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The Effect of Supply Chain Management Practices on Fertilizer Supply Chain Performance, in Ethiopia

By

Tewodros Million Endeshaw

A Thesis submitted to the Addis Ababa University School of Commerce for the Partial Fulfillment of the Requirement for the Degree of Master of Arts in Logistics and Supply Chain Management

Advisor: Shiferaw Mitiku (PhD)

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"The Effect of Supply Chain Management Practices on Fertilizer Supply chain Performance in Ethiopia."

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Approved by Board of Examiners

_____	_____	_____
Name of Advisor	**Signature**	**Date**
_____	_____	_____
Name of Internal Examiner	**Signature**	**Date**
_____	_____	_____
Name of External Examiner	**Signature**	**Date**
_____	_____	_____

Declaration

I, the undersigned, declare that, this study **"The Effects of Supply chain management Practice on fertilizer supply chain performance in Ethiopia"** is my original work Submitted to the AAU and has not been presented for a degree in any other university, and that all sources of materials used for the study have been duly acknowledged.

Declared by:

Researcher's Name: Tewodros Million Endeshaw

Place: Addis Ababa

Date of submission: June,2021

Signature_____ Date_____

Certification

This is to certify that **Tewodros Million Endeshaw** has carried out this research work on the topic entitled "**The Effects of Supply chain management Practice on fertilizer supply chain performance in Ethiopia**" under my supervision. This work is original in nature and it can be submitted for the partial fulfillment of the requirements for the award of the degree of Masters of Art in Logistics and Supply Chain Management.

_____

Dr. Shiferaw Mitiku (PhD)

Date _____

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Acronyms and abbreviations

AISE: Agricultural Input Supply Enterprise

CR: Customer Relationship

CRM: Customer Relationship Management

DAP: Di-Ammonium Phosphate

EABC: Ethiopian Agricultural Business Corporation

EATA: Ethiopia Agricultural Transformation Agency

ESLSE: Ethiopian Shipping and Logistics Services Enterprise

FOB: Freight Onboard

GDP Gross Domestic Product

LSCM: Logistics And Supply Chain Management

MOA: Ministry Of Agriculture

OPT: Optimized Production Technology

OTIF: On-Time-In-full

SCM: Supply Chain Management

SCMP: Supply Chain Management Practices

SCPI: Supply Chain Performance Indicator

SPSS: Statistical Package For Social Science

SSP : Strategic Supplier Partnership

Abstract

The primary objective of supply chain management is to create the appropriate product or service in the right amount at the right time and with minimal cost with the goal of meeting client demands as quickly and effectively as feasible. Supply chain practices are undertakings that have an impact on the whole supply chain. Despite the fact that these practices have a significant impact on supply chain performance, they are influenced by contextual factors such as sector, number of organizations involved, supply chain size, and length. As a result, the overall goal of this research was to look at the effect of supply chain management practices on supply chain performance in Ethiopia's fertilizer industry. To achieve this objectives, the study used quantitative method and the relationships proposed in the framework were tested using descriptive and explanatory research method. The primary data was collected from 145 employees of the four major entities that play major role in fertilizer supply chain in Ethiopia (Ministry of Agriculture, Ethiopian Agricultural Business Corporation, Ethiopian Shipping and Logistics Services Enterprise and Agricultural Co-operative Unions). The data was gathered using Likert scale type questions as a measuring tool for the workers' perceptions of the variables, and then analyzed using descriptive statistics, correlational, and multiple regression analysis. The study's main finding was as follows: supply chain management practices i.e. strategic supplier partnership, customer relationship, information sharing and Level of integration have positively and significantly affected the supply chain performance of fertilizer sector in Ethiopia. Specifically, level of integration and information sharing are found to have considerable impact on the performance of fertilizer supply chain. Therefore, the four organizations considered in the study need to give due emphasis in strengthening their level of integration and information

sharing in order to improve the overall performance of fertilizer supply chain in Ethiopia, thereby improve the cost and delivery time of fertilizer to farmers.

Key words*: Supply chain management practices, supply chain performance, Fertilizer.*

CHAPTER ONE

INTRODUCTION

This chapter discussed the background of the study, problem statements, research question, significance and scope of the study.

1.1 Background of the study

The Ethiopian economy is profoundly dependent on agriculture as the main source of employment, revenue, and food security. It produces about one-third of the country's GDP, employs 70% of the workforce, and amounts for 80% of the national merchandise exports (EATA , 2014). Despite the importance of agriculture to the economy The Ethiopian agricultural sector is characterized by small-scale and traditional farming, with few advanced inputs used.

Ethiopia's low agricultural production is endangering the country's survival owing to declining soil fertility, population expansion, and a lack of economic input. Increased productivity through the application of Yield Enhancing Technologies can assist boost rural incomes and contribute to an agricultural-led shift from a low-income, low-productivity, subsistence-oriented economy to a specialized, high-productivity economy. Increased fertilizer use and efficiency can help with this shift by boosting crop yields and boosting land productivity (Barbier, 2000).

In another study Ezeh *et al*., (2006) states One of the most essential inputs for increasing agricultural production and productivity is inorganic fertilizer. Ethiopia started importing fertilizer in 1970, by importing a total of 947 tons of DAP and UREA. In 2020, Ethiopia has imported a total of 1.5 million tons of fertilizer. Fertilizer is mostly imported from overseas suppliers in various countries like Morocco, Saudi Arabia, Egypt, China, and UAE.

As a landlocked country, the importing of fertilizer and distribution to the final user institutes a long supply chain involving four major entities. Hailu, (2018) identified Ministry of Agriculture (MoA), The Ethiopian Agricultural Business Corporation (EABC), The Ethiopian Shipping and Logistics Services Enterprise (ESLSE) and Agricultural cooperative unions as major players in the fertilizer supply chain in Ethiopia.

Ethiopia is a landlocked country, thus the flow of goods in and out is reliant on cooperation with its coastal neighbors. Ethiopia presently has access to four major ports for international trade. However , Djibouti port is the primary port that currently accounts for about 93% of the import-export flow of commodities (Afro Consult & trading plc, 2010). Ethiopia uses the Port of Djibouti for importing all bulk commodities, including fertilizer imports. The transportation of fertilizer from its source to Djibouti is carried out with ships chartered by ESLSE. From Djibouti port, rail and cross border trucks are utilized to transport the fertilizer to farmers' cooperative union warehouses. The trucks assume the lion's share of the fertilizer transported. As a recent newcomer to this supply chain, the Ethiopian Railway Corporation had a modest contribution to the transportation of fertilizer in the 2018 fiscal year, accounting for 4% of the transported fertilizer (Capital Ethiopia, 2019).

Despite the significance of fertilizer to Ethiopia's effort to increase agricultural productivity, the logistics practice of this crucial input remains understudied. While there are studies in the past that looked at fertilizer supply chain such as Reta Hailu,(2018), and (Rashid, et al. 2013) the organization of the logistics of importing fertilizers into Ethiopia has undergone significant transformations in recent years. These include: assigning the logistics segment to ESLSE; the emergence of the Ethiopian Railway Corporation onto the scene etc. Furthermore, the maritime element has also been overlooked, which has undergone some changes, such as maritime transportation done by ships chartered by ESLSE rather than the supplier. Hence, an analysis of the fertilizer supply chain practice in Ethiopia which takes the aforementioned developments into account is a timely undertaking.

1.2 Statement of the Problem

Fertilizer is a seasonal commodity used during specific time of the year. Fertilizer is largely used during the Meher season (approximately July to November), but also during the earlier Belg season (April to July), with the majority of fertilizer used between March and July, according to Stepanek (1998). Hence, on-time delivery of fertilizer is important to have the expected results of increased agricultural productivity from fertilizer use.

However, Fertilizer delivery is often delayed leading to year to year complain from the farmers.

A survey report by Reta Hailu (2018), indicates that "about 64.7 % of farmers complain about the late delivery of fertilizers". The report highlights the ineffectiveness of the supply chain of fertilizer in Ethiopia and raises concerns about timely delivery.

According to Gebrerufael (2015), complete control of fertilizer importation has allowed the government to reduce cost (to procure and transport on the international market) through economy of scale bargaining power, however long domestic supply chain, absence of competition and inadequate infrastructure development has resulted in late delivery of fertilizer to farmers.

According to Kefyalew, (2011) A macro-level research based on data from the Central Statistical Authority (CSA) and the Ethiopian Rural Household Survey (ERHS) reveals that late fertilizer arrival is the third most important reason for poor fertilizer application in Ethiopia, after high prices and supply shortages.

A pilot interview was conducted with the Uni-modal department at Ethiopian Shipping and Logistics Services Enterprise. According to the pilot interview delayed distribution of fertilizer to the farmers is one of the various challenges facing the fertilizer supply chain in Ethiopia.

"It is now widely recognized that faster agricultural productivity growth in Africa will not be stimulated without improvements in soil fertility levels'' (Crawford, Jayne, and Kelly 2006; FAO 2004, 2005). Crawford *et al*. (2006) further argues that use of fertilizer increases Agricultural yield by 5% on average. However late delivery of fertilizer to farmers is discouraging fertilizer use.

Spielman *et al*. (2010), quote a study which finds that half of the surveyed Ethiopian smallholders reported that their fertilizer arrived after planting. Later delivery discourages fertilizer use by farmers. When delivery is delayed and cannot be used during the required season, it is stored for the next season. According to Rashid, et al.(2013) the increase in stock leads to two problems. First, farmers are not enthusiastic about using old stock because the assumption is that the newly arrived is more effective. Second, the storage cost is added to next season's retail price , rendering the use of fertilizer more costly to the farmers.

To improve on-time delivery performance, an in-depth understanding of the present state of fertilizer supply chain is important. This study focuses on mapping the supply chain of fertilizer from demand estimation to final delivery. Strong understanding of the supply chain helps to

identify the main limitations contributing to the delay of fertilizer delivery to farmers. The study further examines the effect of fertilizer supply chain practice on fertilizer supply chain performance. Earlier studies, such as Reta Hailu (2018) and (Rashid, et al. 2013), fall short of identifying major constraints in the supply chain that contribute to the delay in the delivery of fertilizer to the farmers. This study, therefore, targets to address this knowledge gap by examining effect of supply chain management practice on the fertilizer supply chain performance.

1.3 Objectives of the study

The general objective of the study is to examine the supply chain of fertilizer in Ethiopia. This will be achieved through pursuing the following specific research objectives:

- To map the supply chain of fertilizer in Ethiopia
- To assess the supply chain management practice of fertilizer in Ethiopia
- To examine effect of supply chain management practice on fertilizer supply chain performance in Ethiopia.
- To measure the supply chain performance of fertilizer in Ethiopia.
- To identify the major bottlenecks in the supply chain of fertilizer in Ethiopia

1.4 Research Questions

The study sought to answer the following research questions:

- Who are the major actors in the supply chain of fertilizer in Ethiopia?
- How the supply chain of fertilizer is being practiced in Ethiopia?
- What is the effect of supply chain management practice on fertilizer supply chain performance in Ethiopia?
- What is the supply chain performance of fertilizer in Ethiopia.
- What are the major bottlenecks in the supply chain of fertilizer in Ethiopia?

1.5 Significance of the Study

Little research is done on the supply chain of fertilizer in Ethiopia. This research would contribute to generating a clear picture of the supply chain of fertilizer from demand estimation to final delivery to farmers. Having a clear picture of the fertilizer supply chain structure will be a good starting point for future studies and improve coordination among the supply chain actors. This research examines the effect of supply chain practice on the supply chain performance of fertilizer in Ethiopia. This research also contributes to identifying the various bottlenecks in the supply chain. Supply chain actors and policymakers can benefit from the strategies that will be forwarded by this research in improving the on-time delivery of fertilizer.

Subsequently, improving the on-time availability of fertilizer will likely contribute to increasing the agricultural productivity of farmers in Ethiopia.

1.6 Scope of the Study

When examining the effects of supply chain practice on supply chain performance in the fertilizer sector in Ethiopia the study will focus on the demand forecasting at the ministry of agriculture, the procurement process at the EABC, transportation, and delivery done by the ESLSE, and warehousing function done by the cooperative unions. The focus of this study is to examine the effect of supply chain management practice on the supply chain performance in the fertilizer sector in Ethiopia.

Due to no production function in the supply chain activity of fertilizer in Ethiopia The scope of this study is limited to the planning sourcing and delivering process of the supply chain functions.

Methodologically, the study was delimited to the descriptive and explanatory research type, and the researcher intended to describe, analyze and investigate the effects of supply chain management practices on fertilizer supply chain performance in Ethiopia. The time to prepare the study and deliver the thesis was delimited to October 2021 to June 2021G.C.

1.7 Operational Definition of Terms and Concepts

Supply chain management (SCM)

The term "supply chain" refers to the integrated and coordinated flows of products from point of origin to point of destination, as well as the related information flows. (Little, A. 1999).

Supply chain management Practice

A collection of activities done in an organization to achieve effective and efficient supply chain management is characterized as supply chain management practices. (Suhong Lia, 2006).

Supply Chain Performance

Supply chain performance is defined by Fugate et al. (2010) as the measurement of the efficiency or effectiveness of a supply chain activity's outcome.

The major indices for measuring supply chain performance have been efficiency and effectiveness (Beamon, 1999)

Efficiency

The term "efficiency" refers to the connection between input and output (Bowersox et al. 2010). A supply chain is described as efficient when the focus is on cost reduction and no resources are spent on non-value-added processes, according to Naylor, et al (1999).

Effectiveness

Effectiveness relates to how well supply chain goals have been achieved (Bowersox et al. 2010)

Strategic supplier partnership

Defined as the Cooperation to work closely with suppliers who can work in collaboration and with responsibility for the success of the company**.** . (Radas S, 2009)

Customer relationship

Customer relationship management (CRM) is a consistent organizational activity that aims to identify the customer's true needs via the use of an integrated selling, marketing, and service approach (Koskela, 1999).

Level of information sharing

Information sharing is described as the readiness of business partners to exchange private data in order to track the status of items as they move through various stages of the supply chain. (Simatupang,2002)

Level of integration

Supply chain integration is defined by the characteristics such as Partnerships, Collaboration, teamwork, sharing of information, mutual trust, mutually used (Ronald, 2000).

1.8 Organization of the Thesis

There are five chapters in all in this thesis. The first chapter addresses the introduction, statement of the problem, research question objective, and scope of the study. In chapter two, existing literature will be analyzed. It included the noteworthy theoretical and empirical studies of other writers which are related to supply chain management practice and fertilizer in Ethiopia. In chapter three, deliberates on methodology and data collection methods. The fourth chapter deals with result discussion and interpretation and the fifth chapter, delivers a summary, conclusion, recommendations and limitations, and implications of the research topic for further study.

CHAPTER TWO

REVIEW OF THE RELATED LITERATURE

2.1 Introduction

This chapter is arranged into 4 categories. The theoretical review discusses literatures related with supply chain mapping, supply chain management practice, supply chain bottlenecks and supply chain performance. The Empirical review deals with previous literatures about supply chain of fertilizer in Ethiopia. The theoretical framework explores existing theories that guides how this study should proceed to achieve its objectives. last the conceptual framework shows the structure on how this study planned to proceed.

2.2 Theoretical Literature Review

2.2.1 What is supply chain management

No society can produce everything it needs no matter how rich its mines, how skilled its members or how advanced its technology. To bridge this gap, resources are mobilized from one part of the world to another integrating various players sometimes involving a long chain.

The supply chain and the management of it, is a broad subject that has many definitions. The definitions stated below give a general understanding of the subject.

All parties engaged in completing a consumer request, whether directly or indirectly, make up the supply chain. Not only do manufacturers and suppliers play a role in the supply chain, but so do transporters, warehouses, retailers, and even customers. “The supply chain encompasses all operations involved in receiving and fulfilling a client request inside a company. New product creation, marketing, operations, distribution, financing, and customer support are just a few of these roles” (Chopra.S & Meindl. P, 2007).

According to Simchi-Levi *et al*., (2000), Suppliers, distribution services, and consumers are constituent components of a supply chain, which is a combinatorial system that consists of four processes: plan, source, make, and deliver. Supply chain management has shown to be a very effective mechanism for providing fast and dependable delivery services at the lowest possible cost.

Societies with well-developed supply chain infrastructure and practices are able to trade resources rapidly and cheaply. Logistics and supply chain management are ancient principles that shaped the outcome of wars and the development of nations. The efficient movement of supplies and information was critical to nations' economic success, armies' victories, and traders' profit. However, the importance of supply chain management to organizations' performance recognized and researched as a subject only recently (Christopher, 2016). Various researchers define logistics and supply chain from different perspectives.

The supply chain, according to Chow, *et al.*, (1999), is the group of manufacturers, suppliers, distributors, retailers, and transportation, information, and other logistics management service providers engaged in providing products to consumers. on the other hand Aitken J. (2000) Supply chain is described as a network of interconnected and interdependent companies that collaborate to regulate, manage, and enhance the flow of products and information from suppliers to end-users.

According to Simchi-Levi *et al.*, (2000), Suppliers, distribution services, and consumers are constituent components of a supply chain, which is a combinatorial system that consists of four processes: plan, source, make, and deliver. Supply chain management has shown to be a very effective mechanism for providing fast and dependable delivery services at the lowest possible cost.

2.2.2. Supply chain Mapping

One of the first steps to understanding an entire supply chain is to map it. A map is a visual form of language to communicate information (Muehreke & Murhreke, 2003). In order to have a better picture of the entire supply chain, mapping plays an key Role, A supply chain map provides a representation of the business environment just as a roadmap provides a spatial representation of a city. Supply chain map helps us navigate through the supply chain process and networks of interconnected organizations .

Various research shows that to achieve an optimal supply chain performance, it is essential to map the supply chain to show the overall connectivity of every partner in the system (Gardner & Cooper, 2003). Mapping provides clear visibility to the supply chain and such visibility provides easy access to control the flow of material, finance, and information across the chain. The term "mapping" refers to the process of graphically demonstrating a chain. The chain functions,

establishments, and organizations must all be specified for this purpose (Rashid, *et al*. 2013). It would be challenging to identify obstacles and implement any improvement mechanism if managers don't know what's going on in their supply chain. The primary stakeholders in Ethiopia's fertilizer supply chain will be identified and their distinct responsibilities will be described in this study.

2.2.3. Supply Chain Management practice

Present-day supply chains are complex involving multiple companies working together for a single goal. This complexity and involvement of various stakeholders required the need for a universal framework for measuring and benchmarking.

The practice of SCM discusses the whole set of actions that are done in organizations to improving the performance in the internal supply chain. SCM practices are described as a collection of actions carried out by the companies to achieve successful supply chain management (Suhong Lia, 2006). Supply chain management (SCM) describes how companies use their suppliers' processes, technology, and capabilities to improve supply chain performance and gain a competitive advantage, as well as how manufacturing, logistics, materials, distribution, and transportation functions are coordinated within companies (Billington, 1992).

2.2.4 The dimensions of supply chain management practices

Many writers have looked at supply chain management practice, and there are a variety of aspects and dimensions that have been examined or utilized to measure supply chain practice. for more exploration some of them are summarized below in Table 1:

Table 1 Dimensions of Supply chain management practice.

No	Author	Dimension
1	Chin *et al*. (2011)	Information sharing, customer relationship, strategic supplier partnership, material flow management and corporate culture.
2	(Inda Sukati, 2012)	Strategic supplier partnership ,customer relationship, information sharing
3	Chowa , *et al*, (2001)	There are four elements (suppliers and customer mgt , information sharing , speed of communication , supply chain

		features)
4	Min & Mentzer (2004)	There are seven elements of supply chain practice such as a greed vision and goals, information sharing, risk and award sharing, cooperation, process integration, long-term relationship and a greed supply chain
5	Chen & Paulraj, (2004)	Using supplier base reduction , long-term relationship , communication , cross-functional teams and supplier involvement to measure buyer-supplier relationships
6	Tan, Lyman and Wisner, (2002)	Six elements of supply chain practice (using factor analysis) supply chain integration , information sharing supply chain characteristics customer service management , geographical proximity and JIT capability
7	Alvarado & Kotzab (2001)	Using inter-organizational system in supply chain practice such as EDI , and elimination of excess stock levels by postponing customization toward the end of the supply chain
8	Tan , Kannan and Handfield (1999).	Supply chain practice includes purchasing quality , and customer relations.
9	Donlon , (2012)	Supply chain practice includes supplier partnership , outsourcing cycle time compression , continuous process flow and information sharing

Source : Adopted from (Ibrahim, S.B. and Hamid, A.A., 2014.)

2.3 Empirical Literature Review

2.3.1 Strategic Suppliers Management

The long and short term relationship between the business and its suppliers is represented by the supplier relationship. An effective supplier's management can be an crucial component of a modern supply chain (Gharakhani, 2012). Organizations can engage closely with suppliers who can collaborate and share responsibility for the company's success by forming strategic

supplier relationships. According to Radas S, (2009), collaboration with other businesses or organizations, which includes suppliers, has a positive and substantial influence on total supply chain management innovation and success. Successful SCM should be enabled by such strategic supplier relations.

Hypothesis 1: Strategic supplier management practice positively and significantly affects the fertilizer supply chain performance in Ethiopia.

2.3.2 Customer Relationship.

Customers are key to businesses existence, therefore firms must understand present and future consumer needs, meet customer criteria, and aim to surpass customer expectations. Customer relationship management is central part of supply chain management (Gharakhani, 2012). Customer relationship management (CRM) is a continuous organizational activity that includes integrated selling, marketing, and service strategies (Koskela, 1999). That is, the organization tries to determine the true demand of the consumer by integrating multiple processes and technology, and then asks for internal product and service innovation in order to increase customer pleasure and loyalty.

Hypothesis 2: Customer Relationship management practice positively and significantly affects the fertilizer supply chain performance in Ethiopia.

2.3.3 Supply chain integration

Supply chain integration, according to Clancy (2018), aims to improve the connections within each component of the chain, (to allow) better decision making, and have all the components of the chain interact in a more structured manner, thus establishing supply chain visibility and detecting bottlenecks. The main drivers of integration are listed by (Handfield, 1999) as:

1. The information revolution,
2. Increased levels of global competition which created a more demanding customer and demand driven markets and
3. The emergence of new types of inter-organizational relationships.

Hypothesis 3: Supply chain integration practice positively and significantly affects the fertilizer supply chain performance in Ethiopia.

2.3.4 Information sharing

Information sharing is the capability of the organization in sharing information or knowledge with supply chain allies to optimize its operation effectively and efficiently.

One of the most essential capabilities of the supply chain process is effective information exchange. Effective information sharing is one of the most critical competencies of the supply chain process (Lee, 2002) .He stated that information needs to be understood between one system and another across the supply chain. Zailani and Rajagopal, (2005) add that the technological tsunami of the internet and e-commerce offers a fresh chance to build a "smart" supply chain that distributes data in real time.

Simuatupang, (2002) defined information sharing as the willingness to share private data between business partners in order to be able to follow up the progress of products as they pass through various stages in the supply chain.

According to Simuatupang, (2002) Data collecting, processing, storage, presentation, retrieval, and broadcasting of demand and forecast data, inventory status and location, order status, cost-related data, and performance status through the internet and intranet were also recognized as aspects of information sharing.. Internet and intranet can be distinguished based on characteristics such as access, users, and information. Internet is accessed by the general public in various formats hence its fragmented and inconsistent. Intranet however is private share only between business partners and in a consistent and coherent manner.

Hypothesis 4: Information sharing practice positively and significantly affects the fertilizer supply chain performance in Ethiopia.

2.3.5 Supply chain performance

A supply chain performance measure is a tool for evaluating a supply network's efficiency. A supply chain performance indicator (SCPI) is a numerical reference or representation of an organization's supply chain success that is empirically observable. (Neely, 2003; Lapide, 2000).

The major indices for measuring supply chain performance have been efficiency and effectiveness (Beamon, 1999). In another definition by Fugate *et al.* (2010) for the assesement of supply chain performance the efficiency or the effectiveness of an outcome of a supply chain activity is analyzed.

The term "efficiency" implies to an input/output relationship, whilst "effectiveness" relates to how successfully have supply chain objectives been met (Bowersox et al. 2010). In this way, Supply chain performance can be measured as a function of supply chain resource utilization or as a comparison of supply chain outcomes to supply chain objectives.. To measure supply chain performance: (Beamon 1999) identifies the following metrics:

Table 2: Supply Chain Performance Measure.

Metrics	References
Cost	Cohen & Lee (1989) Cohen & Moon (1990) Pyke & Cohen (1994) Lee & Feitzinger (1995)
Cost & Activity Time	Arntzen *et al*. (1995)
Cost & Customer Responsiveness	Ishii *et.al* (1988) Towil (1991) Towill, Naim & Wikner (1992) Newhart, Stott & Vasko (1993)
Customer Responsiveness	Lee & Billington (1993)

Source: Adopted from Bemoan, (1999)

Beef supply chain performance may consider those elements above including cost, time, customer responsiveness & flexibility.

2.3.5.1 Supply chain performance Effectiveness:

Effectiveness is one of the measure of supply chain performance. Effectiveness is define as the resource getting ability , and refers to absolute level of outcome attainment (Osttroff, 1993). Effectiveness measures how well the supply chain goals are achieved. How well an organization can move products from their conception to the customer in a reliable manner quickly and being able to respond to sudden changes. also defined as the ration between the actual output and normal or expected output (Brian S. Fugate & Stank, 2010).

2.3.5.1.1 Reliability

The most important aspect of reliable supply chain management is a solid relationship among the chain's members, in which they may have mutual faith in each other's skills and actions. Therefore, In the creation of any integrated supply chain, developing partner confidence and trust, as well as designing a reliable system for them, are critical components in achieving long-

term success (Ghazanfari and Fatholla 2006). In the current industries, choosing business partners and establishing a successful and sustainable communication with them regarding the previous standards and criteria is not practicable. Hence, Defining the criteria and conditions by which the best suitable partner might be selected appears to be beneficial. The reliability factor is also one of the most effective criteria, by which the probability of the intact and impeccable performance of the system for a definite and pre-scheduled period of time (Haj Shirmohammadi, 2002) According to A. Solano and *et al*. (2016). Measuring the supply chain's reliability is a key step in promoting the development of more resilient chains. To ensure the efficient and safe worldwide flow of products, resilience is required.

2.2.5.1.2 Flexibility in supply chain management

One strategy for gaining and keeping a competitive advantage in a dynamic environment is to create a flexible supply chain. Several articles explain how current market conditions require supply chains that are capable of dealing with sudden changes of demand and strategies instead of a cost and/or speed oriented view solely. According to Grigore, S.D., (2007) flexibility can be defined as the ability to meet an increasing variety of customer expectations without excessive cost, time, organizational disruption or performance losses.

Changing market demand, differing supplier lead time, product quality and information delay are sources of uncertainty that create a need for building 'flexible'- supply chains that can deal with these changes and preferably in a better way than their rivals (Giannoccaro *et al*, 2003). In doing so, a competitive advantage can be attained. Literature about flexibility in supply chain management describes several definitions about this concept. Viswanadham & Raghavan, (1997) describe this concept as the ability of a business process to effectively manage or react to changes with little penalty in time, cost, quality or performance.

2.2.5.1. 3 Responsiveness in the supply chain management

The ability of supply networks to respond to changing market demands and their overall efficiency are critical concerns in supply chain design and management, and they are now receiving a lot of attention from both the scientific community and practitioners. According to Holweg (2005) responding intelligently and within a suitable timeframe to client demand in the marketplace, in order to attain or sustain competitive advantage, is characterized as responsiveness.

One feasible way to improve supply chain responsiveness is to raise product inventory levels, which would allow for more flexibility. Increasing inventory, on the other hand, reduces supply chain efficiency since it is costly, both in terms of storage and capital costs, as Hopp and Spearman (2004) point out. Management must make trade-off judgments between providing the correct degree of responsiveness and maintaining an efficient supply chain.

2.2.5.2 Supply chain performance efficiency

It's necessary to think about the efficiency notion before selecting what approaches to utilize in measuring efficiency. A variety of efficiency ideas, such as production and cost, have been used to estimate efficiency. On a production function, productive efficiency is defined as the distance between an individual institution and the 'optimal' or 'best practice' institution (Securing, 2002). Explain efficiency in a supply chain Naylor, *et al.* (1999) argues that when the focus is on cost reduction and no resources are spent on non-value-added operations, a supply chain is characterized as efficient.

2.2.5.2. 1 cost

Easier access to information and online bidding on the internet has forced suppliers in many industries to reduce cost dramatically to stay competitive. Cost has increasingly become key competitive edge between firms and supply chains.

Taking into consideration the SCM definition, it becomes clear that costs are not only caused by material and information movements throughout the supply chain, but also by the interactions within the supply chain itself, according to Stefan Securing (2002). There are three cost levels to consider: direct, indirect, and total expenses in a supply chain, as well as finding the suitable partner to control them.

According to John Ashton (1998), cost efficiency measures how different an individual institution's production costs are from the production costs of a best practice institution or corporation working under identical conditions and delivering the same outputs. The cost function assumes that individual institutions' total production costs are determined by the price of variable inputs such as capital and labor, the quantity or value of outputs produced, random error, and any other additional variables accounting for the environment or unique circumstances of

each institution. A cost function allows the least cost proportions of inputs to be measured in terms of input prices.

2.2.5.2.2 Asset management

Based on Tetyana Kovalchuk , and Andriy Verhun (2019), In the supply chain, asset management is an key element that is generally represented in two directions: cash to cash cycle time and Return on Investment. each component are indicative of the supply chain performance in terms of its asset management

Though there are various definitions; in general, cash-to-cash cycle is defined as “the average days required to turn a dollar invested in raw material into a dollar collected from a customer” (Stewart, 1995). Cash to cash cycle time contribute to the supply chains performance in terms of evaluating how efficiently the firm’s assets are utilized to achieve the supply chain goals.

Dell and Xerox, for example, enjoy a competitive advantage over their market competitors because to efficient supply chain operations. These methods are primarily focused on decreasing supply chain uncertainty, lowering inventory costs, and speeding up the cash-to-cash cycle (Sheridan, 2000).

Return on investment is another generally used key indicator used in studying the financial standing of a company and viewed by many authors and practitioners as an proper means of measuring management’s efficiency in utilizing company resources (Financial Accounting, 2012).

ROA shows how well or ill management the company’s total assets are employed to make a profit (Twineyo-Kamugisha, 2017). In addition it indicates if it is worth using borrowings to finance assets (if the interest rate for the borrowings is lower than the return on total assets, the use of borrowings has proved worthwhile) (Schwetje, Vaseghi, 2007).

Table 3: Dimension of Supply Chain Performance Measurement based on Score Model

Dimensions	Definitions	Items
	Effectiveness	
Reliability	Supply chain performance is in delivery of right product, at the right time, to the right place, and in a good condition and package, in a good size and amount, with a proper documentation and appropriate client	100% delivery of order Delivery performance to customer on time Product delivery with perfect condition
Responsiveness	Quick delivery of products to customer in the supply chain	Sourcing cycle time Manufacturing cycle time Delivery cycle time
Flexibility	able to react on sudden changes in demand and quantity	Volume flexibility Delivery flexibility Number of Back orders
	Efficiency	
Cost	Cost related with in the supply chain operations	Direct and indirect Cost of the SC. Distribution and selling Expense of products
Asset management	The effectiveness of an organization in management of its property and asset to support responsiveness to demand	Cash to cash cycle time Return on investment (profitability)

Source : Adapted from Hamidianpour, *et al* (2016)

2.3.6. Supply chain bottlenecks

When supply chain delay is encountered, bottle necks rather than one time disruptions (like weather or traffic) are often the root cause. So understand what bottlenecks are and their root cause is important.

The bottleneck is the slowest activity in a series of activities. In the supply chain context, it is the activity that determines the speed of all the other processes.

2.3.6.1 Causes of bottle neck emergence.

On the topic of supply chain bottlenecks, states: "All the logistics processes can be viewed as a network of interlinked activities that can only be optimized as a whole by focusing on total throughput time. Any attempt to manage by optimizing individual elements or activities in the process will lead to a less-than-optimal result overall". (Christopher 2016)

The throughput time of the entire system is determined by bottleneck activities. So to speed up total system throughput time it is important to focus on improving the efficiency of bottlenecks.

The author further states: Constraint limits the output of every system, whether we acknowledge it or not. When properly identified and managed, constraints provide the fastest route to significant improvement and form the bedrock for continuous growth. When ignored, the constraint may lay idle, squandering system capacity. An out-of-control constraint may also wreak havoc on delivery schedules and cause unpredictable delays. It is therefore crucial for any manager to make the most of their constraint and learn to manage it well.

2.3.6.2. Mapping the Supply chain of fertilizer in Ethiopia

Inorganic fertilizer is an import commodity in Ethiopia. This makes international/overseas suppliers major stakeholders in the supply chain of fertilizers in Ethiopia. EABC (formerly knows as AISE) is the sole importer of fertilizers, and agricultural cooperative unions serve as retailers and distribution centers according to Reta H. (2018).

Rashid, *et al*. (2013) states that: Numerous parties participate in Ethiopia's fertilizer value chain, which consists of three distinct sets of operations: (1) Import planning, (2) import execution, and (3) marketing and distribution.

The agricultural bureau conducts a demand estimate based on primary data gathered by agricultural extension workers in the Woreda, which is the first step in the import planning process. This information is then consolidated at the zonal and regional levels. To arrive at a national demand estimate, the Ministry of Agriculture and Rural Development adds together the regional estimates. The overall import quantity for that year is derived by subtracting the previous year's stock from the current year's projected demand.

Preparing tender paperwork and floating tenders on the international market are all part of the import execution procedure. According to Rashid *et al*. (2013), in order to obtain more negotiating leverage by importing big quantities of fertilizer, AISE (EABC) is solely responsible for carrying out fertilizer imports into the nation. The Ethiopian federal government decided in 2008 to coordinate all fertilizer imports via a single business in order to take advantage of economies of scale and conserve foreign currency by purchasing in bulk (World Bank, 2011).

Describing the process after arriving at Djibouti port Hailu (2018) states that: "Once it arrives ESLSE handles port clearance, follows vessel arrival, discharge, trucking and dispatch, local customs clearance and delivery up to the respective central warehouse of the four regions"

Aside from the aforementioned parties, transporters, ESLSE, Djibouti port, and ERCA are also involved. Other regulatory and financial organizations have a significant influence in Ethiopia's fertilizer supply chain performance.

Stepanek (1998) stated that Fertilizer is used mostly during the Meher season (approximately July to November), although it is also used during the earlier Belg season (approximately April to June) (April to July). Between March and July, the majority of fertilizer is applied. So the demand for fertilizer use is seasonal and requires proper coordination along the supply chain to deliver a sufficient amount before the farming season. One way of ensuring sufficient supply is by carrying sufficient safety inventory. However, according to Rashid, *et al.* (2013) "keeping large stocks in the storage makes costs to be transmitted to retail price next year, Making fertilizer more expensive for farmers". Keeping large stock causes damage to the fertilizer and exposes it to pilferage due to lack of enough warehouse facility in the four major regions.

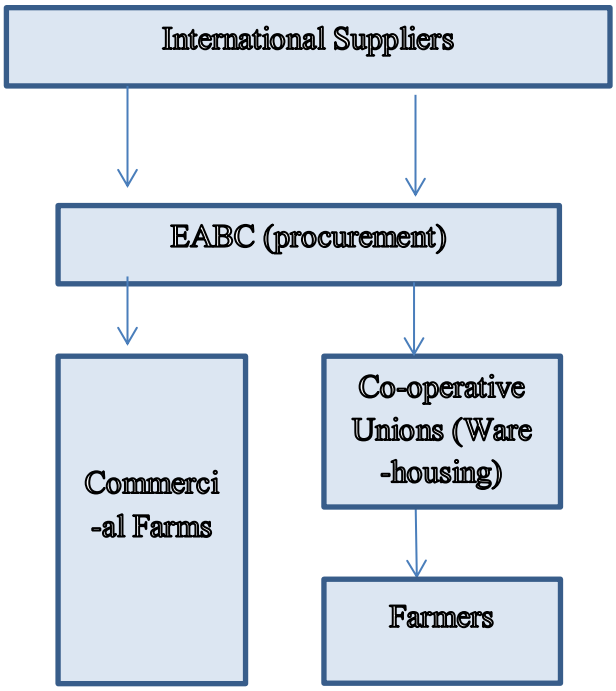

Figure 1: fertilizer distribution in Ethiopia.

Adapted from IFDC, 2012

2.3.6.3 Supply chain practice of fertilizer in Ethiopia

To increase agricultural productivity use of fertilizer is regarded as a strategic goal in Ethiopia. Since fertilizer is not produced in Ethiopia the supply and distribution of fertilizer from overseas to farmers pass a long supply chain structure. To make cost-effective and timely delivery of fertilizer, the government has implemented various policies on the fertilizer supply chain.

2.3.6.3.1 The planning process

Overall Ministry of Agriculture is responsible for the assessment and forecasting of fertilizer need for the next planting season. The evaluation of fertilizer demand is the first step in import planning. It's a bottom-up strategy. Extension personnel known as Development Agents (DA) collect farmers' needs at the Kebele (sub-district) level. Demand evaluations are also carried out by certain primary cooperatives. The woreda (district) bureau offices reconcile the development agent and cooperative estimates before sending them to the zonal offices. The zonal offices collect data at the woreda level and provide estimates to the Bureau of Agriculture and Rural Development (BoARD).

Finally, the Ministry of Agriculture and Rural Development combines the regional forecasts to provide national demand forecasts. The net import need is calculated by subtracting carry-over stockpiles from the current year's fertilizer demand.

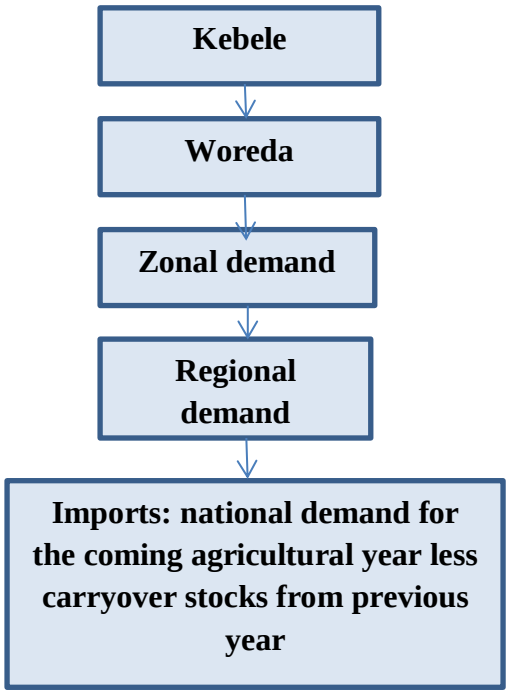

Figure 2: The Process (steps) of fertilizer demand estimation in Ethiopia

Source: IFDC, 2015

2.3.6.3.2 *The sourcing process*

Agricultural Inputs Supply Corporation (AISCO), which was renamed Agricultural Inputs Supply Enterprise (AISE) in 1992 and is now renamed Ethiopian Agricultural Business Corporation (EABC), is a government-owned enterprise that is awarded the role of fertilizer importer every year, leaving fertilizer distribution to cooperatives.

Government agencies also play an important role in controlling supply, setting marketing margins and pricing, and overseeing the EABC and cooperatives. (Daniel D.,2020), The EABC advertises fertilizer tenders on the worldwide market for the two main planting seasons.

2.3.6.3.3 *The delivering process*

I. Transportation (ESLSE)

In addition to being the sole importer EABC used to be responsible for distribution of fertilizer to farmers through farmer's cooperative unions. However current policy changes have given ESLSE responsibility to transport Fertilizer from suppliers port to final cooperative warehouses.

II. Warehousing (Cooperative unions)

In the long supply chain line of importing fertilizer form over seas suppliers co operative unions are at the bottom link of receiving the fertilizer and distributing it to their members/farmers.

The Ethiopian government has placed a strong focus on developing co-operatives as one of the key organizational vehicles for improving food security and decreasing rural poverty as part of its attempt to modernize the agricultural sector (Tefera D. A. et al.2016).

This agricultural cooperatives in the four regions of the country (Amhara, Oromia, Tigrai and SNNP) have warehouse that serve as a distribution point for agricultural inputs. Agricultural cooperatives, for example, are intended to alleviate constraints by providing a variety of services, which including input/output marketing, expanding financial services in rural areas, purchasing agricultural machinery and equipment among other. (FDRE 1998).

One of the important roles played by Co-operative unions is to distribute fertilizer to their farmers by receiving fertilizer in their warehouses. The imported fertilizer after transportation by ESLSE will finally be received by the cooperative union warehouses.

This agricultural cooperatives in the four regions of the country (Amhara, Oromia, Tigrai and SNNP) have warehouse that serve as a distribution point for agricultural inputs.

2.3.6.3.4 Bottlenecks in the supply chain of fertilizers in Ethiopia

To avail fertilizer to farmers effectively and efficiently there are vital inputs and practices that need to be implemented in the supply chain. A study by Camara and Heinemann,(2006) states that, Transport, communication and storage infrastructures are key to fertilizer availability. The study further argues internal transportation costs are usually high in Africa because of poor infrastructure.

According to IFDC (2001), a well-functioning market requires, the flow of fertilizer market information to be smooth and timely. According to a research by Budiman (2004), supply fluctuations were caused by capacity adjustments, lead times, order processing delays, and order wait times.

In its analysis of fertilizer supply chain in Ethiopia Reta H, (2016), The primary difficulties to fertilizer delivery in Ethiopia were identified as a lack of storage facilities across the nation, delays in customs clearance and transit time, truck shortages, transportation issues, documentation requirements, and infrastructural issues. On the other hand Gebrerufael (2015), in his study, discovered a flaw in Ethiopia's fertilizer demand estimating mechanism, implying a discrepancy between yearly demand estimates and effective fertilizer demand. This study has also highlighted long fertilizer supply chain and late delivery of fertilizer is due to inadequate infrastructure development in Ethiopia. According to a research by DASH (n.d.), one of the most serious difficulties in fertilizer delivery is a lack of sufficient and standard storage capacity, particularly in regions with union cooperatives. Due to that, trucks have spent several days unloading fertilizer at warehouses.

A study on fertilizer supply chain in Ethiopia by Gregory, D.*et.al*, (2006), reveal that market development restrictions were impacting the performance of fertilizer markets. This include lack of market information, infrastructural constraints, problem accurate demand estimation, problem of transport and handling, and long transport distances and inadequate infrastructure.

2.4. Identified literature Gap

The information regarding the Supply chain structure of Fertilizer is not updated according to current policy changes that have given ESLSE a major role beyond what is shown on the research paper by Reta H.(2018). Port clearance and customs handing at Djibouti port . The recent role of Ethio-Djibouti Railway's contribution in the year 2020 is not included as well.

The lead time of fertilizer is also found to be more than 6 months and survey reports by Reta Hailu showed 64.7 percent of farmers complained about the late delivery of fertilizer. However, previous studies have not identified the major constraints contributing to the long lead time and delay in delivery time. There is also a gap in suggesting fitting strategies that would help improve fertilizer supply chain performance.

Although there are at least four organization who have major role in the fertilizer supply chain in Ethiopia previous studies such as Lina Z. (2017) studied the effect of supply chain management practice only on each individual organizational performance . This study tries to analyze the effect of supply chain management performance practice on the fertilizer supply chain performance across all the organizations.

Furthermore, Previous research, such as (Rashid, *et al.* 2013), have failed to uncover important supply chain bottlenecks that contribute to the delay in fertilizer delivery to farmers. As a result, the goal of this research is to fill in the gaps in the knowledge base by examining supply chain management practices and their influence on fertilizer supply chain performance.

2.5 Conceptual frame work

A conceptual framework, according to Wilson *et al*. (2015), is a visual or written output that explains the key items to be investigated, ideas, or variables, and the supposed relationship among them, either visually or in narrative form. Conceptual framework is also described by Jabareen (2009), as a collection of related concepts that collectively give a full explanation of a phenomenan.

Figure 3 below illustrates the conceptual framework of this study. The conceptual framework highlights the influence of supply chain management practices on the fertilizer supply chain performance in Ethiopia, based on the research questions, literatures, and assumed link between supply chain management practices and supply chain performance.

This study adapts Supply chain integration, information sharing, customer practice, supplier practice as independent variable and or supply chain performance (effectiveness and efficiency) as dependent Variable.

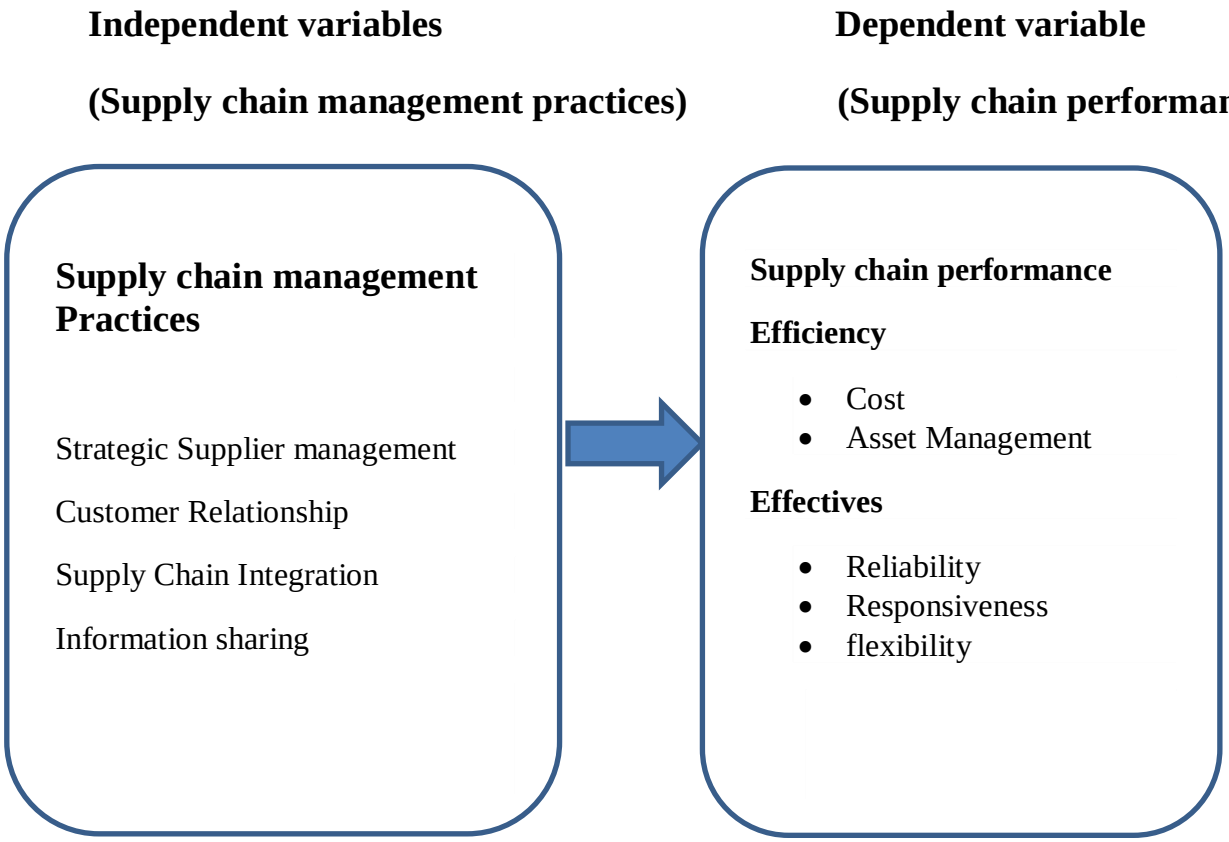

Figure 3 conceptual framework

Source: Adapted from: Ibrahim, S.B. and Hamid, A.A., 2014.

2.5 Hypothesis summery

Hypothesis 1: Strategic supplier management practice positively and significantly affects the fertilizer supply chain performance in Ethiopia.

Hypothesis 2: Customer Relationship management practice positively and significantly affects the fertilizer supply chain performance in Ethiopia.

Hypothesis 3: Supply chain integration practice positively and significantly affects the fertilizer supply chain performance in Ethiopia.

Hypothesis 4: Information sharing practice positively and significantly affects the fertilizer supply chain performance in Ethiopia.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section covers the research methodology that utilizer to conduct this research. It presents the research approach, design, population and sampling, data collection instruments and data analysis techniques.

3.2 Description of study area

Although fertilizer is being imported in Ethiopia since the 1970's the supply chain of fertilizer has not been given the attention it deserves and not many researches are done in the field. This coupled with the complex nature of the import supply chain of goods into Ethiopia has marred the sector with various problems among which is a delay in the delivery time. This research aims at identifying the major actors of the fertilizer supply chain in Ethiopia and explains how supply chain management practice affects fertilizer supply chain performance in Ethiopia. The study further identifies the major bottlenecks of the fertilizer supply chain in Ethiopia that contributed to late delivery. The research focus on 4 major players in the fertilizer supply chain structure in Ethiopia. Ministry of Agriculture plays a mojor role in fertilizer demand estimation process, EABC is responsible in procurement and contract management of fertilizer. ESLSE takes care of the transportation and distribution process from loading port to delivery at the cooperative warehouses. Co operative unions play a major role in warehousing and distribution to the farmers in their locality.

3.3 Research Approach

According to Creswell (2005), the three most frequent methodologies used in research are quantitative, qualitative, and mixed approaches, none of which are superior than the others. It all depends on how the researcher wants to conduct the study. Quantitative research, he claimed, is a type of educational research in which the researcher decides what to study, asks specific, narrow questions, collects numeric (numbered) data from participants, analyzes these numbers using statistics, and conducts the investigation in an unbiased, objective manner. Whereas A qualitative

method is used to uncover the meaning behind outcomes that are normally assessed or quantified using a quantitative method. A mixed research method is a type of study in which the researcher use both quantitative and qualitative research techniques or approaches, in one study (Kothari, 2004).Because mixed research captures the best of both qualitative and quantitative techniques, it was employed in this study. The advantage of adopting mixed methods, according to Greener, 2008 and Saunders et al. (2007), is that it allows you to triangulate and support the data and results gathered via questionnaire.

3.4 Research design

Three sorts of study designs are discussed by various writers. The three types are exploratory (which stresses the discovery of new ideas and insights), descriptive (which focuses on identifying the frequency with which an event occurs), and explanatory (which explains why something happens) (concerned with determining the cause and effect relationships). The researcher employed both descriptive and explanatory study characteristics, allowing for quantitative and qualitative data analysis as well as inferential statistics. The descriptive study allowed the researcher to explain the data and to learn more about the event, whereas the explanatory study looked at the correlations between factors. Explanatory research focuses on why inquiries, according to Cooper and Schindler (2000). The research is concerned in generating causal explanations in order to address the "why" questions. Causal explanations claims that phenomenon Y (supply chain performance) is influenced by factor β (supply chain practices). As a result, the study took a descriptive and explanatory method, elucidating the impact of supply chain integration, information sharing, customer management, and supplier management on fertilizer supply chain performance in Ethiopia.

These two study strategies make it easier to do research that is as efficient as feasible and yields the most information (Kothari, 2004).

3.1.1 Variables of the study

There are both dependent and independent variables in this study.

Independent variables are; supply chain integration, information sharing, customers management, suppliers management and responsiveness on

Dependent variable; Supply chain performance (Efficiency and effectiveness)

3.5 Research Population and sampling

3.5.1 Population

According to Mugenda & Mugenda (2003), the target population refers to all members of a real group of people, events, or objects to whom the study generalizes hypothetical research findings. A well-defined group of persons (or things) with certain common observable features that are being examined is often referred to as a population. For this study, the population was employees of Ministry of Agriculture (Procurement Of Agricultural Inputs Department) Ethiopian Agricultural Business Corporation (Agricultural Inputs Supply EO), Ethiopian Shipping and Linguistics Service Enterprise(Unimodal, Commercial Departments) and Co-operative unions located around Addis Ababa . Those organizations and their respective departments selected because they are responsible for the forecast, procurement, transport and distribution of fertilizer in Ethiopia as well as activities of fertilizer supply chain is directly related with those selected departments within the supply chain. The total population within respective departments is summarized in the following table.

Table 4: Target Population of the Study

Organizations/Departments	Population
MOA (Procurement Of Agricultural Inputs)	46
EABC(Agricultural Inputs Supply EO)	37
ESLSE (Unimodal Commercial)	49 41
Co-operative unions around Addis Ababa	12
Total	**185**

Sources: MOA, EABC, ESLSE, Co-operative unions, 2021.

3.5.2 Sampling method

Alreck & Settle (2005) stated that the choice of sample size is made after considering statistical precision, practical issues and availability of resources. Samples that are selected on a random basis are considered as a representative of the population. Because the target population is diverse, the researcher used probability sampling, specifically stratified random sampling, to pick a sample from the target group. According to Malhotra and Peterson (2006), there is no one-size-fits-all method for determining sample size, therefore there are a variety of shortcomings in deciding sample size. The greater the sampling size of a research, the more accurate the data obtained. Yamane's (1967) method was used to calculate the sample size for the study, which was based on a 95 percent intended confidence level and a 5% desired precision level.

$$n = N/(1 + (N * e^2))$$

$$n = 185/(1 + (185 * 0.05 * 0.05))$$

$$n = 165$$

Where:

N=Population size

e=Tolerance at desired level of confidence, take 0.05 at 95% confidence level.

n=sample size

The sample size of the study was

Table 5: Sample size of the Study

Organizations/Departments	Population	Sample
MOA (Procurement Of Agricultural Inputs)	46	41
EABC(Agricultural Inputs Supply EO)	37	33
ESLSE (unimodal department & Commercial)	49 41	43 37
Co-operative (around Addis Ababa)	12	11
Total	**185**	**165**

Sources: Yamane's formula (1967).

3.6 Sources of data

The researcher employed both primary and secondary data to gather trustworthy information. The primary data for the study was obtained from the targeted organization employees, supervisors, and managers, as well as secondary data from written sources such as academic journals, organizational reports, and manuals, as well as books and the intranet and internet.

3.6.1 Data collection tools

A closed-ended questionnaire was used in this research. Closed-ended questionnaires are created for a variety of purposes. First, to prevent responders from writing responses outside of the concern for this subject, and second, to facilitate coding, editing, and analysis. Another reason for using a closed ended question is because most respondents are unwilling to fill in blank spaces in questioners (thus blank space questioners are uninteresting for respondents), resulting in non-response. As a result, the researcher opts for a closed-ended (check box) questioner to avoid this situation.

In designing the questionnaire a 5-point Likert-Scale approach used.

Most of the questionnaires were adapted from previous researches with modifications, and some of the questionnaires were developed based on a careful review of literatures, a statement of

problem, a literature review, a conceptual framework, and the research questions in order to maintain the validity of the constructs and scale used in this study. Secondary data (historical information gathered and tallied using graphs, charts, and reports) was gathered from journals, books, and the internet.

3.6.2 Data collection procedure

To acquire firsthand knowledge, the researcher personally handed questionnaires to all strata. A tight follow-up was kept through the filling out of the questionnaire to minimize misunderstanding and to make the administration easier.

3.7 Data analysis

After the data was obtained, it was analyzed using descriptive and inferential statistical techniques. The data was analyzed using the Statistical Package for Social Sciences (SPSS) version 20 computer software.

3.7.1 Descriptive statistical Analysis

Descriptive analysis is presented by utilizing statistical techniques. notably frequencies, percentages, mean and standard deviation to summarize the answers. According to Denscombe (2012), descriptive statistics is a process of translating a mass of raw data into tables, charts, with frequency distribution and percentages which are a very essential element of making sense of the data.

3.7.2 Inferential statistical Analysis

In inferential statistical analysis, correlation and multiple regression methods were employed using (SPSS) software version 20. Spearmans coefficient of correlation analysis was performed on the data obtained from the respondents to examine the relationship between the independent and dependent variables, and multiple regressions used to examine the joint effect of the four independent variable aspects have on the performance of fertilizer supply chain.

3.7.2.1 Correlation

Correlation is used to describe the strength and direction of relationship between two variables (Independent variables are; supply chain integration, information sharing, customers management, suppliers management. and Dependent variable; Supply chain performance).

The correlation result is always between -1.0 and +1.0, and if "r" is positive, the variables have a positive connection. If it's negative, the variables have a negative connection. A correlation value of 0 indicates that there is no link. The results of correlation coefficient may be interpreted as follows.

Correlation Coefficient	**Interpretation**	
(-1.00 to -0.8]	Strong	Negative
(-0.79 to -0.6]	Substantial	
(-0.59 to -0.4]	Medium negative	
(-0.39 to -0.2]	Low	
(-0.19 to 0.19)	Very Low	
(0.2 to 0.39)	Low	Positive
(0.4 to 0.59)	Medium positive	
(0.6 to 0.79)	Substantial	
(0.8 to 1.00)	Strong	

3.7.2.2 Multiple Regression Analysis

The second aspect of the relationship between variables that multiple regression examines is the specification of the form of the relationships in order to find a mathematical expression that allows us to predict the score of one variable (called the dependent variable) based on the scores of the other variables (called the independent variables).

According to Cooper and Schindler, (2001) multiple regression analysis is a statistical analysis method used to establish the linear relationship between a single dependent variable and two or more independent (explanatory) variables and is used to assess hypotheses. Multiple regression analysis, according to Hair *et al*. (2006), provides an indicator of the degree of association (1 = perfect link, 0 = no association) between the criterion variable and the dependent variable (s), on the one hand, the weighted combination of the predictor variables as specified by the regression equation, on the other hand—that is, R. They also mentioned that regression analysis predicts changes in a dependent variable by weighting the influence of numerous independent factors. Understanding the results of regression analysis could be more simply assessed by scrutinizing

the R-squared (R^2) statistic, which shows the proportion of variance in the dependent variable that is shared by the weighted combination of independent variables.

When it comes to determining the combined influence of numerous independent variables on a single dependent variable multiple regression analysis (adjusted R square) is a great option. In addition it is of being interest to know the specific effect of each independent variable on the dependent variable in the presence of the other independent variables (i.e. assessing the impact of each independent variable while keeping the impact of the other independent variables under control).

This study's model was created utilizing four supply chain management techniques or predictors that have an impact on fertilizer supply chain performance.

$$y = \beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 + \beta 4x4 + \beta 5x5 + \beta 6x6 + \varepsilon$$

Where:

Y= Supply chain performance

β0 = Constant factor

β1 = Coefficient of Integration

β2 = Coefficient of information sharing

β3 = Coefficient of Customers management

β4= Coefficient of suppliers management

X1 = Integration

X2 = information sharing

X3 = customers management

X4 = suppliers management

ε=Error

3.8 Scale of reliability and validity

3.8.1 Reliability Test

According to Golafshani (2003), dependability is defined as the degree to which a research's results are consistent across time and accurately represent the whole population under investigation. According to Toke et al., (2012), the goal of reliability analysis is to determine the extent to which a measuring technique produces the same result when performed under the same conditions over and again.

According to Sekaran (2005), the Cronbach Alpha Statistics are the most commonly used approach in the literature to measure the scale's reliability and stability. Cronbach Alpha should be more than 0.70 in order to generate a trustworthy scale, and any scale that falls short of this criterion should be removed. The Cronbach alpha values for strategic supplier partnerships, customer relationships, information sharing, integration, Supply chain performance, and overall reliability are 0.786, 0.794, 0.824, 0.775, 0.783, and 0.814, respectively. This suggests that the construct's components all reflect the same underlying disposition. The table below summarizes the reliabilities of all constructions.

Table 6; reliability test

	Variable name	Cronbach's Alpha	No. of Item
1	Strategic supplier partnership (SSP)	0.786	6
2	Customer relationship (CR)	0.794	5
3	Level of information sharing (IS)	0.824	6
4	Level of integration	0.775	5
5	Supply chain performance	0.783	13
6	Over all	0.814	35

Source: Respondents survey result test, 2021

3.8.2 Validity Test

Kothari (2004) defines validity as "how well instruments measure what they are meant to assess." The most essential element to examine for the purposes of this study was content validity. This was because it was concerned with how well the instrument's content sampled the kind of items that may be used to make conclusions or inference. There are several ways of establishing validity such as content validity; convergent validity concurrent; predictive validity; construct validity; and convergent validity (Joppe, 2000). The questionnaires were adopted from Li, (2006). The researcher advisor reviewed the content of the instruments to determine their content validity and advised the researcher on the content validity. Research advisors comments was utilized to improve the instruments.

3.9 Ethical consideration

In order to instill honesty in the minds of responders It was important to provide complete information regarding the study's goal, as well as the researcher's position and function. The respondents were informed that the information they provided would be kept confidential and only used for academic reasons. In addition, Respondents were told not to provide any personal information or a reference in the questionnaire. Furthermore, the many research publications, journals, and textbooks utilized as references in the study were thoroughly referenced.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

Introduction

In this chapter,The information gathered was evaluated and presented in accordance with the study's goals. The information was deemed important in determining the effects of supply chain management practices on the performance of Ethiopia's fertilizer supply chain. Descriptive, correlation and regression analysis were employed to analyze and interpret the outcomes of the study. The questionnaires were organized in five labels ranging from one to five; where 1 indicates to a strongly disagree, 2 disagree, 3 neutral, 4 agree, 5 strongly agree, for measurements of supply chain performance and supply chain practice and bottlenecks of supply chain management. In order to measure the relationship between supply chain management practices and supply chain performance, Correlation and regression analysis were employed for scale typed questionnaire. A total of 165 questionnaires were distributed to employees and 145 (87.9%) were collected valid and used for analysis. The data obtained from the respondents were presented and analyzed by helping SPSS version 20 statistical software. To determine the degree of link between the variables under investigation, the researchers employed correlation analysis, especially Spearmans correlation as Spearman correlation is more suitable for likert scale data collection. Regression was also used to assess the effect of independent variable (Supply chain management Practice) on dependent variable(fertilizer supply chain performance).

4.1 Demographic information of the respondents

In Table 7 below, The demographic data of responders is displayed. These include educational qualification, employee level, and company of the employees and experience of respondents. To get data on these topics the respondents were questioned and their responses are summarized below. The outcomes of this survey processed with the help of SPSS 20 software.

Table 7 Demographic summary of respondents

Demographic Profile	Item	Frequency	Percent
Education	diploma	10	6.9
	degree	77	53.1
	post graduate	58	40.0
Experience	Under two Years	6	4.1
	2-5 Years	41	28.3
	6-10 Years	68	46.9
	Above 10 years	29	20.0
	Under two Years	6	4.1
Employment Level	Staff	86	59.3
	supervisor	44	30.3
	Manager	5	3.4
	Officer	10	6.9
Company Name	MoA (Procurement of Agricultural Inputs Dept.)	38	26.2
	EABC (Agricultural Inputs Supply EO)	27	18.6
	ESLSE (Uni-modal Commercial)	71	49.0
	Co-operative unions	9	6.2
Total Number of respondents = 145			

Source: Own computation using SPSS version 20 software.

4.1.1 Educational background of the respondents

Educational background is paramount in helping the respondents to understand the issues related to supply chain management practices. This is consistent with Katz (1992) conclusion that those with higher education are more effective as they have more knowledge and have modern managerial skills making them more aware of the reality of the business environment around them.

As it can be seen form the Table 7, most of respondents' educational qualification is above 1st degree level i.e., 53.1% and 40% of the respondents have bachelor and post graduate degree respectively. This demonstrates that they are capable of internalizing and respond confidently on supply chain performances and supply chain management practices.

4.1.2 Work Experience of respondents

From the respondents(total 145), 41 respondents (28.3%) have work experience of 2-5 years, 6 respondents (0.25%) have a work experience level of below 2 years, 68 respondents (46.9%) have 6-10 and the rest of the respondents 29(20%) have above10 years. This implies that the majority of the respondents, 139 (95.9%), had more than two years of work experience. This means that virtually all of the respondents have sufficient knowledge and expertise about their organizations to respond to questions related to supply chain management practices and supply chain performance.

4.1.3 Employee Level of the respondents

Based on the table 7 above 86 (59.3%) of the respondents are stuff members, 44(30%) respondents, are supervisors 10 (6.9%) are officers and 5(3.4%) of the respondents are managers. This implies that respondents can give information from different perspectives.

4.1.4 Company of the respondents

Based on the table, 38(26.2%) of the respondents are from MOA, 27(18.6%) of the respondents are from EABC are, 71(49%) of the respondents are from ESLSE, and the remaining 9(6.2%) respondents are from cooperative unions. This shows that due to their in depth involvement on supply chain management practices, the data collected from them is truthful and relevant for the study. Therefore, the results can be generalizable for the supply chain.

4.2 Mapping the supply chain of fertilizer in Ethiopia

Based to literature review of and secondary data from the supply chain of fertilizer in Ethiopia is mapped simply to have a visualization of the process from demand estimation to final delivery to famers.

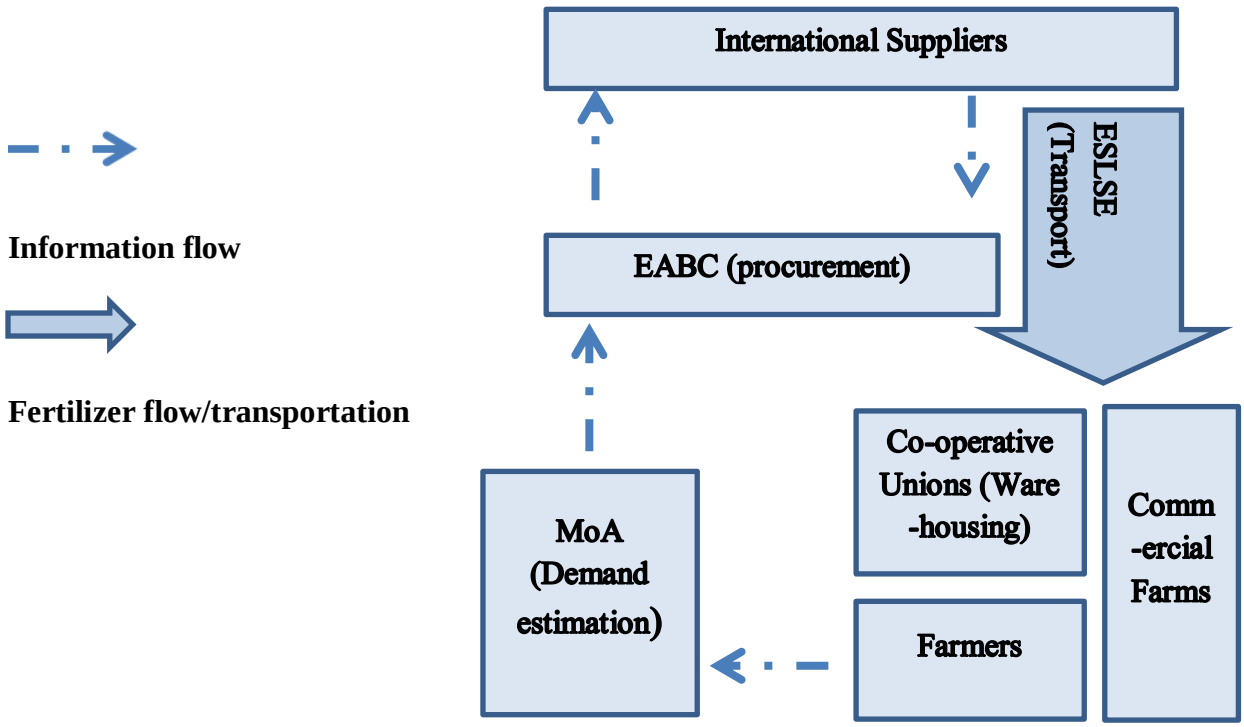

Figure 4: Map of fertilizer distribution in Ethiopia.

Adapted from IFDC, 2012 and secondary data from ESLSE

Ministry of Agriculture (MoA)

The fertilizer import process starts by estimating the demand for the upcoming year. The demand estimation process starts from kebele level and aggregated to national demand. The previous year's stock is deducted from national demand and the figure is passed on to Ethiopian Agricultural Business Corporation to float bid according to fertilizer procurement procedure .

Ethiopian Agricultural Business Corporation (EABC)

The Ethiopian Agricultural Businesses Corporation is a newly established corporation as a Federal Government Public Enterprise by Council of Minister Regulation Number 368/2015 in 22nd December 2015. The corporation was formed by merging five owned Enterprises; namely Ethiopian Seed Enterprise, Agricultural Equipment and Technical Services Share Company, Agricultural Inputs Supply Enterprise, Natural Gum Processing and Marketing Enterprise and Agricultural Mechanization Service Enterprise (EABC,2021).

Agricultural Input Supply (AIS) receives the yearly demand of fertilizer to be imported from Ministry of Agriculture (MoA). That in turn collects from Regions. Collecting the annual need and specification of fertilizer EABC-AIS floats international bid. Floating international bid by aggregating total demand of the country benefits to negotiate reasonable price and good quality.

Ethiopian Shipping and Logistics Services Enterprise (ESLSE)

Ethiopian Shipping and Logistics services Enterprise takes charge of the transportation process from suppliers loading port up to the agricultural cooperative union's warehouse. Up to year 2018 ESLSE's role in fertilizer supply chain was limited to port clearing, local customs clearing ,port handling and dispatch of trucks at Djibouti port. ESLSE used to grant waiver to EABC to charter ships and transport fertilizer on its own. currently however ESLSE is taking care of the entire transportation from suppliers loading port to cooperatives warehouse using both sea and land transport. With its more than 50 years of Experience in operating and chartering ships ESLSE is in better position to negotiate ship chartering terms and taking care of sea transportation than ESLSE.

ESLSE charters ships to transport the fertilizer from loading ports such as Jorf Lasfar (Morocco), Adabiya (Egypt) Saudi Arabian and United Arab Emirate ports To Djibouti port. Once it arrives in Djibouti, ESLSE takes care of port clearing , local customs clearing, and dispatch the fertilizer using trucks and train to more than 90 destinations across the country.

ESLSE uses its own truck and floats a bid to hire cross boarder and local trucking companies. The cross boarder trucking companies transport from Djibouti port to the cooperative ware

houses across the country. The Non-cross boarder trucks (local trucks) transport the fertilizer from train stations at Adama and Indode to the various Cooperative warehouses.

Agricultural Cooperative unions

The Agricultural cooperative unions serve as local warehouse and distribution center to the farmers.

4.3 Analysis of respondents data on independent and dependent variables used. (Descriptive Analysis).

4.3.1 Descriptive analysis of independent variables (SCMP)

As quoted by Girma Kumsa (2018), Mesfin (2016) used a kind of rule of thumb to create equal gaps for a level of five points Likert scale (that ranges from strongly disagree to strongly agree in the survey questionnaire). The calculated mean value that ranges from 1 to 1.80 implies strong disagreement, a mean range from 1.81 to 2.6, from 2.61 to 3.4, from 3.41 to 4.2 and from 4.21 to 5.00 represented respondents' opinions of to some extent disagree, neutral, somewhat agree and strongly agree respectively. The 0.8 used as delimitation for each factors of the measurement in the questionnaire. The result 0.8 was found by dividing the difference between the maximum (5) and minimum (1) scores to the maximum score (5) of the questionnaire. In the method of evaluation of the data, standard deviation was used. Small standard deviation (relative to the value of the mean itself) implies that data are close to the mean whereas a large standard deviation (relative to the mean) implies that the data points are distant from the Mean. According to Field, (2009) Standard deviation is a measure of how well the mean represents the data.

4.3.2 The practice of Strategic supplier partnership (SSP) in fertilizer supply chain

Table 8 Mean and standard deviation of responses on Strategic supplier partnership (SSP)

Descriptive Statistics

Strategic Supplier Managment	Mean	Std. Deviation
We consider quality as our number one criterion in selecting suppliers.	3.9448	.99847
We regularly solve problems jointly with our suppliers.	3.7931	1.04014
We have helped our suppliers to improve their product quality	3.8069	1.08203
We have continuous improvement programs that include our key suppliers.	4.0552	1.03936
We include our key suppliers in our planning and goal-setting activities.	3.8897	1.06143
We actively involve our key suppliers in new product development processes.	3.9517	1.00230
Valid N (listwise)		
Grand Total	**3.9069**	**1.03728**

Sources; SPSS survey 2021

According to the Table above, all six questions asked under Strategic supplier partnership (SSP) scores an average above 3.7, which implies that the respondents agreed to the point that Strategic supplier partnership (SSP) are highly practiced in the supply chain network. The literature also agrees with the literature review that was presented in the second chapter of the study. An effective supplier's management can be important element of a leading-edge supply chain (Gharakhani, 2012). He also added that, through strategic supplier partnerships, organizations can work closely with suppliers who can share responsibility for the achievement of the company.

4.3.3 The practice of Customer relationship (CR) in fertilizer supply chain

Table 9 Descriptive analysis on Customer relationship (CR)

Descriptive Statistics

Customer relationship	Mean	Std. Deviation
We frequently interact with customers to set reliability, responsiveness, and other standards for us.	3.9241	1.15520
We frequently measure and evaluate customer satisfaction.	4.0483	1.00920
We frequently determine future customer expectations	4.0207	.94626
We facilitate customers' ability to seek assistance from us.	3.9655	1.05682
We periodically evaluate the importance of our relationship with our customers.	3.9241	1.01436
Valid N (listwise)		
Grand Mean	**3.97654**	**1.036368**

Sources; SPSS survey 2021

According to the table, A mean score greater than 3.9 which implies the respondents agreed to the point that customer relationship is highly practiced in their organization. The literature also agrees with the results that Customer relationship management (CRM) is an important component of SCM (Gharakhani, 2012). A firm's customer relationship practices can generate higher achievement to the supply chain performance .(Koskela, 1999) considered that customer Relationship management can be seen as the reliable organizational activity under usage of marketing and service strategy.

4.3.4 The practice of Level of information sharing in fertilizer supply chain

Table 10 Descriptive statistics of Level of information sharing

Descriptive Statistics

Level of information sharing	Mean	Std. Deviation
We inform trading partners in advance of changing needs.	3.9724	1.01342
Our trading partners share proprietary information with us.	3.9862	.98592
Our trading partners keep us fully informed about issues that affect our business.	3.8621	1.03159
Our trading partners share business knowledge of core business processes with us.	4.0069	.95377
We and our trading partner exchange information that helps establishment of business planning.	4.0276	.99962
We and our trading partners keep each other informed about events or changes that may affect the other partners.	3.9103	.93480
Valid N (listwise)		
Grand Mean	**3.95862**	**0.98114**

Sources; SPSS survey 2021

According to the table, The mean value greater than 3.8 is indicative that the respondents agreed to the fact that their trading partners share proprietary information with them. The literature also agreed that Effective information sharing is considered as one of the most important abilities of supply chain process Information sharing is one of the most vital tools for realizing an integrated and coordinated supply chain (Lee, 2002) he also stated that information should be interoperable, which means that one organization can talk to another.

4.3.5 The practice of Level of integration in fertilizer supply chain.

Table 11 Descriptive statistics on Level of integration

Descriptive Statistics

Supply chain integration	Mean	Std. Deviation
Firms in our supply chain establish more frequent contact with each other	3.9724	1.02025
Firms in our supply chain create a compatible communication and information system	3.8483	1.02964
Our firm extends its supply chain beyond its customers/suppliers	3.9931	1.08331
Our firm participates in the marketing efforts of its customers	4.1034	1.07189
Our firm participates in the sourcing decisions of its suppliers	3.9379	.96624
Valid N (listwise)		
Grand Total	**3.97102**	**1.034266**

Sources; SPSS survey 2021

According to the table above, the mean and standard deviation of Firms in our supply chain establish more frequent contact with each other (M=3.9724, SD=1.02025), Firms in our supply chain create a compatible communication and information system (M=3.8483, SD=1.02964) Our firm extends its supply chain beyond its customers/suppliers (M=3.9931, SD=1.08331), Our firm participates in the marketing efforts of its customers(M=4.1034, SD=1.07189), Our firm participates in the sourcing decisions of its suppliers(M=3.9379, SD=.96624). The mean value above 3.8 shows that the respondents agreed there is high level of integration with in the supply chain. This view is supported by the literature in chapter two. Clancy defines supply chain integration as "attempting to elevate the connections inside each part of the network, (to allow) better decision making, and getting all the components of the chain to interact in a more efficient way, therefore creating supply chain visibility and identifying bottlenecks.

4.3.6 Summary of SCM practices

The supply chain practices and the questions considered under each practice is summarized in the table: below. The Grand mean of mean which is the mean value of total supply chain management practices considered under this study is computed and presented simply.

Table 12: Summary of SCM Practices.

SCM Practices	No of Items	Grand Mean	stand deviation
Strategic Supplier Partnership	6	3.9069	1.03728
Customer relationship	5	3.97654	1.036368
Level of information sharing	6	3.95862	0.98114
Supply chain integration	5	3.97102	1.034266
Grand Mean of Mean		3.95327	1.022264

Source : Own computation using SPSS version 20 software.

4.3.7 Descriptive statistics of fertilizer supply chain performance in Ethiopia.

Table 12: Summary of supply chain performance, in fertilizer sector in Ethiopia..

	Items	**Mean**	**Std. Dev.**
Cost	Direct and indirect cost of the SC	3.8276	1.10142
	Distribution and selling Expense of products	3.9931	.96822
	Grand mean	3.91035	1.03482
Asset management	Cash to cash cycle time	3.8690	1.11340
	Return on investment (profitability)	3.8966	.97699
	Grand mean	3.8828	1.045195
Reliability	100% delivery of order (quantity)	4.0138	1.16658
	On-time delivery (Time)	3.8966	.98407
	Product delivery in in perfect condition	3.9724	1.00654
	Grand mean	3.960933	1.052397

Responsiveness	Low Customer complaints	4.0000	1.08653
	Shortest Lead time	4.0621	1.04230
	Low Shipping errors	3.9172	.99655
	Grand mean	3.98965	1.019425
Flexibility	Volume flexibility	3.9586	1.02656
	delivery flexibility	4.0483	.97419
	Low back orders	3.9310	1.05182
	Grand mean	3.9793	1.017523
Grand mean of supply chain Performance		**3.944607**	**1.033872**

Source : own computation on SPSS version 20.

4.3.7.1 Fertilizer supply chain performance in terms of cost

According to the table, the mean and standard deviation of Direct and indirect cost of the supply chain (M=3.8276, SD=1.10142) and Distribution and selling Expense of products (M=3.9931, SD=.96822). This shows that the performance of the supply chain is very good.

4.3.7.2 Fertilizer supply chain performance in terms of asset management

According to the table, the mean greater than 3.86, shows that the performance of the organization is very good. According to Martin Christopher & John Gattorna(2005), From an organizational perspective a critical performance measure is cash-to-cash cycle time. Based on Tetyana Kovalchuk, and Andriy Verhun(2019), In the supply chain, asset management is an important component that covers a wide range of tasks.

4.3.7.3 Fertilizer supply chain performance in terms of statistics of Reliability

According to the table, the mean and standard deviation, for 100% delivery of order (quantity) (M=4.0138, SD=1.16658), for On-time delivery (Time) (M=3.8966, SD=.98407), Product delivery in in perfect condition (M=3.9724, SD=1.00654), is above 3.8, implies that organization is very good. According to Solano and etal. (2016) Measuring the reliability of a supply chain is a significant step to promote the construction of more resilient chains. The resilience is essential to guaranty the efficient and secure global movement of goods.

4.3.7.4 Fertilizer supply chain performance in terms of Responsiveness

According to the table, the mean value is above 3.9. This implies that the supply chain performance is very good. The literature also agrees that responsiveness of supply chains to changing market necessities and their overall efficiency are vital issues in supply chain design and management and consequently currently have wide attention in the scientific community as well as in practice as defined as the "ability to react purposefully and within an appropriate time-scale to customer demand or changes in the marketplace, to take about or sustain competitive advantage" (Holweg, 2005, p. 605).

4.3.7.5 Fertilizer supply chain performance in terms of flexibility

According to the table, the mean value of Volume flexibility, delivery flexibility and Low back orders is 3.9586, 4.0483, 3.9310with their SD 1.02656, .97419 and 1.05182 respectively.

This shows that flexibility with in the supply chain is very good. Changing market demand, differing supplier lead time, product quality and information delay (Giannoccaro et al, 2003) are sources of uncertainty that create a need for building 'flexible'- supply chains that can deal with these changes and preferably in a better way than their competitors. In doing so, a competitive advantage can be realized.

Table 13Descriptive statistics of challenges (bottle necks of) fertilizer supply chain in Ethiopia

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
supply chain volatility	145	1.00	5.00	3.9586	1.09212
supply chain complexity	145	1.00	5.00	4.0621	.96624
week supplier relationship	145	1.00	5.00	3.4759	1.18487
inventory cost	145	1.00	5.00	3.9034	1.09496
political instability	145	1.00	5.00	3.2345	1.35408
lack of qualified personnel	145	1.00	5.00	3.1862	1.27468
quality levels and defects	145	1.00	5.00	3.0207	1.10220
lack of information sharing	145	1.50	5.00	3.9609	.72035

managerial problem	145	1.00	5.00	3.9103	1.14817
transportation cost	145	1.00	5.00	3.8345	1.09299
Lack of coordination	145	1.00	5.00	2.9103	1.16617
Lack of infrastructure	145	1.00	5.00	3.9621	1.07122
Economic pressure	145	1.00	5.00	3.3262	1.29706
Valid N (listwise)	145				

Sources: SPSS Survey 2021

According to the table, supply chain volatility (M=3.9586, SD=1.09212), supply chain complexity (M=4.0621, SD=.96624), week supplier relationship (M=3.4759, SD=1.18487), inventory cost (M= 3.9034, SD=1.09496) managerial problem (M=3.9103, SD=1.14817), lack of information sharing (M=3.9609, SD=.72035), transportation cost (M=3.8345, SD=1.09299) and Lack of infrastructure (M=3.9621, SD=1.07122) scores the highest mean value. The remaining bottlenecks of supply chain scores below mean value of 3.3. This shows that supply chain volatility, supply chain complexity, week supplier relationship, inventory cost, managerial problem, lack of information sharing, transportation cost and Lack of infrastructure are the major bottlenecks (challenges) of the fertilizer supply chain in Ethiopia.

4.4 Relationship between supply chain management Practices and fertilizer supply chain performance

This section covers correlation and regression analysis. The section was intended to achieve both general and specific objectives in creating the relationship that exists between the variables.

4.4.1 Correlation analysis of SCMP and Fertilizer supply chain performance.

Correlation analysis was employed to realize the study specific objectives which were to examine the influence of strategic supplier relationship, customer relationship, level of information and level of integration on fertilizer supply chain performance in Ethiopia. The value of a correlation coefficient can range from -1 to 1. Closer values near the absolute value of 1 imply that the variables being linked have a strong relationship. While numbers closer to 0 indicates that there is slight or no linear relationship. Evans' (1996) recommendation for the absolute value of r, as mentioned in Beldjazia and Alatou, can be used to describe the strength of correlation (2016). If "r = 0.00-0.19 - very weak, r= 0.20-0.39 - weak, r = 0.40-0.59 - moderate, r

= 0.60-0.79 - strong and r = 0.80-1.0 - very strong". Spearman correlation coefficients were determined with the objective to obtain information about the relationships between the dependent and independent variables as presented in table.

Table 14 Correlation analysis of of SCMP and Fertilizer supply chain performance

			SSRP	CR	L Integra	Info shar	SC P
Spearman's rho	SSRP	Correlation Coefficient	1.000				
		Sig. (2-tailed)	.				
	CR	Correlation Coefficient	.492**	1.000			
		Sig. (2-tailed)	.000	.			
	SC Integra	Correlation Coefficient	.415**	.465**	1.000		
		Sig. (2-tailed)	.000	.000	.		
	Info shaing	Correlation Coefficient	.489**	.484**	.411**	1.000	
		Sig. (2-tailed)	.000	.000	.000	.	
	SC P	Correlation Coefficient	.584**	.627**	.640**	.564**	1.000
		Sig. (2-tailed)	.000	.000	.000	.000	.
		N	145	145	145	145	145

**. Correlation is significant at the 0.01 level (2-tailed).
Source: SPSS output survey, 2020

As shown from the table, strategic supplier relationship r (145) = .584**has a positive and moderate relationship. According to Evans (1996) magnitude of correlation, the relationship between the two variables is moderate.

As shown from the table, customer relationship has a positive and strong relationship with fertilizer supply chain performance r (145) = .627**. According to Evans (1996) magnitude of correlation, the relationship between the two variables is strong.

According to the table, Level of information sharing r (145) =.564**has a positive and moderate relationship with supply chain performance.

As indicated from the table, Level of integration r (145) =.640** has a positive and strong relationship with supply chain performance. According to Evans (1996) magnitude of correlation, the relationship between the two variables is strong.

The correlation analysis showed that there is a positive and moderate relationship between strategic supplier relationship, and information sharing. In addition, there is a positive and strong relationship between level of integration and customer relationship with supply chain performance.

4.4.2 Analysis of the Effect of SCM P on fertilizer supply chain in Ethiopia (Regression Analysis)

To evaluate the impact of independent factors on the dependent variable, a multiple regression analysis was used. Since the data is a Likert scale, To evaluate the overall fit (variance explained) of the model and the relative contribution of each predictor to the total variance explained, linear multiple regression is acceptable and employed.

According to Ballance (2004), the effective application and validation of multiple regression models necessitates the fulfillment of certain important assumptions. Only if the assumptions in an analysis have been checked and met are inferences and generalizations about the theory legitimate.

The researcher has evaluated the required assumptions that the data must fulfill in order for the study to be trustworthy and legitimate before doing multiple regression analysis. These include tests for normality of the distribution and multicollinearity. Each test is explained below.

4.4.3 Normality Distribution Test

The independent variables in multiple regressions must be regularly distributed. Skewness and kurtosis are statistical techniques that may be used to determine whether or not data is normally distributed. According to Smith and Wells (2006), The characteristic of a distribution that defines the thickness of the tails is known as kurtosis. The amount of scores falling at the extremes of the Gaussian/normal distribution accounts for the tail's thickness. Skewness is a symmetry metric. If a distribution or data set looks the same to the left and right of the center point, it is said to be symmetric. The data's skewness and kurtosis test results are within the allowed range (1.0 to +1.0), implying that it is regularly distributed. As a consequence, the

kurtosis skewness result ranges from -1.0 to +1.0, which is acceptable as an error term for each variable constant. The kurtosis and skewness results are shown in appendix B.

4.4.4 Multicollinearity Test

The term "multicollinearity" refers to when the independent or predictor variables are significantly linked. There is “overlap” or sharing of predictive power when independent variables are multicollinear. As a result, a paradoxical outcome might occur. while the regression model fits the data well, but none of the independent variables has a substantial impact in predicting the dependent variable. Tolerance should be greater than 0.2 and VIF should be less than 10 according to Menard, (1995) and Myers, (1990). In this study the result found confirmed this one and acceptable. Multicollinearity test results are shown in appendix B.

4.4.5 **Linearity assumption:**

The assumption of linearity was checked by plotting the relationship between each independent variable and the dependent variable on scatterplots. The interaction between each independent variable and the dependent variable was confirmed to be linear by visually inspecting the SPSS scatterplot, as shown in appendix B.

4.4.6 **Homoscedasticity assumption:**

The homoscedasticity assumption states that errors have the same variance at all levels of the independent variables. This indicates that mistakes are evenly distributed among the variables. Homoscedasticity can be verified by visual scrutiny of a plot of the standardized residuals by the regression predicted value. In an ideal world, residuals would be randomly distributed about zero (the horizontal line), resulting in an equal distribution. When the dispersion isn't even, it's called heteroscedasticity; typical patterns of violation include fan and butterfly forms. The researcher used SPSS to generate a scatterplot of standardized residuals vs standardized predicted values to test homoscedasticity and discovered that heteroscedasticity was not a major problem, as shown in appendix B.

After the data was examined for the above required multiple regression assumptions and validated that it has meet all these assumptions, multiple regression analysis was perfromed to asses how well the regression model met the data (model summary), independent variables statistically significantly predict the dependent variable (ANOVA) and statistical significance of each of the independent variables (regression coefficients).

4.5 Model Summary

In the model summary table below (Table 15) the coefficients R, suggests a strong correlation of .772[a] between supply chain practices and supply chain performance. The R^2 (also called the coefficient of determination), Value of .596 (59.6%) Indicates the relative importance of supply chain practices in understanding supply chain performance. This indicates Other variables are responsible for the remaining 40.4 percent of supply chain performance changes.

The adjusted R2 is .585, which indicates that supply chain practices (strategic supplier relationship, Level of integration, Customer relationship , Level of information sharing) can account for 58.5% of the variation in supply chain performance. Although there are numerous elements that might influence supply chain performance, supply chain practices account for roughly 58.5 percent of the variance. This indicates that the remaining 41,5% of the variation in supply chain Performance cannot be described by those practices of supply chain management practices.

Table 15Model test

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.772[a]	.596	.585	.18087

a. Predictors: (Constant), InfoShar, SCIntegra, CM, SSM

b. Dependent Variable: SCPERFO.

Sources: SPSS Survey 2021

4.5.1 ANOVA Model Fit

Table 16 ANOVA

ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.

	Regression	6.768	4	1.692	51.719	.000[b]
1	Residual	4.580	140	.033		
	Total	11.348	144			

a. Dependent Variable: SC Performanace

b. Predictors: (Constant), infoshare, SCIntegra, CR, SSM

Sources: SPSS Survey 2021

ANOVA may be used to assess the overall fit of the regression model. In the ANOVA table, the F-ratio determines if the overall regression model is a good match for the data. As a result, the table indicates that the R and R2 values obtained from the model summary are statistically significant at (F=51.719), (P<0.001) and it can be said that there is a relationship between supply chain management practices (strategic supplier relationship, customer relationship, level of information sharing and level of integration) and fertilizer supply chain performance.

4.5.2 Regression Coefficients

Table 4.23: Regression coefficients between supply chain management practices and supply chain Performance

Table 17 regression analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	1.037	.237		4.374	.000
	SSR	.174	.055	.216	3.185	.002
1	CR	.112	.043	.162	2.586	.011
	SCIntegra	.268	.044	.378	6.064	.000
	infoshare	.218	.055	.256	3.952	.000

a. Dependent Variable: SC Performanace

Source: SPSS output survey, 2021

4.5.3 Standardized Coefficients

The standardized coefficients are useful to know which independent variable is more important. They are used in comparison of impact of any independent variable on the dependent variable. As indicated in regression coefficients table level of integration had the highest standardized coefficient (.378) followed by level of information sharing (.256). This revealed that level of integration had higher relative effect on fertilizer supply chain performance. Level of information sharing (beta=.256), strategic supplier relationship (beta=.216) and customer relation(beta=.162) are ranked from two to four respectively in their relative importance on fertilizer supply chain performance. As indicated from regression coefficient table, the predictor variables of strategic supplier relationship, level of integration, customer relation and level of information sharing are statistically significant in predicting supply chain performance because all their p-values (strategic supplier relationship p-value=.002, customer relation p-value=.011, level of integration p-value= .000, and level of information sharing p-value=.000,) are less than alpha level of 0.05.

4.5.4 Unstandardized beta coefficient (β)

As stated in chapter three, the unstandardized coefficients (x1 to x4) are the coefficients of the calculated regression model. Hence, by including the error term (ε), the model for supply chain performance can be written as ; $y = \beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 + \beta 4x4 + \varepsilon$,

Where; Y = supply chain performance

X1 = strategic supplier relationship

X2 = customer relation

X3 = level of integration

X4 = level information sharing

ε= Error term

β0 = Constant factor

β1 = Coefficient of strategic supplier relationship

β2 = Coefficient of customer relation

β3 = Coefficient of level of integration

β4= Coefficient of level information sharing

$Y = 1.037 + 0.216X1 + .162X2 + .378X3 + .256X4 + .05 \varepsilon$

The constant value (0 = 1.037) indicates that if all other variables in the model were zero, fertilizer supply chain performance would be 1.037. Furthermore, a beta coefficient of.174 implies that a unit change in strategic supplier relationship leads to a change in the supply chain performance of fertilizer by 0.195.

According to the regression coefficient values, All four factors are found to be statistically significant in predicting fertilizer performance. The statistically significant variables are strategic supplier relationship, customer relationship, level of information sharing and level of integration as evidenced by their P-values ($P<0.05$). This implies that an increase in these factors leads to an improvement in the fertilizer supply chain performance.

4.5.5 Hypothesis Summary

Table 18: Summary of Hypothesis.

Hypothesis	**Remark**
Hypothesis 1: Strategic supplier management practice positively and significantly affects the fertilizer supply chain performance in Ethiopia.	Accepted
Hypothesis 2: Customer Relationship management practice positively and significantly affects the fertilizer supply chain performance in Ethiopia.	Accepted
Hypothesis 3: Supply chain integration practice positively and significantly affects the fertilizer supply chain performance in Ethiopia.	Accepted
Hypothesis 4: Information sharing practice positively and significantly affects the fertilizer supply chain performance in Ethiopia.	Accepted

Source : From Analysis and summary of Respondents Data.

Conclusively the fertilizer Supply chain practices, Strategic supplier management, Customer Relationship, Supply chain integration and information sharing, found to have positively and significantly effect on the supply chain performance.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter of the research study incorporates the summary of major findings which are obtained from the questionnaire results and secondary data then conclusion is drawn in light of the objective of the study. The researcher also presented possible recommendation of the study based on the conclusion drawn from the data analysis.

5.1 Summary of major findings

The major objective of this research study was to examine the effect of supply chain management practice on supply chain performance in the fertilizer sector in Ethiopia. The study further assessed how the supply chain management is practiced in the fertilizer sector in Ethiopia and measured the current supply chain performance of the fertilizer sector.

To this effect the researcher has prepared and distributed questionnaires and reviewed secondary data obtained from the organizations that have key role in fertilizer supply chain. Descriptive statistics, correlation and regression analysis were used for analyzing the data. This chapter provides the summery of findings with respect to the study objectives,

Statistical analysis of the data showed majority of the respondents are from ELSE with 49% percent and the remaining 51 percent from EABC, MoA and Agricultural cooperative unions. 93% of the respondents have above degree level of education and This showed the respondents have a higher level of education that helps them conceptualize and respond authoritatively on the issues and practices. 96% percent of the respondents have above 2 years of experience with the companies and shows they have sufficient knowledge about their organizations.

- The first objective of this study was to map out the supply chain structure of fertilizer in Ethiopia for clear visualization of the chain from demand estimation to final delivery to farmers. Previous Studies and secondary data obtained from the ESLSE shows that Ministry of Agriculture, Ethiopian Agricultural Business Cooperation, Ethiopian

Shipping and Logistics Services and Agricultural Cooperative are the major players in the fertilizer supply chain in Ethiopia.

- The second objective was to assess the supply chain management practice of fertilizer in Ethiopia . Based on the descriptive statistics finding it can be concluded that on average the four organizations has a good level of implementation. The mean score is great than 3.5 for each independent variable meaning that the respondents agree the four supply chain practices are practiced in their Respective organizations.
- The third objective was to measure the supply chain performance of fertilizer in Ethiopia. The descriptive statistics results show respondents are positive about effective and efficient supply chain performance of fertilizer. Based on the descriptive statistics the mean value of the supply chain performance measures (effectiveness and efficiency) is above 3.8 which implies a very good supply chain performance.
- The fourth objective was to assess the effect of supply chain management practice on fertilizer supply chain performance in Ethiopia. From the analysis The adjusted R2 is .585 and it can be concluded that supply chain management practices has a significant and positive relationship with fertilizer supply chain performance in Ethiopia.
- The fifth objective was to identify the major bottlenecks to the fertilizer supply chain in Ethiopia. Supply chain complexity, lack of information sharing, Lack of infrastructure and supply chain volatility as the major bottlenecks in the fertilizer supply chain in Ethiopia.

5.2 Conclusion

Based on the data presented in the previous section. The study has drawn the following conclusions.

- According to the map established by this study. ESLSE has taken the role of transportation from loading port to cooperatives warehouse after 2019. EABC/AISC used to responsible for the transportation and distribution of fertilizer up until and ESLSE's role was limited to customs clearance operation at the Djibouti port.
- The study intended to assess how supply chain management is practiced in terms of strategic supplier relationship, customer relationship, information sharing and level of

integration. The respondents affirm good level of implementation in their respective organization.

- The study started with low effective supply chain management with repeated delays in on time delivery of fertilizer to farmers according to various literature and pilot interview with Uni-modal department at ESLSE in Sept 2020. However very good supply chain performance was registered according to respondents answers in May 2021. This could be justified due to two reasons. The high performance of train transportation in the current fiscal year in transporting fertilizer from Djibouti port to Adama and Indode train stations. And the decline in volume of other import cargoes due to COVID-19 that would reduce congestion at the port and avails extra trucks to transport addition fertilizer.
- The study intended to evaluate the effect of supply chain management practices on fertilizer supply chain performance. Thus independent factors such as; strategic supplier relationship, customer relationship, information sharing and level of integration were used to measure their impact on the performance of the fertilizer supply chain in Ethiopia. The results showed SCMP have significant and positive relationship with fertilizer supply chain performance in Ethiopia.

  The estimation result indicated Level of integration has the largest coefficient of impact in affecting the fertilizer supply chain performance. And customer relation has a relatively lower impact in affecting the fertilizer supply chain performance in Ethiopia.
- Regarding the bottle necks of fertilizer supply chain, the descriptive statistics results concluded supply chain complexity, lack of information sharing, Lack of infrastructure and supply chain volatility as the main bottleneck or challenges. These results are in line with the characteristics of fertilizer supply chain structure in Ethiopia. Considering the various organizations involved in the supply chain from import planning to final distribution to customers it is expected to have complex networks of stakeholders and coordination between there networks to be a daunting process. In addition Fertilizer is an agricultural product that needs to be distributed to the rural parts of the country where there are not adequately paved roads .hence infrastructure problem is to be justified.

5.3 Recommendation

Based on the above findings the study therefore recommends the following.

- Level of integration and information sharing has the highest impact on fertilizer supply chain performance in Ethiopia, hence the Firms in the supply chain need to establish more frequent contact with each other and have to establish compatible communication and information system among themselves. This would have substantial impact in improving the performance of the fertilizer supply chain in Ethiopia. In addition to communication and integration among the local stakeholders there needs to be efforts to extend further and collaborate with the foreign stakeholders such as suppliers, sea port at Djibouti and Neighboring countries. Issues that affect the fertilizer procurement price on global market improvement or decline on port capability in handling fertilizer unloading operation needs to be discussed in advance and mechanism to solve problems jointly needs to be established.
- Supply chain complexity, lack of information sharing, Lack of infrastructure and supply chain volatility are identified as the main bottleneck and the organization within the supply chain need to address this constrains by simplifying the documentation and information sharing mechanism, and improve infrastructures that are within their scope.

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Annex 1-

Questioner of the Survey

ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

FOR PARTIAL FULFILLMENT OF THE DEGREE OF MASTER IN

LOGISTIC AND SUPPLY CHAIN MANAGEMENT QUESTIONNAIRE

Dear respondents, the purpose of this questionnaire is to gather data on the effect of supply chain management practices on fertilizer supply chain performance. The study is purely for academic purpose and thus not affects you in any case. So, your genuine, frank and timely response is vital for successfulness of the study. Therefore, I kindly request you to respond to each items of the question very carefully.

In order to investigate the effect of SCM practices on fertilizer supply chain performance, the researcher prepared the following questions, please tick (√) on the appropriate question number to indicate the extent to which you agree or disagree with each statement.

The item have five-point Likert type scales, the scales have the following meaning

1. Strongly Disagree
2. Disagree,
3. Neutral,
4. Agree,
5. Strongly Agree

General Instructions

- There is no need of writing your name

- Where answer options are available please tick (√) in the appropriate box.

Contact Address

If you have any query, please do not hesitate to contact me and I am available as per your convenience at (Mobile: 0921-317158 or e-mail: teddyghana@yahoo.com)

Thank you for spending your precious time in advance!

PART I: DEMOGRAPHIC INFORMATION

1, Educational Qualification:

Certificate ☐ diploma ☐ Bachelor's degree ☐ Post Graduate degree ☐ Doctorate degree ☐

2, Employee Level

Staff ☐ supervisor ☐ Manager ☐ Officer ☐

3, Years stayed at the sourcing and supply chain division:

Under two Years ☐ 2-5 Years ☐ 6-10 Years ☐ Above 10 years ☐

4, Your company

MOA (Procurement of Agricultural Inputs) ☐ EABC (Agricultural Inputs Supply EO) ☐ ESLSE (Uni modal Commercial) ☐ Co-operative unions

Part II: Instruments of Supply chain management practice;

Strongly Disagree (1) Dis- agree (2) Neutral (3) Agree (4) Strongly Agree (5)

1. Strategic supplier partnership (SSP)		**1**	**2**	**3**	**4**	**5**
1.1	We consider quality as our number one criterion in selecting suppliers.					
1.2	We regularly solve problems jointly					

	with our suppliers.					
1.3	We have helped our suppliers to improve their product quality					
1.4.	We have continuous improvement programs that include our key suppliers.					
1.5	We include our key suppliers in our planning and goal-setting activities.					
1.6	We actively involve our key suppliers in new product development processes.					
2. Customer relationship (CR)		**1**	**2**	**3**	**4**	**5**
2.1	We frequently interact with customers to set reliability, responsiveness, and other standards for us.					
2.2	We frequently measure and evaluate customer satisfaction.					
2.3	We frequently determine future customer expectations					
2.4	We facilitate customers' ability to seek assistance from us.					
2.5	We periodically evaluate the importance of our relationship with our customers.					
3. Level of information sharing (IS)		**1**	**2**	**3**	**4**	**5**
3.1	We inform trading partners in advance of changing needs.					

3.2	Our trading partners share proprietary information with us.					
3.3	Our trading partners keep us fully informed about issues that affect our business.					
3.4	Our trading partners share business knowledge of core business processes with us.					
3.5	We and our trading partner exchange information that helps establishment of business planning.					
3.6	We and our trading partners keep each other informed about events or changes that may affect the other partners.					
4. **Level of integration**		**1**	**2**	**3**	**4**	**5**
4.1	Firms in our supply chain establish more frequent contact with each other					
4.2	Firms in our supply chain create a compatible communication and information system					
4.3	Our firm extends its supply chain beyond its customers/suppliers					
4.4	Our firm participates in the marketing efforts of its customers					

4.5	Our firm participates in the sourcing decisions of its suppliers					

III. Instruments of Supply chain Performance.

Strongly Disagree (1) Dis- agree (2) Neutral (3) Agree (4) Strongly Agree (5)

Efficiency		**1**	**2**	**3**	**4**	**5**
3.1 cost						
3.1.1	Direct and indirect cost of the SC					
3.1.3	Distribution and selling Expense of products					
3.2 Asset						
3.2.1	Cash to cash cycle time					
3.2.2	Return on investment (profitability)					
Effectiveness						
3.3 Reliability						
3.3.1	100% delivery of order (quantity)					
3.3.2	On-time delivery (Time)					
3.3.3	Product delivery in in perfect condition					
3.4 Responsiveness						
3.4.1	Low Customer complaints					
3.4.2	Shortest Lead time					
3.4.3	Low Shipping errors					
3.5 Flexibility						

3.5.1	Volume flexibility					
3.5.2	delivery flexibility					
3.5.3	Low back orders					

iv. Challenges (Bottle necks) fertilizer supply chain in Ethiopia.

Among factors listed below mark those that contribute to the fertilizer supply chain delay according to the scale provided if they contribute high mark (5) if no contribution mark (1) and in between

Strongly Disagree (1) Dis- agree (2) Neutral (3) Agree (4) Strongly Agree (5)

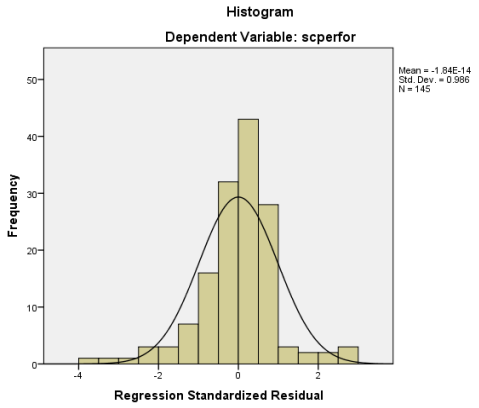
Efficiency	List of Bottlenecks	1	2	3	4	5
4.1	Supply chain volatility (weak demand estimation)					
4.2	Week supplier relationship					
4.3	Supply chain complexity					
4.4	Inventory costs					
4.5	Economic pressure.					
4.6	Lack of qualified personnel's					
4.7	Quality levels and defects					
4.8	Level of information sharing					
4.9	Managerial problem					
4.10	Transportation cost					
4.11	Lack of coordination					
4.12	Lack of infrastructure					
4.13	Political instability					

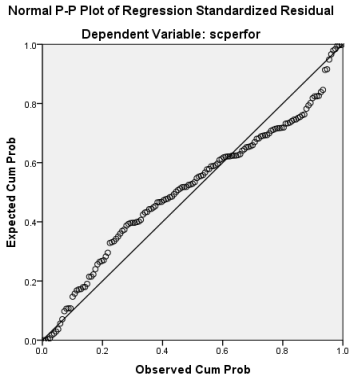
Thank You

Appendix

Regression Model assumption Tests

1. Normality Distribution test





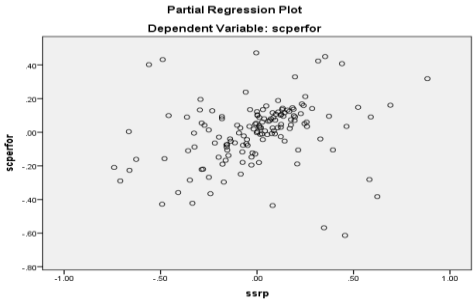
2. **Multicollinearity Test**

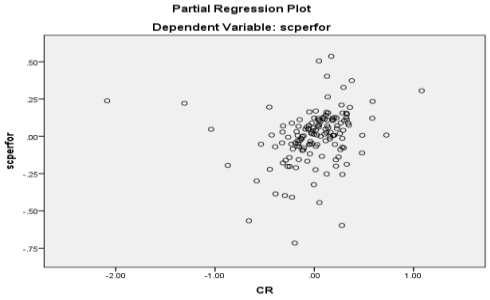
Coefficients[a]

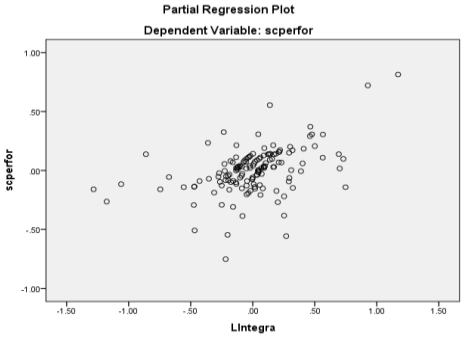
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.037	.237		4.374	.000		
	Ssrp	.174	.055	.216	3.185	.002	.627	1.595
	CR	.112	.043	.162	2.586	.011	.734	1.363
	LIntegra	.268	.044	.378	6.064	.000	.740	1.351
	Infoshare	.218	.055	.256	3.952	.000	.688	1.453

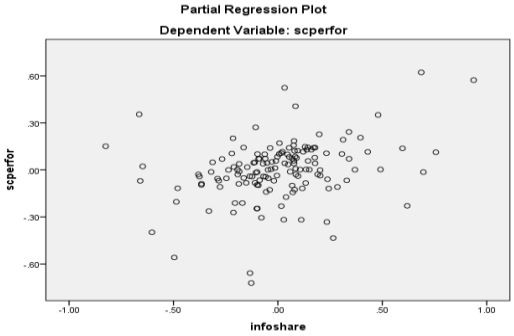
a. Dependent Variable: scperfor

3. Linearity…









4. Homoscedasticity Test