

# ASSESSMENT OF THE LOGISTICS PROCESS AND ITS GAPS

## THE CASE OF AMIBARA

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## DESCRIPTION

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Abstract This thesis is based on Amibara, a company of cotton growers and exporters. The aim of this thesis was to identify the logistics gaps and recommend appropriate technologies and practices that contribute to the improvement of the existing logistics operation at Amibara agricultural development PLC.  The main research method applied in this thesis was qualitative research, based on theoretical research, interviewing internal employees and a five-year company plan. The descriptions of the company profile, the ginning machinery, transportation system and also the warehouse process were based on the author's three months of practical training. The literature review, country background and some part of the company profile were developed on the basis of the information from the Internet.  Brief introduction to transportation, warehousing, packaging, baling and ginning were given in the literature review. The case study presented a summary of the studied company regarding its logistics management. In the research findings, organizational gaps, knowledge and skill gaps, technology gaps and infrastructural gaps were described. A SWOT analysis followed and it described the strengths, weaknesses, opportunities and limitations of the company.  The result and recommendation showed how the quality, time, and the good reputation of the company can easily be affected by ginning, the warehouse condition and transportation system. The study was assigned by an Ethiopian cotton grower association company. At the end of this thesis, some recommendations were proposed.		
Keywords  Logistics, production system		
Miscellaneous		

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## Abbreviations

ECGEA: - Ethiopian cotton growers and exporter association

PLC: - Private Limited Company

SWOT: - strength, weakness, opportunity and limitation or traits

RFID: - Radio frequency identification devices

GPS: - Global Positioning System

# 1 INTRODUCTION

## 1.1 Motivation of the study

The topic of my thesis is “Assessments of the Logistics process and its gaps”, the case of Amibara cotton Grower and Exporter Company. This company is a member of the Ethiopian Cotton Growers and Exporter Association (ECGEA) and its main office and logistics facilities are located in the capital city of Ethiopia, Addis Ababa. As the thesis idea was selected based on the existing situation of the company, the study will be directly addressed to Amibara and the Association.

The idea of doing my thesis on this company arose as a result of my practical training in ECGEA and the lessons learnt during my stay. Specifically, my recognition of the very inefficient logistics operation in the company that happened due to the lack of knowledge, skills, modern technologies and infrastructures associated with the logistics management were the major motivational factors behind this thesis plan.

Although various studies have been conducted on the companies' operation, there are no satisfactory researches about the logistic component. They are focusing on cotton farms in general; how to upgrade the cotton quality in farming and harvesting. However, warehousing and transport management have not been given the required attention, even though this sector plays a significant role in keeping the required quality and reducing operational costs.

## 1.2 Country Background

Ethiopia has 86 million people composed of 85 ethnic groups (2011). The land area is 1.1 million square kilometres with about one third of the land classified as highland, i.e. above 1500 meters above sea level. About 80 percent of the

population lives in the highlands mainly engaged in mixed agriculture; 20% of the population lives in the lowlands practicing agro-pastoralist and shifting cultivation.

The Ethiopian economy is dominated by agriculture: in 2010 the agriculture sector accounted for 41% of the gross domestic production and it is the main source of livelihood for 13 million households. The Ethiopian economy has grown at an annual rate of 11% over the past five years and per capita GDP is reported to have reached US\$400 in 2010. The current national development plan, called the Growth and Transformation Plan or GTP, projects a similar level of growth for the coming five years. The projection is for much faster growth for industry (20%) compared to agriculture (8.1%).

The stock of infrastructure in Ethiopia is very low. The infrastructure density and access statistics for 2010 were as follows: the road density was 44.5km/1000km<sup>2</sup>, mobile access was 1.5%, 2.5% of the irrigable area was irrigated, and the total installed power was 2000MW. The current plan projects increasing infrastructure density by several times by 2015: three times for road, 5.5 times for mobile phones, 6 times for irrigated area, and 4 times for power production capability.

### 1.3 Study background and justification

From the information obtained about the existing cotton sector development as well as from the national plan for the coming years, the following issues justify the importance of improving the logistics management and operation in the sector.

**Limited ginnery facility:** So far a ginnery unit is found only in Addis Ababa and Middle awash (about 250 km far from Addis Ababa and it requires transporting a large amount of raw cotton from different farms of the company. Lack of a computerized system, tracking methods, a well-developed infrastructure like roads, are some of the additional factors that make this issue critical.

**Ambitious national plan:** As it is seen in the 5-year national strategic cotton sector development plan, it is intended to develop 549.9 thousand ha of land or to

produce 435.1 tons of cotton or to establish a food oil and textile and garment factory in the country. However, the logistic component has not been given the required attention. According to the information obtained from different persons working in the sector, the existing knowledge and skill in the logistics sector is also limited. Therefore, unless the logistics operation is advanced, this ambitious plan will be challenged and considerable resources will be lost.

**Environmental concern:** A commercial cotton farm is water and chemical intensive agricultural practice. Moreover, the crop is annual (not perennial) and because of this, it requires a tremendous amount of fuel to plow and cultivate the land every year. In view of this, the environmental cost of a cotton farm is very high and requires compensating this foot-print by implementing environmentally friendly management and impact mitigation measures. Efficient transportation management, quality control, reduction of product lost and processing cost are crucial. To affect this, like the other cost items, efficient and effective logistics engineering would play a paramount role in avoiding costs that might occur due to poor processing, handling, storage and inefficient transport management.

**Poor networking and data base management:** The existing data base and networking system is not equipped with modern technologies like the Internet and helpful software. Because of this, considerable resources are being lost due to poor monitoring and follow up. It is also difficult to improve the system based on data-based researches and studies.

#### 1.4 General and specific objectives of the study

The general objective of this research was to evaluate the existing logistics management of Middle Awash Agricultural Development, one of the five organizations under Amibara Agriculture Development PLC; and recommend the best practices & technologies that could enhance the efficiency and effectiveness of the logistics operation.



Thus, the specific objectives and tasks were

- Literature review. Academic literature regarding logistics engineering related to the cotton industry, relevant different web pages related to logistics engineering and cotton industry or farm sector, journals, Google books etc.
- Develop information gathering tools, like a questionnaire and check lists
- Collect relevant primary and secondary data by using the prepared information gathering tool and appropriate electronic media, such as the Internet, telephone or fax
- Undertake a data analysis and identify the gaps by using appropriate standards and benchmarks
- Recommend the best possible and the most cost effective logistics management technologies and practices.

This study also aimed at acknowledging the importance of cotton as an incredibly powerful tool to advance sustainable economic development in Ethiopia, and finding better solutions to upgrade its quality and quantity in export to make it more competitive in the global market. It also looked at the challenges faced by the company in dealing with the unsuitable infrastructure and lack of innovation, and it was found out what they had achieved in the last five years.

### 1.5 Organization of the thesis

- Chapter 1- introduces the motivation of the author, justifies the background of the study and defines the general & specific objectives of the thesis. It describes the research questions and explains the method used for data collection, data analysis and strategies to implement the recommendations. It also presents a review of the background of the country.
- Chapter 2 –Literature review defines logistics process and gives a brief introduction to transportation, warehousing, packaging, bailing, and the like.

- Chapter 3 –case study, Presents the studied company profile. Presents a summary of the studied company and baseline information regarding its logistics management
- Chapter 4 – Analysis
- Chapter 5 - Explains the research findings
- Chapter 6 – Recommended interventions
- Chapter 7 – Conclusion

## 1.6 Research questions and study methods

Research questions were as follows:

- A. What are the major organizational gaps in relation to efficient logistics management?
- B. What are the major Knowledge & Skill gaps in relation to efficient logistic management?
- C. What are the major technological gaps in relation to logistic management?
- D. What are the major infrastructural gaps in relation to efficient logistic management?

## 1.7 Study methods

The study targeted at technologies and good practices that the selected company could comprehend and utilize, and convey the recommendations to its personnel and counterparts.

The following were the major stepwise approaches carried out so as to produce the expected outputs.

### **Phase 1 - Preparation:**

- Literature review and developing adequate secondary data on the area of studies
- Identification of key informants
- Preparation of data collection tools (*Questionnaire and check lists*).

**Phase 2 - Data collection:** As mentioned earlier, the study was mainly based on the previously collected data. However, as deemed necessary, additional data was collected through convenient media, such as the Internet, telephone or fax and following the steps mentioned below:

- Assessing the conditions of the socio-economy, agro- climate and environment of the country in general and the place where the company is located in particular
- Assessing the existing situation & management practice regarding the warehouse, transport unit and ginning plant
- Assessing the future plan regarding cotton production, export and the logistics operation
- Discussing with relevant informants.

**Phase 3 - Data analysis:** Appropriate technologies and good practices were identified based on the evaluation criteria presented below. Implementation strategies for the recommended interventions were also suggested by employing a SWOT analysis.

### **Evaluation criteria**

- R Relevance
- PB Potential benefit
- CE Cost effectiveness
- EA Ease of application
- AF Affordability
- AC Adoptability by other companies

## 1.8 Overview of the cotton sector development in Ethiopia

In Ethiopia cotton has a long time history (it was introduced a long time ago); in fact the cotton sector doesnot develop as it was introduced earlier. Cotton is grown in hot regions and the highest place is above 300-1800 meters. Recent information shows that 100-120 thousands of hectares (1ha=10000 square meters)of cotton are grown by farmers and private sectors. In year 2007 to 2009 a total of about 65 thousand quintals (6500 tons, 1ton=10quintals) of cotton was grown by irrigation and rain on 3 thousand hectaresof land. Irrigation has more advantage than using rain for cultivating cotton. It has a better final out-put.

Cotton is playing an important role in the country's economy. It is used in domestic textile factories and it is one of the main sources of foreign currency to the country. Pakistan, India, Greece, Indonesia, and Thailand are the main cotton importers from Ethiopia. In year 2007 these countries bought 7.673 metric tons of cotton or 47.4 million worth in the Ethiopian currency.

There is a big gap between the world market demand and the actual production of raw cotton. Ethiopia exported 7.673 metric tons of cotton to the world market, but it doesnot fulfill the demand of world market. It has almost a 0.13% market share but still the land which can be suitable for farming is ideal which is not in use. For these and other reasons, it needs a plan to fulfill the domestic and world market demand, so they have developed a future plan for a short and long term period. This plan includes the uses of new technology (innovation); the world market and domestic textile factory raw cotton demand is expected to increase by 66% per year. So it is estimated that the 50 thousand tons of the current production are expected to increase to 191.4 thousand tons of raw cotton demanded in the domestic textile factories. And also the exportto theworld market is expected to increase from 17 thousand tons to 28.7 thousand tons of raw cotton. In year 2007 (2014) there are expectations and plans to cultivate/ grow 549.9 thousand hectares of land. This gives the opportunity to use the full capacity of the current ginning machinery and buy a new one. It helps to develop the domestic market as well as to be competitive in world market. Besides the

expansion of cultivating cotton, the plan takes into consideration establishing an additional cooking oil factory. It is recommended to be built near the ginning machinery warehouse.

In the long run plan for years 2008-2012, 1.1 million ha of land is to be used for growing cotton. The long run plan includes to grow 27 quintals of cotton per ha and 2.9 million tons of raw cotton per year, and 1.9 million tons of ginned cotton is expected or planned. To achieve the plan there are a lot of strategies, in all of those strategies, transformation in technology and research projects are included. To accomplish the five-year plans additional research is needed. At the moment, for example, 15 thousand hectares of land use irrigation, so it is planned to expand the irrigated land from 15 to 50 thousand ha (if Awash irrigation can get additional intensive? or support it plans to increase or expand the land from 5 to 10 thousand hectare). So all the above mentioned plans need additional finance.

## 2 LITERATURE REVIEW

### 2.1 Definition of logistics operation

The oldest foundation of the word “logistics” is in Greek and French. In Greek “logisticos” represents the quantitative aspects of logistics, a person who has an ability to calculate or reckon is called “logisticos”. In French “logis” represents the qualitative aspects of logistics; it means lodging or quarters, which are involved in managing and organizing.

Logistics deals with the storage of goods and the process of planning, implementing and controlling the flow of resources. In this fast growing industrial and global competition logistics plays a major role, which companies need to plan and schedule for efficient production to ensure the customer’s satisfaction.

### 2.2 What is a production system?

According to Kress (2002), a production system is processes that consume inputs to produce one or more outputs of higher value than the inputs. It is the physical transformation of inputs into outputs. There are two types of inputs in a production system. The first one is the means of production, which are labor, capital and knowledge, and the second one is production resources, which are raw materials and services. For example, the means in the cotton growing are engineers, technicians, production-line workers, ginning machines, tractors and the like. The resources are raw materials, such as seed, Asian cloth and sacks, belling wire, computers, transportation, maintenance and the like. (Kress 2002, 4.)

An illustration of a production system is given in Figure 1 below.

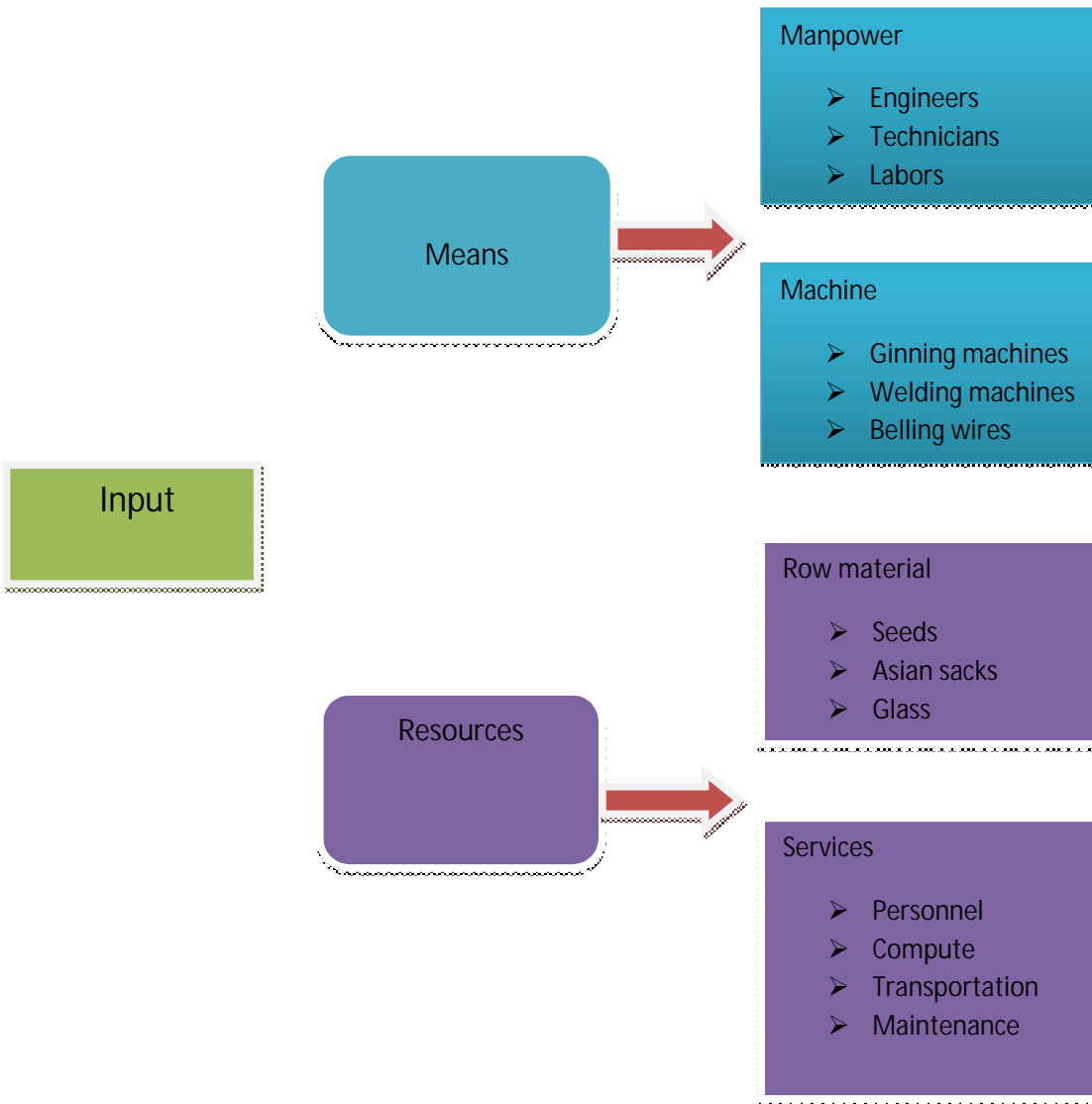


FIGURE1. Production Systems

## 2.3 Why is logistics important?

For all companies' logistics is important in operating the right product, quantities, condition, place, time and cost for better customer service.

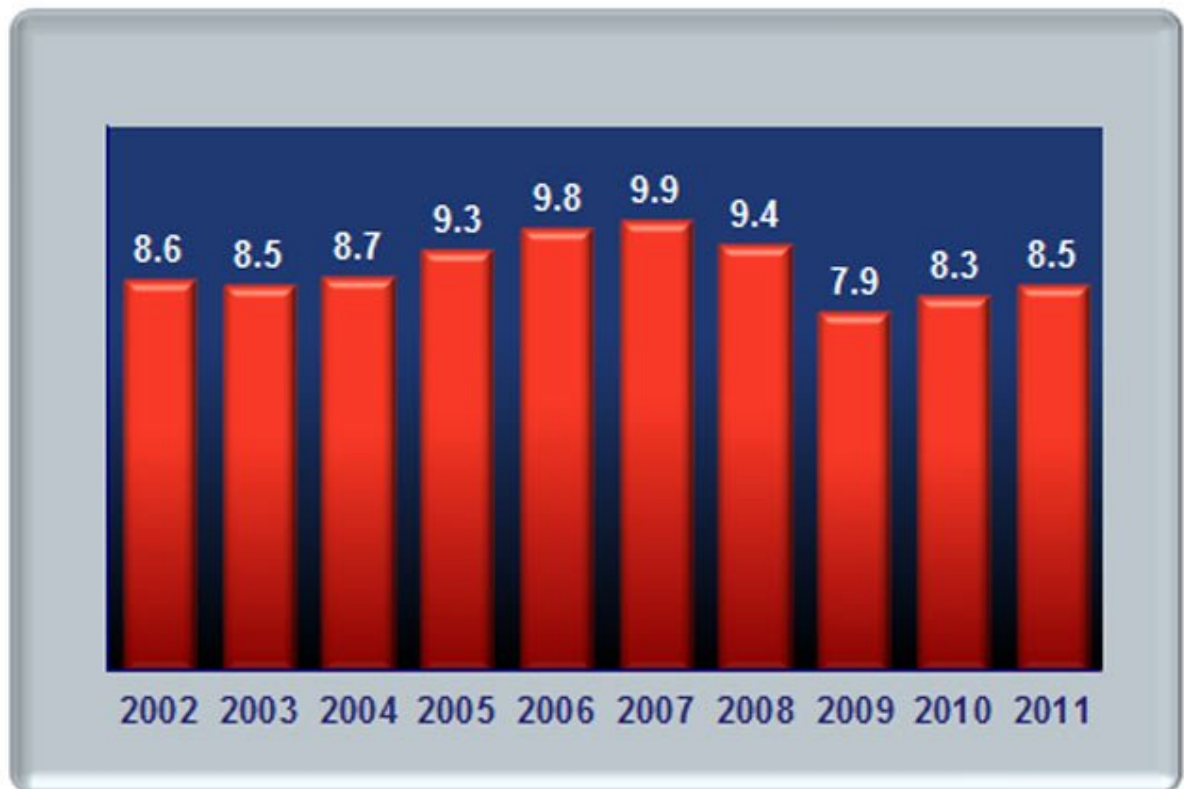
According to Wilson's report, in most countries logistics costs are increasing time to time. For example in the US logistics costs rose from 2.6% to 8.5% of GDP in 2011. In 2010 there was a 10.6% rise in turn followed by two years of logistics cost decline because of recession.

*Just for perspective, the total cost of US logistics was estimated at \$1.28 trillion in 2011, up 6.6%. A lot of elements go into that number, from warehouses to trucking to pipelines, but the three main categories are inventory carrying costs, including the costs of warehousing, (32.6% of the total), transportation costs (62.8%), and administrative costs, mostly related to logistics IT spend not otherwise capture in the other two categories (just 4.6% of the total). (Annual state of logistics report 2012.)*



The following figure shows an Illustration on US Logistics Total Cost.

## US Logistics Cost As A Percent of GDP



**Source: Rosalyn Wilson, CSCMP**

FIGURE 2.US Logistics Costs(State of the Logistics Union 2012)

### 2.4 Transportation system

According to Farahani,Rezapourand Kardar (2011),logistics transportation cost takes one-third and two-thirds of the overall product costs in most

companies' revenue of. The cost depends on the product type, size, weight and distance. Most of the time production and selling places are located in different places. Transportation plays an important role to fill this gap, and transporting just in time creates time and place utility on the products. This plays an important role in fulfilling the customers' needs. (Farahani, Rezapour & Kardar 2011, 13.)

Farahani et al. state that the material flow from the point of origins to the point of consumption needs an integrated system. This response forces to generate the logistics concept. The objective of the logistics process is to get the right quantity and quality of materials (or services) to the right place at the right time, for the right client, and at the right price. Logistics involves the integration of information, transportation, and inventory, warehousing, materials handling, and packaging.

Farahani et al. say that the logistics process deals with receiving, processing and delivering movement and it can be divided into three parts:

1. Inbound logistics: receiving, storing and disseminating incoming goods from suppliers.
2. Materials management: controlling the storage and flows of materials within a firm.
3. Outbound logistics: movement of material, storing, transporting and distribution to the final customers. Its benefits are delivery on time; meeting the customer's needs, and balance between supply and demand.

## Storage

Warehouses and distribution centres are fundamental for product quality and safety, consumer protection and respect for the environment. Depending on the storage, the product could stay in a different location and for a different length of time in between the time it is manufactured and time it is delivered to the customer. A warehouse must be designed to accommodate the loads of products to be stored depending on the goods. (Farahani, Rezapour & Kardar 2011, 30.)

There are four primary storage functions and the design and structure of the storage should satisfy one or more of these:

1. Holding
2. Consolidation
3. Break-bulk and
4. Mixing.

An illustration of the stages of storage is found in Figure 3.

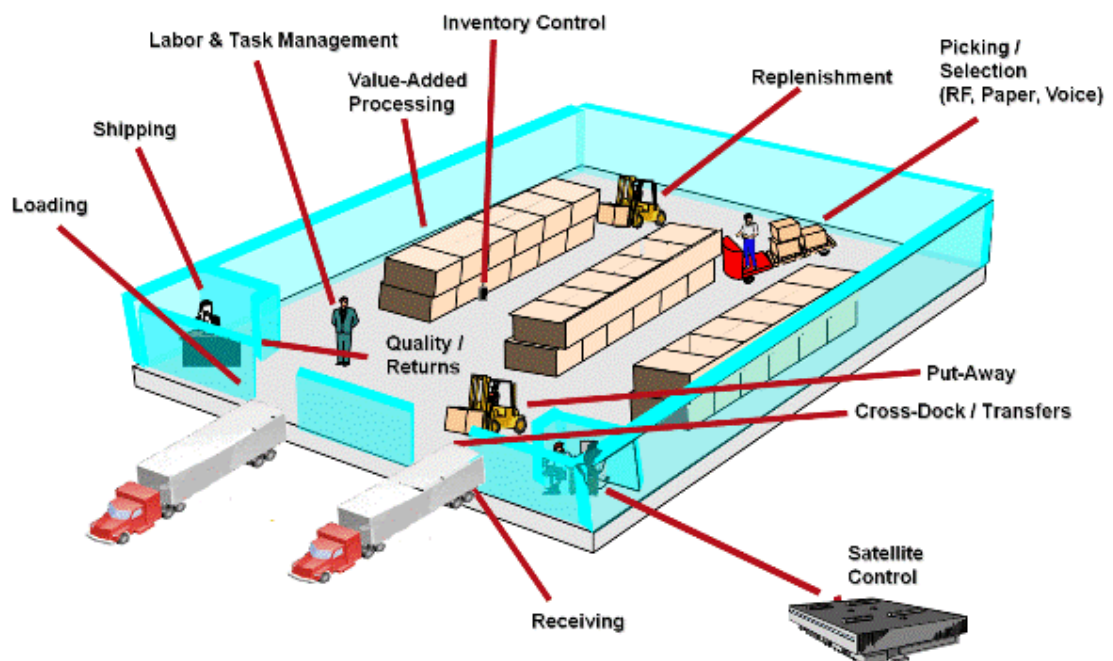


FIGURE 3. Structure of a Warehouse (Source: armitage.com)

Storage of inventory in warehouses can be categorized into two main groups: (Sadjady2011, 32.)

- Temporary or short term storage
- Semi-permanent or long term storage.

Temporary or short term storage can be used for a short period of time.

Unpredictability in lead time and demand can limit the amount of temporary inventory stored period.

Semi-permanent or long term storage is used for the excess of what is required for normal replenishment, like seasonal demand, conditioning or products, special deals and speculation or forward buying.

## Module

As stated by Anthony and Mayfield (1994), since 1972 there has been a steady increase in the use of modules for storing harvested cotton. By 1992, more than half of U.S. cotton crop was stored in modules before ginning. A cotton module is a freestanding stack of cotton; the stack is produced by dumping harvested material into a form known as a module builder. A module builder is equipped with a mechanism that compacts the harvested material to a density of about 12 lb/ft, thus giving the stack integrity to be freestanding after the module builder is removed. Specially built, self-loading trucks and trailers are used to transport the modules. (Anthony & Mayfield 1994, 21.)

According to Robert (1996) Since 1960s, there has been production of cotton with increasing trends in quality. During this period, there has been a stable increase in the use of modules for storing harvested cotton. The module builder was invented in Texas in 1970s. The module is a freestanding stack of cotton which allows seed cotton to be stored for long periods. From 1992 until now US has a stored cotton crop in modules before ginning and it has changed cotton harvesting and storage protocols. Normally modules are built on the ground and covered with traps to protect the cotton from rain and wind damage. The standard module size is 9.75 m in length, 2.44 m in width, and 2.44m in height. (Robert 1996, 16.)

Having a supply of cotton leads to a more predictable, manageable, and economical operation.

The use of modules:

- When ginning cannot be applied immediately after harvesting the cotton, they can be used as reservoirs.
- When harvesting is not thinkable, the ginning process can proceed from the reservoir without any difficulty.
- Harvesting and ginning operations can proceed individually. (Kerby, Weir, and Keeley 1996, 313.)

Before modules were introduced in 1972, the primary method of moving the harvested cotton from the field to the cotton gin was trailers. Having a lot of trailers limits the amount of storage. As the result of harvesting being delayed when the trailers were occupied, the harvest season was extended, which let the cotton remaining in the field in bad weather conditions and the cotton would lose its quality. (Bennett 1992, 16.)

Bennett states that using turn rows instead of buying more trailers for seed cotton to be stored is more preferable and cost effective. In the late 1960's a cotton ricker came into use, it was a portable slip form equipped with a compressing compartment, which allowed seed cotton to be dumped into it. When the seed cotton was filled into it, the ricker started to compress and the slip form created room by moving forward.

### Module storage

According to Anthony and Mayfield (1994), seed cotton should be stored in a good site to prevent damage. To store cotton for a long period of time the storage site should be as follows:

- Well drained module site
- Smooth or free from grass land
- Far from traffic road
- Away from possible sources of fire
- Accessible in wet weather.

A safe storage site for modules should be:

1. Well drained
2. Free of gravel, stalks, and debris such as long grass
3. Smooth, firm, and near-constant grade
4. Accessible in wet weather
5. Away from heavily traveled roads and other possible sources of fire and vandalism
6. Clear of overhead obstructions such as power lines.

Anthony et al. have stated that growers may use turnrows, field roads, or designated in-field storage areas as storage sites for modules. Field turn rows can be improved by preparing an elevated site. Drainage precautions are essential because standing water or permanently wet soil will cause a layer of seed cotton to deteriorate. In the Rain Belt, modules should be oriented north-south because they dry faster after rain than when oriented east-west. ( Anthony et al, 1994, 21).

## Seed quality

According to Lalor, Willcutt and Curley (2011, 19), planting good quality seed as well as the length of the storage period are critical for establishing a good stand. Cool, wet fall conditions and immature cotton can reduce the quality of seed. Mostly when seed cotton moisture increases, the color of the cotton will change. An average air temperature during storage is a better way for cotton module. More than 14% moisture will increase the chance to be yellowing. Moisture content in the cotton and storage length afflation should be stronger if it is weak it causes low seed quality. Seed germination will be reduced and free fatty acid content and aflatoxin level are increased. F.Lalor, Willcutt and Curley (Cotton Ginners Handbook, 19).

In Table 1, the box on the right shows recommendations from Agricultural Research Service (ARS) studies on safe storage. The studies were done on small lots of seed cotton at densities up to 12lb/ft<sup>3</sup>.

TABLE 1. Moisture Content

Moisture content of seed (percent, wet basis)	Maximum safe storage (days)
8-10	30
10-12	20
12-14	10
14-15	Fewer than 3

Willcutt et al. have pointed out the things which should be considered when storing seed cotton:

1. Cotton seed modules vary in moisture content.
2. During storage at higher moisture level seed cotton moisture increases one or two percent.
3. If the seed moisture goes above eleven percent while in storage, the quality of the seed is affected, as specified by germination and free fatty acid.
4. Moisture level causes low quality in storage, and seed which has a low quality during harvest.
5. While storing seed, cotton trash and its moisture has a critical factor on it.
6. Poor germination is a result of long storage periods and warm environment temperature.
7. Seed should not be compressed at a density of 25lb/ft<sup>3</sup>; it causes physical damage to the seed.

Oil quality and seed germination can easily be affected by moisture during storage. When the seed cotton is stored for planting the moisture should not exceed ten percent. On the other hand, oil quality can be kept well at twelve percent of moisture at storage. (Lalor et al. 2011, 19.)

## Effects of moisture and storage conditions on fiber quality

Several variables influence module temperature and seed and fiber quality during seed cotton storage. Moisture content is the most important of these variables. Other variables include length of storage, amount of high-moisture foreign material, initial temperature of the seed cotton, temperature of the seed cotton during storage, weather factors during storage (temperature, relative humidity, rainfall), and how well the cotton is protected from rain and wet ground conditions. (Lalor et al. 2011, 23)

Levels of moisture increase or decreases affect the quality of the seed. To prevent the seed from damage we need to make the temperature balance with a proper amount of drying or moisture level.

As Gordon, Horne and van der Sluijsstate in their series, Moisture in cotton- the fundamental, there should be optimum moisture levels for seed storage.

*The level of moisture in seed-cotton at harvest through to the level in baled lint can have significant effects on the quality of fiber sold to the spinning mill. Dry cotton is easier to clean but will be damaged during ginning and lint cleaning. On the other hand, cotton with excessive moisture is difficult to gin and clean, and will degrade during storage. Both constituents of seed-cotton-fiber and seed are hygroscopic, for example sensitive to moisture, but to different degrees. (2010, 38).*



## Effect of storage on quality

Seed and fiber quality can be affected by numerous variables while in storage of seed cotton. Some affecting factors according to Cotton Production Manual (Kerby, Weir, and Keeley 1996, 317) are as follows:

- Moisture content
- Length of storage
- Amount of high-moisture foreign matter
- Variation in moisture content throughout the stored mass
- Initial temperature of the seed cotton
- Temperature of the seed cotton during storage
- Weather factors during storage (temperature, relative humidity, rainfall)
- Protection of the cotton from rain and wet ground.

## Packaging

Packaging is an essential element in logistics systems; it can affect logistic activities, cost and performance. Although packaging involves less cost than other logistics expenses, if the packaging is not complete it will be a cause for other unnecessary cost. As an example, if a package breaks during transportation the transportation company will pay extra for repackaging and the goods might not be in their previous condition- in addition there will be delay in delivery which results in that they have to compensate for this as well. (Johnsson 1998:, Twede 1992, Saghir 2002.)

Packaging goods helps to protect or preserve items from damage, identify the item easier, and it gives basic information, facilitates the handling and storage of items and improves the product appearance, and assists in promoting, marketing, and advertising it.

There are three well explained definitions for packaging:

1. *Packaging is a coordinated system of preparing goods for transport, distribution, storage, retailing, and end use.*

2. *Packaging is the means of ensuring safe delivery to the ultimate consumer in sound condition at minimum cost.*
3. *Packaging is a techno-economic function aimed at minimizing costs of delivery while maximizing sales. (Paine 1981.)*

Packaging can be classified as primary, secondary and tertiary. Primary packaging handles the small unit in the system. Secondary packaging deals with bundling a number of primary packages together. The tertiary packaging system is used when there are a number of primary or secondary packages which are assembled on a pallet or roll container. The role of packaging is to fulfil the requirements of logistics, marketing, production, product development and from the environment (Johnson, Hake, and Eerby, 1998, 322).

Different levels of packaging are shown in Figure 4 below:

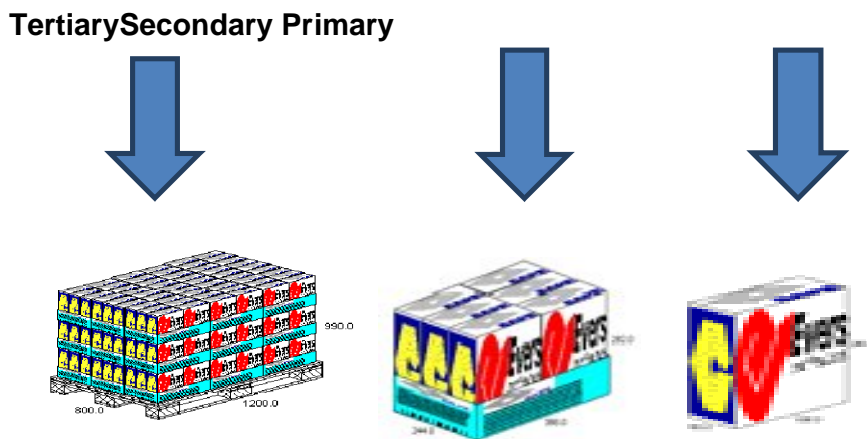


FIGURE 4. Level of Packaging Systems

According to Johnson et al. (1998, 322), cotton is a very popular product widely used all over the world. Packaging has an influence on seed and fiber quality during seed cotton storage, so to protect the quality during storage in particular the characteristics of packaging are essential.

Johnson et al. state that packaging time has a greater impact on cotton; during storage the moisture content is the most important. Different factors can influence the quality of the cotton such as the length of storage, amount of high-moisture, variation in moisture content throughout the stored mass, initial temperature of the seed cotton, temperature of the seed cotton during storage, weather factors during storage, and their protection from damage. In general, the weight or moisture change characteristics of universal density cotton affect seed germination. Cotton moisture content should not exceed 10% in storage when the seed will be saved for planting.

### Humidity/Moisture

Cotton requires particular temperature, humidity and possibly ventilation conditions (SC VI) (storage climate conditions).

TABLE 2. Cotton Humidity Source: Transportation Information Service (GDV)

<b>Designation</b>	<b>Humidity/water content</b>
Relative humidity	65%
Water content	7.85 - 8.5%
	8.5%
Maximum equilibrium moisture content	65%

## Bale presses

In the course of transportation and storage to protect cotton from contamination it must be baled and packaged. The universal density of a bale is 28 pounds per cubic foot. There are three types of bales modified flat, compress universal density, and gin universal density (Johnson, Hake, and Eerby 1998,322).

## Ginning effect on cotton quality

One of the reasons for poor qualities of cotton production is ginning. This indicates that the quality of cotton also depends on ginning processes. Fiber moisture during ginning and the amount of cleaning used are the main factors in the quality of cotton. Ginning the cotton has its own influence on the quality of fiber by converting seed cotton into bulk. However it can expand the market value (S. Johnson Hake, K.D. Hake, and T.A. Eerby 1998,322).

Johnson et al. think that moisture range between 6 to 8 percent is suggested for ginning lint. Gin cleaners will remove more trash if the moisture is low; however, more fiber damage will result, and turnout will be reduced. At 7 percent moisture, the average fiber strength for upland cottons is about 1.8 times the fiber-seed separation force. Lowering fiber moisture will decrease individual fiber strength. Fiber moisture will decrease individual fiber strength, thus causing more fibers to break during ginning.

The report of an expert panel on ginning methods (2001, 15) recommended the best ginning practices in their report as follows:-

- *Determine the needs of customers including marketing firms, textile mills, and cotton farmers. Consider the type gin stand required (saw or roller), hand-picked or spindle-harvested cotton, humidity during harvesting and ginning, type seed cotton storage used, market grades required, and potential textile use.*
- *Select a gin site that is economical for cotton transport. The site should not conflict with the present or anticipated land use in the area, especially urbanization.*

- *Install gin machinery that meets the needs of the customers*
- *Develop contamination prevention program to ensure contaminant free bales. Avoid use of synthetic materials in and around the gin and cotton fields.*
- *Ensure that each gin machine operate all the correct speeds, settings and capacities.*
- *Store seed cotton at less than 12% moisture content*
- *Gin at 6 to 7% fiber moisture at the gin stand.*

Labor basic hourly wages for workers are \$7.00 and \$4.45 per hour for machine operators and field workers (irrigators), respectively. Adding 34 percent for SDI, FICA, and other benefits increases the labor rates to \$9.38 per hour for machine labor and \$6.10 per hour for manual labor. The labor hours for operations involving machinery are 10 percent higher than the machine hours, to account for the extra labor involved in equipment setup, moving, maintenance, and repair (Report of An Expert Panel on Ginning Methods 2001, 15).

## 3 DESCRIPTION OF THE COMPANY

### 3.1 Profile

The Ethiopian cotton growers, exporter and ginnery association, the ECGEA is an autonomous non-governmental, non-political and non-profit organization that acts on behalf of its members. It operates under the proclamation number 341/1995 issued to establish Chamber of Commerce and Sectorial Association. It is registered by the Ministry of Trade and Industry with license number 020/4/019 issued on 15/09/2009.

ECPGEA is also registered and licensed by Charities and Societies Agency in accordance with the Charities and Societies Proclamation no. 621/2009 under certificate number 1416 on January 18/2010.

Today ECPGEA's membership is broadened significantly and many companies in the Cotton and Ginning value chain are joining the Association, motivated by the association's basic commitment to serve all in the Industry.

**AMIBARA Business Group:** This is established by a dedicated local entrepreneur called Mr. Abdulatif Omar in the former AMIBARA Angelele farm in 1997. After years of expanding the farming business it has integrated vertically beginning from 2006. Middle Awash Agricultural Development Enterprise, Omo valley Agro -Industry plc, Arba Minch and Abaya farms are under the administration of AMIBARA Business Group. The corporate administrative office is in the capital Addis Ababa, these five farms are located in the Afar regional state and Southern Nations, Nationalities and people's regional states. The total cultivable land holding has increased to more than 14,000 hectares. In addition to the farming business, the promoter also has integrated horizontally to other businesses as Aviation, Food processing and Freight & Transport.

**Middle Awash Agricultural Development:** This Enterprise was established in the Awash valley on 300 hectares of land scattered around the former AMIBARA Angelele farms in 1960 E.C. By the time of establishment the enterprise was one of the few farms engaged in cotton production. In 1973 the enterprise was

reorganized under Awash Agricultural Development Corporation. And in between 1973 and 1977 E.C the government expanded the Enterprises land holding by 10,116 hectares making it 13,116 hectares. The enterprise was managed under five subdivided state farms (MelkaSedi, MelkaWerer, AMIBARA Anglele, DoffenBolhamo and Gewane state farms) until three of the state farms and part of MelkaWerer are given back to the local farmers which reduced the land size to 7,533 hectares.

## Business plan

As this is very confidential, the company is not willing to cooperate on this regard. However, they have confirmed that they have a plan to expand their farm by two-fold (from 6000 ha – 12000 ha) and the required associated facilities in the coming five to ten years. Therefore based on the information the future plan of the company can be anticipated.

## Organizational structures

### 3.2 Description of the company's major logistics operation

#### Farm activities:

Agro-climatic character of the area is arid and the farms are located at an altitude of less than 300-1800meters above sea level. As mentioned earlier there are five farms under the Middle Awash Development Enterprises, with a total area of 6,000 ha. All in all, the cotton is grown by surface fade irrigation and mechanized farm. Mid-January and early April is the planting and harvesting seasons of the operation respectively. Some of the major farm activities are:

- 1 Pre- planting activities
  - Collecting and burning the previously cultivated residues ( cotton stalk )
  - Undertaking secondary plow and tertiary plows
  - Field leveling ,ridging ,de-silting irrigation and drainage

- canals
  - Maintenances of farm roads machineries, equipment
- 2 Planting activities
- Planting
  - Weeding
  - Pest control (spraying using chemicals , weeding by laborers etc.
  - Harvesting (picking cotton )
- 3 Post harvesting activities
- Pilling
  - Conveying to warehouse
  - Ware house management
  - Loading and unloading
  - Ginning
  - Grading
  - Baling
  - Marketing and transporting to Djibouti for export or to Addis for local market

As it can be seen from the above, the logistics activity of the cotton growing, processing, grading, marketing and transporting is very vast. However, for the purpose of this academic research, the scope this study was limited to the post harvesting activities.

### Post harvesting logistics activities

Right after the cotton is reached for picking, it will be picked by man power .In advanced countries this will be done by a cotton picker machine and this will reduce loss, damages, time, cost etc.). One cotton picker machine can do the work of 30 to 40 hand pickers.



An average collection rate per person per day is 450 pounds, and an average yield per ha is 25 quintals. From this we can estimate the annual total man days to collect the product as

$$1\text{pound} = 0.453592 \text{ kg} \quad 1\text{ton} = 10 \text{ quintals(Qu)}$$

So 450 pounds = 204kg = 2 quintals

- $6000 \text{ ha} \times 25 \text{ Qu/ha} / 2 \text{ quintals average picking per day} = Z$   
75.000labors---- (1)

Since the total products have to be collected completely within six weeks, therefore the total laborers will be

$$Z = 75.000 \text{ labors}$$

- $Z / 42 \text{ days ( 6 weeks )} = V \text{ 1786 labors-----} ( 2 )$

### Cotton in the field pile (Awdema and field Pile)

After the cotton is collected from its stem, it will be piled and temporarily be stored on the field .The average size of the pile is 10 m in radius and 8 m high .This means the average volume of the pile is

- $\pi r^2 \times h = 3.14 \times 10^2 \times 8\text{m} = 250 \text{ m}^3, \text{-----} ( 3 )$

The average density of stored cotton at AWDEMA is 150.000 quintals. This means in average in one pile 600 Quintals of cotton will be stored. The pile will be covered by plastic membrane .The main reason for storing raw cotton on the field is due to the need to collect the cotton within 4 - 6 weeks after it reached for picking. Otherwise it will be affected by pests and its quality will be deteriorated. Rain, pests, theft, loss are the major problem while storing at the field. Means of transport to store the cotton on the field is manpower and tractors. The major factors that determine selection of field pile sites are:

- ✓ Well drained area
- ✓ Well-developed infrastructure (availability of roads, electric...)

- ✓ Convenience to protect from theft and the destruction of animals
- ✓ Nearness to the farm from the cotton is to be collected

## Cotton in the factory

Batch by Batch, the field stored raw cotton will be taken to the local factory by using tractors. Here, loading and unloading will be carried out by employing manpower. The factory is located at middle awash and the maximum distance from the farms is 32 km. The factory has got its ginnery plant and warehouse .The ginning capacity is 300,000 quintal per annum and 50% of the total (150,000 quintal) is coming from own farm and the remaining is other's private farmers.

As the information obtained from the officials, depending on the market and quality of the product can be stayed from 1- 6 months in the ware house. See the factory flow diagram at the last page of this report. To transport the raw cotton to factory they use tractor mounted wheel.

## Ginning

Cotton obtained from middle Awash farm shall be ginned at the ginning factory located at middle awash, in close proximity to the five farms under Middle awash Agro industry. This factory gives the service to the five farms and other private cotton growers that found in the vicinity. Maximum distance between the farms and the factory is 32 km .In average 300.000 quintal will be processed by the factory and 50 % of which the middle Awash and the remains are others. As mentioned earlier the factory has got its own warehouse and transport unit at Amibara. Depending on the market and quality of the product, it can be stayed up to six months in the ware house.



FIGURE 5. Ginning Plant

#### Factory flow diagram (Ginning plant)

- **Feeding Room:** This is the inlet room where raw cotton is to be fed or supplied.
- **Rock Trap:** Part of the ginning plant which separate stones from raw cotton.
- **Big J (1<sup>st</sup> level cleaning):** Separates dirt and unwanted coarse impurities.
- **Inclined cleaner:** This is the second level of cleaning where gravitational and centrifugal force will be used to separate very fine rocks, stones and sands.
- **Pneumatic separator:** This is part of the ginning plant which uses pressurized air to remove dusts and very fine dirt, before the raw cotton is channeled to distribution conveyor.
- **Distribution Conveyor :** it distributes the cleaned raw cotton to different Gin units

- **Gin units:** There are four gins and, by receiving raw cotton from the distribution unit, each gin will separate the seed and lint from the raw cotton.
- **Jet cleaner:** separate light cotton from the heavy and the light batch will be sent to condensing unit.
- **Condenser:** At this stage condensation will takes place and then after the cotton will be sent to press unit.
- After the cotton is pressed, it will be tied with bearing wire and abujedi. The seeds will be conveyed to seed collector and finally packing will be held.

TABLE 3. Summary of the Ginning Unit

No	Issue	Description
1	Number of ginning unit and capacity	There are 8 ginnery units, each of them with 80 ginning saw.
2	Average service per annum	300,000 quintal per annum
3	Quality control mechanism	In general quality control is held manually. Some of the major manual practices are: <ul style="list-style-type: none"> <li>• Controlling the flow of cotton</li> <li>• Monitoring moisture of cottons and regulating machines</li> <li>• Controlling cleanness of sacks</li> <li>• Cleaning machine parts and equipment's with pneumatic cleaners</li> </ul>
4	Main power source	Hydroelectric power supplied from the main Grid.
5	Manpower	There are about 44 skilled and semi-skilled workers, this include operators, electricians and welders.
6	Major problems of the ginnery unit	Power interruption, mechanical problem and difficulties in getting Spare parts are some of problems encountered by the plant

### Belling

Belling and packing of the product will also be done at the factory and the following materials will be used:

- ✓ Asian cloth (Abujedi)
- ✓ Sacks (JONYA)

- ✓ Belling wire (quick link and manual)

## Warehouse

Brief description of the warehouse and major activities

<b>Warehouse</b>	Totally there are 10 (12 x 50 meter) warehouses and the mode of storing the goods is almost mixed. Raw cotton ,lint and seeds are the major goods to be stored and others like sacks are also be put in the store
<b>Storage Duration</b>	<ul style="list-style-type: none"> <li>• Lint – 1-2 months</li> <li>• Raw cotton – up to two or three weeks</li> <li>• Seed – immediately (in days )</li> </ul>
<b>Major procedures or activities in receiving and issuing goods.</b>	<ul style="list-style-type: none"> <li>• Receiving raw goods based on goods receiving form and procedures</li> <li>• Arranging received cotton and labeling</li> <li>• Supplying to the ginning factory</li> <li>• Record the input and output of the factory (raw cotton versus seed and lint)</li> <li>• Rearrange the lint and seeds in the ware house</li> <li>• Dispatch the product based on dispatch form and procedure</li> <li>• Document all records and report to the head office</li> </ul>
<b>Quality control</b>	<p>There are no technologies and facilities applied to prevent reduction of cotton's quality in the store. Fumigant is the only chemical to be used.</p> <p>In order to identify the product it will be tagged</p>

with the following labels.

<p><b><i>Lot number</i></b></p> <p><b><i>Gross weight</i></b></p> <p><b><i>Net weight</i></b></p> <p><b><i>Ter weight (weight of packing materials)</i></b></p> <p><b><i>Steeple length (length of cotton fiber)</i></b></p> <p><b><i>Grade</i></b></p>
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**Man power**

there are about 10 skilled, 45 semis killed and 300 daily laborers in both day and night shifts.

**Addis Ababa warehouse**

Due to various reasons, such as export market or lower quality, some of the final product will be taken to Addis Ababa for the domestic market .The distance from Middle Awash to Addis Ababa warehouse is about 250 Km. As mentioned earlier, depending on the local market it could stay in the warehouse for about six months to one year. Different types of goods will be stored in the warehouse (Raw cotton, oil seeds, planting seed, cotton seeds, Asian cloth (JONYA) etc.).



FIGURE 6. Addis Ababa Warehouse

As per the information obtained from the office, the average capacity the warehouse at Addis Ababais 10 % of the cottons coming to Addis Ababa from the different farms including the Middle Awash.

Transporting Cotton (for export to Djibouti or for local market to AddisAbaba)

After ginning and belling, as per the request of buyers, the cotton will be transported to Djibouti (for export) or Addis Ababa (for the domestic market). The product will be checked by the Ethiopian Custom Clearing branch office at



Awash. The mode of transport is FOP (freight on port). The means of transport they use to transport to the port Djibouti as well as to Addis Ababa is tracks.



FIGURE 7. Addis Ababa Garage

There are no special or advanced technologies like GPS, RFID or networked system that ensure the tracking system. They just use fuel, verifying dispatch order, incentives to motivate drivers and avoid delay. Some of the major problems associated with transporting cotton are:

- ✓ Theft while driving or being stationed
- ✓ Delay
- ✓ Reduction of quality
- ✓ Rain, dust etc.

TABLE4. Means of Transport and Days Required from Middle Awash to the Ginnery

	Station	Means of transport	Number of days
1	From cotton stem to field pile ( Awdema)	Manpower, tractor mounted wheel	4 – 6 weeks (all the product)
2	From field pile to Factory	Tractor, and man power to load and unload	8 – 10 weeks (all the product)
3	From factory to warehouse at the Middle Awash	Tractor, manpower and fork lift	-
4	From factory to warehouse to Addis	Trucks (to load and unload man power and forklift)	One trip takes 2 days (1 <sup>st</sup> day travel from AA – Middle Awash ,2 <sup>nd</sup> day loading and travel to Addis)

## 4 ANALYSIS

### Explanation of the research finding

Today, the Ethiopian cotton grower company can proceed with its 5-year business plan and also can slowly increase its benefit, but still with its unsolved logistics gaps, which have a destructive influence on the company's future. According to the analysis of the questionnaire and interview with the manager, the main current logistics problems are as follows:

#### a. Organizational gaps

In Ethiopia until the last few years, the field of logistics has not been well known. The Ethiopian cotton growers and ginning company faces an absence of adequate staff regardless of its logistics department. And also the country has no clearly stated policy concerning the cotton grower and exporter company. This leads the company to have inadequate regulations, policies and standards related with logistics activities. With all of the above mentioned problems, getting into world markets and being competitive is a big challenge for the company. Financial problems are the big barrier to introduce better technologies like computers, machineries, new software, truck, tractor, and the like that can advance the operation.

- ✓ Absence of adequate staff
- ✓ Absence of policies, regulations, standards related with logistic activities
- ✓ Challenges in getting start-up capital to introduce better technologies or equipment that could advance the operation

## b. Knowledge and skill gaps

Regarding the knowledge and skill gaps in ECGG, most of the departments suffer from lack of required professionals, especially ginning, tractor etc. Also all the paper work from point of receiving orders till delivery needs well trend specialist personnel to make the business operation smooth and effective.

The equipment which is used for processing cotton starting from seeding to the final production contributes essentially to the cotton quality and quantity. So this equipment needs maintenance to perform in their full capacity. The company has no maintenance schedule for the ginning machineries according to its standard application.

- ✓ Absences of specialist in regards to logistics management

## c. Technological gaps

The absence of innovation is one of the company's logistics gaps. There are no controlling methods used in its transportation process, there is manual data recording, warehouse processes are poor, file documenting is done manually. There is a low capability of warehouse for raw cotton, i.e. it does not have a single technology like controlling the room temperature, humidity etc. There is limited communication, like updating every activity with internal or external information, no internet connection.

- ✓ Relevant soft wares
- ✓ GPS
- ✓ Automated equipment
- ✓ Limited communication (radio, internet etc.)
- ✓ Controlled warehouse (temperature, humidity etc.)

#### d. Infrastructural gaps.

Limited electric power, asphalt and transportation facilities are barriers to the growth of logistics sectors. Beside these difficulties, the location of farming, warehouses and distribution places has an impact on the development of the business.

Recently in Ethiopia electric power has been the most difficult and still unsolved problem. Nowadays it is common not to get electric power for one full day or even two days. So the ginning process may be interrupted with this situation. This is one of the big gaps in the process. The other logistics gap is road. Ethiopia has four weather seasons, autumn, spring, winter and summer. Starting from June to September it rains every day, most of Ethiopian roads are not asphalt, so all the roads get muddy. It is pretty difficult to drive; even a car can be stuck in mud especially if the car is not four wheel drives. The other three seasons are not rainy seasons, some are cold and one is a hot season, it has no effect on the transportation process, but still the infrastructure of the road is not suitable for the vehicles. Beside this, the location of the warehouse is another logistics gap for the company. Due to the policy in Ethiopia, land is owned by the government. The company has rented the warehouse for ten years from private owners. Due to that, the company will not develop any warehouse facility, so the condition of the warehouse is in danger. Especially in a rainy season it might get into a very bad condition.

- ✓ Limited electric power
- ✓ Limited warehouses, garages and terminals
- ✓ Bad roads.

Technologies, practices, organizational, structure, skills and knowledge are considered in order to identify the appropriate interventions and implementation the following logical frame work have been employed

- R Relevance
- PB Potential benefit

- CE Cost effectiveness
- EA Ease of application
- AF Affordability
- AC Adoptability by other  
companies

TABLE 5. Weighting

Recommendations	Evaluation criteria – weight out of 10						Total mark Out of 60
	R	PB	CE	EA	AF	AC	
At field level <i>Cotton picking</i> <i>Piling</i> <i>Loading unloading</i>	2	3	0	0	0	0	5
In warehouse mgt <i>Issuing &amp; receiving goods</i> <i>Quality control</i> <i>Loading unloading</i>	10	10	10	10	10	10	60
In ginning process <i>Quality control</i> <i>Maintenance of machines</i> <i>Improving efficiencies</i>	10	9	5	5	5	5	39
In pressing , belling & packing <i>Pressing machine</i> <i>Packing materials</i>	5	5	5	5	5	5	30
During loading unloading <i>Labour efficiency</i> <i>Health &amp; Safety issues</i> <i>Others</i>	10	10	10	10	10	10	60
In transporting the product <i>Planning transport mgt</i> <i>Tracking and monitoring</i> <i>Maintenance</i> <i>Communication</i> <i>Efficiency improvement</i> <i>Others</i>	10	10	10	10	10	10	60

In the SWOT analysis carried out, the following findings were made:

- A. Strengths of the company
  - Has got a large size of farm
  - Has got already developed farms and well mechanized farms
  - Has got its own transport unit
  - Has got its own ginnery unit
  - Has developed good network among international and domestic buyers
  - Has got its own garage, trucks etc.
  - Others
  
- B. Weaknesses of the company
  - Absence of adequate staff
  - Absence of policies , regulations , standards related to logistics activities
  - Limitation of start-up capital to introduce better technologies or equipment that can advance the operation
  - Absence of appropriate software
  - Absence of GPS
  - Un-automated equipment
  - Limited communication equipment (Radio, internet)
  - Limitations in controlling warehouse environment (temperature, humidity, storing system...etc.).
  
- C. Opportunities of the sector (Out of the company)
  - Ambitious national cotton sector development plan
  - Availability of adequate market or huge demand
  - Existence of cheap labour in Ethiopia
  - All weather road
  - Good communication infrastructures (telephone, electric, road )
  - Availability of project based loan
  - Others.



D. Limitations or traits of the sector (out of the company)

- Limited skilled manpower
- Environmental factors ( very hot working area ,dust ...)
- Others.

## 5 RECOMMENDED TECHNOLOGY RFID

RFID stands for Radio-Frequency Identification. The acronym refers to small electronic devices that consist of a small chip and an antenna. The chip typically is capable of carrying 2,000 bytes of data or less. It provides a unique identifier for that object or item and, just as a bar code or magnetic strip, must be scanned to get the information. (Technovelgy.com.)

RFID, or Radio-Frequency Identification, is a method of storing data and retrieving it via radio waves. Much in the same way as a barcode can store information about a type of product, RFID tags contain unique identifiers that correspond to inventory database records. RFID gives more advantage in your logistics chain than traditional logistics chain control. (Salon Media Group 2013.)

The following are described the benefits of RFID and how it works in logistics

### Material flow control with RFID

RFID helps to control material flow from starting point to final destination. RFID is able to identify the transport destination and specific routing. The purchase order number can be saved in the RFID tag, which can make the material handling process easier. Moreover, decisions can be made using locally available data. (DEMATIC 2013.)

### Real-Time Updates

RFID also can provide information to users across the company network if the item enters or leaves the warehouse by installing it at the entrances of the warehouse.

## Integration with Other Systems

The same RFID tags that provide inventory information can provide other services as well. Security scanners at building exits can let your system know instantly when any product leaves the premises, allowing you to spot theft or misdirected shipments quickly and correct the problem. Likewise, scanning RFID tags at entry and exit points allows confirmation of shipping and delivery of goods, allowing you to trace a shipment as it moves through your logistics chain, and provide accurate estimates of arrival to customers or other business units.(Salon Media Group 2013.)

## RFID tags and readers

RFID tag also called RFID transponder that combines the RFID technology looking and robust encapsulation.(Huayuan Smart Co.Ltd 1995-2011.)

In the following figure there is an illustration of a RFID Tag:



FIGURE8. Alien ALL-9338-02 RFID Tag

RFID tags are available with different types but for our logistics gap purpose, AlienALL9338 a 96-bit is selected. It is a very cost effective tag; it costs only 8 euros per tag. It is used to track product movement throughout your warehouse or supply chain. (BarcodesInc 1994-2013.)

RFID readers are also available with different types but for our purpose G: smart GX8900 and USB pen reader is selected.

G: smart GX8900 includes an integrated RFID reader, camera with flash, GPS and phone eliminating the need to carry multiple devices. It allows data to be transferred easily to other applications by using Bluetooth, WI-Fi. It costs 950 euros per item. It features as follows (CoreRFID Ltd 2012.):

Features:

- Operating System: Microsoft Windows Mobile 6.5
- Connectivity: Bluetooth, WiFi, GPS, 3.5G HSUPA, HSDPA, UMTS, EDGE, GPRS, GSM
- ID Capability: 2D barcode imager + ISO7816 IC Card
- Camera: 3 mega pixels, CMOS type with flash
- Voice communications: Phone / SMS Communications Support
- Environmental: IP65 rated, 1.5m drop tested
- Included accessories: Travel Charger, Headset and USB Cable
- RFID Capability: Reader /Writer 125 kHz/ 134.2kHz (Low Frequency RFID).

The USB reader costs 50 euros. Its advantage is that it doesnot require special software; it simply works on Excel, Word, and Outlook page. The reader works with Windows, Linux, Apple Mac and Android devices. (CoreRFID Ltd 2012.)

Features:

- Dimensions: 70mm x 20mm x 9.8mm
- Operating Frequency: 125kHz
- Tag Compatibility: Unique, EM4100, EM4102

If the company decides to buy, the cost per item will be as follows:

Cost Benefit Analysis - Purchase of new system (RFID)  
(Costs shown are per item)

1. Purchase of RFID reader (minimum cost) .....50 euros.
2. Purchase of RFID reader (medium cost)..... 950 euros.
3. Purchase of RFID tag (minimum cost) .....8 euros.
4. Installation of RFID tag ..... 0.05 c

In these findings the costs of shipment, time, labor and even training (how to use the system) are not included. This recommended technology is in a big question to apply it. Only to purchase one RFID reader costs 950 euros, which is equal to 23.750 in Ethiopian currency Birr? The company at list needs four RFID readers, which cost almost 100.000,00 Ethiopian currency Birr.

<b>Recommendations</b>	<b>Strengths</b>	<b>Weakness</b>	<b>Opportunities</b>	<b>Traits or challenges</b>
<ul style="list-style-type: none"> <li>- RFID tag Alien ALL9338</li> <li>- G:smart GX8900</li> <li>- USB reader</li> </ul>	Strengths of the company in employing the recommended technologies: can only be expected to have good will for accepting and applying; hope to see after this finding	Weaknesses of the company in employing the recommended technologies: still not easy to adapt new technology and also lack of money to invest.	Existing external opportunities in employing the recommended technologies are computers, vehicles.	Existing external challenges in employing the recommended technologies: not easy to convince the management so it needs a lot of deep research to prove how important it is.

## 6 RECOMMENDATIONS AND CONCLUSIONS

### 6.1 Recommendations (results)

As mentioned in the literature review part of this thesis, transportation plays a vital role in the development of any business company. It influences good reputation, customer trust, good profit and the like. So, in order to meet all these essential requirements, the company needs to plan and schedule effective transportation services based on the customer satisfaction as well as its goal.

The second big issue is the design and structure of the warehouse. The company does not own its warehouse; the company rents its warehouse from private owners. As a result of this, no innovation, renewing or adjustment has been made in any part of the warehouse. Many factors affect the quality of the final product, raw cotton, like length of storage; amount of high-moisture foreign matter; variation in moisture content during storage period; initial and during storage period temperature of the seed cotton, and also weather factors during storage like humidity and rainfall as well as rain and wet ground;. Harvested cotton can be kept up to six months in the warehouse depending on the market demand; during this period all the necessary conditions must be fulfilled. So the company should negotiate with the owner of the warehouse about the condition of the warehouse and how they can renew or fix it according to the standard, and also how they will share the cost of renewal.

Harvesting and storing the raw cotton may take not more than six months; for the rest of six months the company should study and plan how the warehouse can make a profit rather than earn its fixed cost. They should, for example, investigate and collect data if there is seasonal storage demand for that period, plan to start a new business related to cotton product (oil factory, textile, fertilizer etc.). All the above mentioned ideas can make a profit and can even help compensate for the warehouse renewal cost.

Ginning is the other main issue especially when quality is more concerned. It has an impact on fibre quality. Based on the information gathered from the

company, there is lack of maintenance, spare parts and skilled man power regarding ginning machinery. This can lead the company to incur big costs or losses due to the quality and quantity of the final product. Maintenance is not the only quality impact but lint moisture also has an impact on fibre quality, so the company should give attention and provide the necessary materials and environment condition to keep lint moisture at a standard temperature. They should check the right humidity during harvesting and ginning- lint moisture should be in the range of six to eight per cent- the accurate speeds, settings and capacities of the ginning machine should be checked before using it. If this is not done, it can lead to more trash and more fibre damage.

Power interruption is the major problem, not only to the company but also the whole Ethiopia. Middle Awash ginning gives service for five farms and other private cotton growers; space, quality, quantity, time, money and other unnecessary costs are incurred due to power interruptions. To prevent this situation the company should have a generator which can replace the electric power when there is no power supply.

Starting from recording the input and output of the factory, the report provided to the head office is processed manually. Moreover, the document which is processed manually is kept in poor conditions and an unprofessional documentation system is used. There is no fire protection or theft protection as it can be seen clearly in Figure 6. If the company should use a computerized method to record the input and output of the factory till dispatching the product, it would save time, money, damage and loss of files, and it would be easier to apply the just-in-time method.

## 6.2 Conclusion

In this thesis it was found out that there are gaps in transportation, warehouse and ginning machinery, which are pulling back the logistics activities as well as the whole company goal. Based on the study, there is too little skilled man power to perform the ginning maintenance with a standard schedule and advanced efficiency. There is also a lack of capital

and government policy regarding having the company's own warehouse near the market, and a lack of capital to acquire all the necessary technology which can help store the items according to the standard in the warehouse as well as while transporting and protecting them from theft.

The objective of the study was to examine or evaluate the existing logistics management of Amibara agriculture development PLC, a member of ECGEA, and to recommend the best practices and technologies that could enhance the efficiency and effectiveness of the logistics operation. The study was focused on three major backbones of logistics activities; transportation, warehouse and Ginning machinery.

The transportation system in ECGEA is one of the major logistics activities which can make or bring the big difference concerning the quality, quantity, JIT method, profit and development of the company, as well as the ability to stay in and even to lead the market in future. ECGEA has its own transportation units the advantage of owning its own transportation units are availability of vehicles when needed, availability of suitable vehicles to transport raw cotton. Above all these positive sides, ECGEA have no controlling system regarding theft, time and condition, which is the main problem or obstacle in meeting its goal and in the development of the company. To avoid or minimize all these risks, using RFID is one of the solutions. Based on the data obtained from the company, the big issue regarding applying new technology is still money. The best solution for compensating for the cost of applying new technology would be to study the demand of renting vehicles, give mechanical service for outsiders (ECGEA only gives service for its own vehicles) and also provide delivery services for other companies. These could compensate for the cost of applying new technology.

The other main logistics activities cover all warehouse processes, which start from receiving seed cotton to be stored and harvested cotton from the farm to delivering ginned and packed cotton to the customer. Based on the study, the location and building structure of the company ECGEA warehouse



is below standard for storing seed, lint, raw cotton, ginned cotton and all the products of cotton seeds. There is no suitable temperature condition; the warehouse does not even have doors and no shelves to store to get the best quality and quantity output. According to the study, there is a possibility to improve the current situation by negotiating with the owner of the warehouse and also the government official to get a licence for building construction improvement. But still investing additional money in improvement is in question to the company.

Lack of skilled man power in the maintenance of ginning is the other major logistics gap. No standard scheduled maintenance has been performed before and still now; this is one of the major disasters regarding the cotton quality. Based on the cost efficiency, the solution could be to give training to the existing maintenance staff, and to give bonuses for the top maintenance staff who can lead the other maintenance staff. So with skilled man power it would be easier to maximize the cotton quality and the ginnery could work with its full capacity.

To conclude, applying new technology, giving advanced training to the staff, controlling transportation and improving warehouse conditions are expected to fill the logistics gaps which have been problems for the growth, being competitive in the world market and also for achieving the goal. So if the company can fill all the logistics gaps, it is likely to get better results in the future.

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