12] J Racedo-Gutiérrez, C Collazos-Morales, L Gómez-Rueda, et al. *Improving Fresh Fruit Bunches Unloading Process at Palm Oil Mills with Discrete-Event Simulation,*” in *Lecture notes in computer science*, Springer Science+Business Media, 2020: 232. DOI: 10.1007/978-3-030-58799-4_17.
- [13] V Sharma, B S Sahay, G D Sardana. *An Empirical Assessment of the Impact of SCM Practices on Quality Performance: A Case in the Indian Automobile Industry*. Taylor & Francis, 2008. DOI: 10.1080/16258312.2008.11517188.
- [14] A Shah, T Mehmood, M A Hashmi, et al. *Performance of SMEs in Export Growth and Its Impact on Economy of Pakistan*. Canadian Center of Science and Education, 2011. DOI: 10.5539/ijbm.v6n7p287.
- [15] K Mwansa, B G Mwanza. *An Investigation of the Challenges of Internationalization on Export Performance of Zambia’s Manufacturing SMEs*. IISTE, 2023. DOI: 10.7176/ejbm/15-18-03.
- [16] S H Mirghafoori, A M Sharifabadi, S K Takalo. *Development of causal model of sustainable hospital supply chain management using the Intuitionistic Fuzzy Cognitive Map (IFCM) method*. *OmniaScience*, 2018. DOI: 10.3926/jiem.2517.
- [17] Y Gu, G Nayyar, S Sharma. *Gearing Up for the Future of Manufacturing in Bangladesh*. 2021. DOI: 10.1596/35879.
- [18] M Tarek, E K A Mohamed, M M Hussain, et al. *The implication of information technology on the audit profession in developing country*. Emerald Publishing Limited, 2017. DOI: 10.1108/ijaim-03-2016-0022.
- [19] Mentzer JT, DeWitt W, Keebler JS, et al. *Defining supply chain management*. *Journal of Business logistics*, 2001, 22(2): 1-25.
- [20] Tan KC. *A framework of supply chain management literature*. *European journal of purchasing & supply management*, 2001, 7(1): 39-48.
- [21] Caprioli RM, Farmer TB, Gile J. *Molecular imaging of biological samples: localization of peptides and proteins using MALDI-TOF MS*. *Analytical chemistry*, 1997, 69(23): 4751-60.
- [22] Vokurka RJ, Lummus RR. *The role of just-in-time in supply chain management*. *The International Journal of Logistics Management*, 2000, 11(1): 89-98.
- [23] Aghamohammadi A, Cheraghi T, Gharagozlou M, et al. *IgA deficiency: correlation between clinical and immunological phenotypes*. *Journal of clinical immunology*, 2009, 29: 130-6.
- [24] Mehmeti G. *A literature review on supply chain management evolution*. *Economic and Social Development: Book of Proceedings*, 2016, 13: 482.
- [25] Mehmeti G. *A literature review on supply chain management evolution*. *Economic and Social Development: Book of Proceedings*, 2016, 13: 482.
- [26] Mainuddin M, Kirby M. *National food security in Bangladesh to 2050*. *Food Security*, 2015, 7: 633-46.