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Logistics Practices in Ethiopia

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Abstract

The ability to transport goods quickly, economically and reliably is vital to a nation's prosperity and capacity to compete in global market.

Ethiopia is a landlocked country in East Africa with a land area of about 1.13 million square kilometers and a population of about 82.8 million. 85 percent of the population is living in rural areas and the economy of the country is based mainly on agriculture accounting for 45 percent of GDP, 80 percent of exports and 80 percent of employment.

Ethiopian logistics system is characterized by poor logistics management system and lack of coordination of goods transport, low level of development of logistics infrastructure and inadequate fleets of freight vehicles in number and age, damage and quality deterioration of goods while handling, transporting and in storage. This coupled with lack of sea port resulted in poor linkage of producers (farmers) to the consumers (market) and non-competitiveness of Ethiopian goods on global market, which compromised livelihood of the people and economy of the country. There is very high rate of traffic accident (first in the world) and congestion in cities and at city inlets/outlets to which freight vehicles contribute significantly. Efficient and effective logistics system needs to be put in place to solve these socio-economic problems.

The objective of this work is to assess the current status of logistics practices in Ethiopia with the aim of identifying the gaps, potentials and constraints for development of effective and efficient logistics system. To meet this objective, qualitative assessment of the soft and hardware of logistics, freight logistics and transport companies, organizations dealing with documentation of import and export goods and case studies of specific supply chains of major goods in Ethiopia are made. Information from secondary sources is used to carry out the assessment.

Presence of road of high density and quality makes efficient distribution of goods easy. Customer orientation, low level bureaucracy at customs and trade facilitations expedite goods flow. Availability of skilled manpower, conducive labor regulations and business environment promotes economic activities. On most of these criteria, Ethiopian logistics system is found to be poor.

There is urgent need for research on the problems, for which Excellence Center for Freight Transport and Logistics in Ethiopia (EthioLog) is established. Intermodal transport system is the best solution and commencement of construction of 10, 000 km rail line is an opportunity to use road-rail integrated intermodal transport system to solve the logistics problems of the country.

Key Words: Ethiopia, Logistics, Freight Transport, Dry Port

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List of Abbreviations

ECX	Ethiopian Commodity Exchange
ERA	Ethiopian Roads Authority
ERC	Ethiopian Railways Corporation
ERTTP	Ethiopian Rural Travel and Transport Program
ESLSC	Ethiopian Shipping Lines Share Company
EU	European Union
FCL/LCL	Full Container Load, Less Than Container Load
FDRE	Federal Democratic Republic of Ethiopia
FTL/LTL	Full Truck Load/Less than Truck Load
FTLS	Freight Transport and Logistics System
GDP	Gross Domestic Product
HH	Household
IMT	Intermediate Means of Transport
km	kilo meter
m	meter
MAA	Maritime Affairs Authority
Mn	Million
MOFED	Ministry of Finance and Economic Development
MORAD	Ministry of Agriculture and Rural Development
MOT	Ministry of Transport
MOTI	Ministry of Trade and Industry
MT	Metric Tone
MTSE	Maritime and Transit Service Enterprise
O/D	Origin /Destination
PASDEP	Plan for Accelerated and Sustainable Development to End Poverty
PPP	Private Public Partnership
RSDP	Road Sector Development Program
TA	Transport Authority
TEU/FEU	Twenty/Forty Feet Equivalent Unit
UNCTAD	United Nations Conference on Trade and Development
UNECA	United National Economic Commission for Africa
URRAP	Universal Rural Road Access Program
WTO	World Trade Organization

1 Introduction

The ability to transport goods quickly, safely, economically and reliably (logistics) is seen as vital to success of businesses, and to a nation's prosperity and capacity to compete in globalized economy. Logistics is defined by council of logistics management as the process of planning, implementing and controlling the efficient, effective flow and storage of goods, services and related information from point of origin to point of consumption for the purpose of conforming to customer requirements. The integration of two or more logistics with in a network to create value, enhance efficiency and satisfy customers is called supply chain management.

Analyzing and assessing logistics and supply chain practices will help discern important issues such as emerging trends and areas of concern (Srivastava, 2006), which will help in taking remedial measures.

Cilliers and Nagel (1994) made assessment of status of logistics in South Africa using individual company's logistics excellence and how companies integrate into and the excellence of a supply chain they are part of. They used data gathered by questionnaire survey from key people in logistics industry. The elements of business logistics are treated well but many important factors such as infrastructure, availability of human resource in the market, customs, etc are not taken in the assessment. Diaz and Perez (2002) carried out empirical and statistical analysis on data obtained by questionnaire survey to identify the key characteristics that resulted in operational, market and state inefficiencies that constrained logistics development in Venezuela. They also basically dealt with business logistics and integration into a supply chain. They considered external factors such as the effects of infrastructure, macroeconomic uncertainty (due to short-term economic policies), human resource scarcity, inefficient customs, presence of foreign competitors and unidentifying foreign markets as threats to logistics development but the variance was low and they concluded that factor analysis has limitations in the explanatory power. Srivastava (2006) carried out study on state of logistics and supply chain practices in India by direct observation, informal discussions and interviews with middle and top managers of companies and information gathered from secondary sources. He also dealt basically with business logistics and supply chain integration. His focus was on a) supply chain collaboration and partnership b) supply chain structure including facilities network design for transport and logistics c)forecasting and demand management to cope with supply chain complexity in a cost-effective and delivery-efficient way and d) use of ICT to facilitate supply chain integration and performance. Probably the most

comprehensive study that objectively considered most of the important factors in the assessment is that made by Bookbinder and Tan (2002) where the authors proposed attributes of a world class logistics system (Table 1), applied cluster analysis to data from secondary sources to classify European and Asian countries into three levels (tiers) of logistics excellence.

Table 1: The 20 specific attributes (criteria) that determine logistics tiers

(Bookbinder and Tan, 2002)

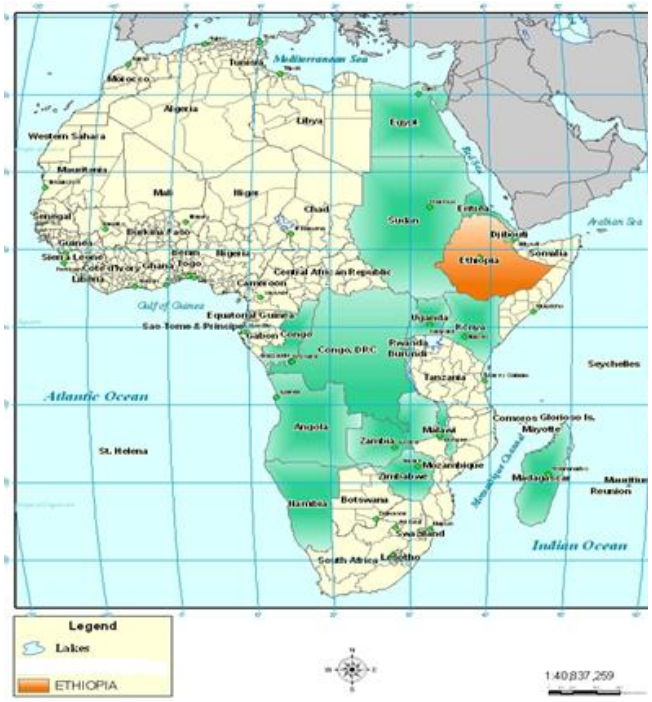
General attributes	Specific attributes	Description
I. Infrastructure	1. Distribution infrastructure 2. Infrastructure maintenance and development 3. Water transportation 4. Air cargo	1.The distribution of goods is generally efficient/inefficient 2.Infrastructure maintenance and development is/is not adequately planned and financed 3.Water transportation meets/does not meet business requirements 4.Cargo handling throughput
II. Performance	5. Customs administration 6. Process management 7. Customer orientation	5.Hinders/does not hinder the efficient transit of goods 6.Process management (quality, time to market, . . . is/is not emphasized in your country) 7.Emphasize/does not emphasize customer satisfaction adequately
III. Information system	8. New information technology 9. Electronic commerce	8.Implementation meets/does not meet business requirements 9.Is/is not sufficiently developed for business opportunities
IV. Human resources	10. Labor regulations 11. Immigration laws 12. Skilled labor 13. Industrial disputes 14. Industrial relations 15. Employee training 16. Worker motivation	10.Regulations (hiring and firing practices, minimum wages, etc) are too restrictive/are flexible enough 11.Prevent/do not prevent your company from hiring foreign labor 12.Is/is not available in your country's labor market 13.Low/high working days lost per 1000 inhabitants per year 14.Labor relations are generally hostile/productive 15.Is/is not high priority in companies 16.Identifies/does not identify with company objectives
V. Business environment	17. Export credits and insurance 18. Exchange rate policy	17.Are/are not available at reasonable prices for companies interested in exporting 18.Hinders/supports the

	19. Cost of capital	competitiveness of enterprises 19.Hinders/does not hinder competitive business environment
VI. Political environment	20. Political stability	20.Risk of political instability

Assessment of status of logistics practice in Ethiopia will be made in this paper from observation and secondary sources using the criteria in Table 1 and some additional criteria specific to the Ethiopian case.

Logistics Related Constraints in Ethiopia

Ethiopia is a landlocked country located in Eastern Africa bordering the Sudan, Eritrea, Djibouti, Somalia, and Kenya (Fig.1) with a land area of about 1.13 million sq. km and a population of about 82.8 million in 2009 (The Global Competitiveness Report, 2010), out of which only about 16 % live in urban areas. It has a tropical monsoon climate with wide topographic-induced variations. The country has wide topographic features varying between an altitude of 4,620 m above mean sea level (Ras Dejen) to about 120 m below mean sea level (Denakil Depression) (Fig.2) with a very difficult terrain (highlands criss-crossed by numerous river valleys and the Great Rift Valley) which made the provision of transport facilities very expensive.



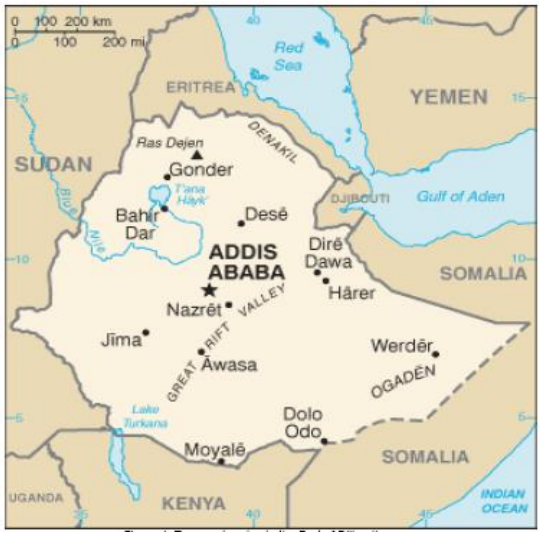


Fig.1. Location of Ethiopia (MOT, 2009) **Fig.2. Closer view of Ethiopia** (Kemal, 2010)

In the context of Ethiopia's topography and pattern of settlement as well as its dependence on other countries' seaport for import and export, transport plays a crucial role in facilitating socio-economic development of the country. The Addis Ababa-Djibouti railway (781 km old line of non-standard gauge of 1067mm) is the only railway that the country owns with Djibouti, but recently the Government has initiated the development of railway network with the establishment of Ethiopian Railways Corporation (ERC). Ethiopia has one of the most successful airlines in Africa providing local and international transport services for passenger and freight.

Road transport is the mode of transport that the country relies on for both domestic as well as international transport services. Recognizing the importance of the road infrastructure, the Government has launched the Road Sector Development Program (RSDP) in 1997 to address the

constraints of the low coverage of road network and standards. The network which was about 26,550 km at the beginning of RSDP in 1997 has increased to 46,812 by the year 2010.

Ethiopia is one of the poorest and least developed countries in the world. According to Growth Competitiveness Index of World Economic Forum, Ethiopia stands 119th among 133 countries surveyed (The Global Competitiveness Report, 2011). Its economy is based on agriculture, accounting for 45% of GDP, 80% of exports, and 80% of total employment. The biggest sources of foreign trade are coffee, flowers, oilseeds, grains and leather.

The main development objective of the Ethiopian Government is poverty eradication through accelerated and sustainable development. In about 20 years, Ethiopia's vision is to reach the level of middle-income countries. The long journey towards achieving socio-economic transformation has already commenced with the implementation of effective economic policies and strategies. Ethiopia's economy is growing over 10% and the GDP per capita is estimated to be USD 390 in 2009. Yet, in spite of high rates of growth most Ethiopians live in poverty. Periodic droughts, soil degradation, high population density, high levels of taxation and poor infrastructure (World Bank, 2010) and hence serious imbalance of payments in the country's foreign trade are the main obstacles to sustainable economic growth (Cilliers and Nagel, 1994).

Moreover, as agricultural economy, promotion of agricultural market is among the key strategies of Ethiopia. The post harvest loss which is estimated to range from 15% to 70% are mainly attributed to poor management and control including packaging, value added handling and processing, and transport. These losses depress and compromise the exporting potential of the country and the livelihood of farmers which necessitates the introduction of modern supply chain management system (EthioLog Concept Note, 2010).

Economic growth and trade depend on transport. Virtually no production can take place unless inputs such as raw materials, labor, and fuel are moved to production centers. Without transport infrastructure, manufactured products cannot be delivered to consumers, nor can a wide variety of services be carried out. The road infrastructure in Ethiopia and the freight transport vehicles in terms of size, age and capacity, are not sufficient to support the growth in the economic activities.

As an integral part of national production and distribution system, an adequate transportation network is necessary to provide a means of servicing domestic and international markets.

As a landlocked country, Ethiopia is dependent on seaports of other countries for its export and import. Although, due to the existing circumstances the country is depending mainly on port Djibouti, future possibilities of using Port Sudan, Berbera, Assab, Massawa and Mombasa may be investigated with respect to the available transport infrastructure and geographical proximities. The cost of freight transport is an important factor in the competitiveness of a country's economy. With high transport costs,

large economies of scale will remain unexploited, and production will therefore be inefficient. The estimated total cost of border crossing in Africa is the equivalent of the cost of inland transport of over 1600km (Harmon et al, 2009). Experience from developing regions such as Latin America and Asia suggests that combined trade liberalization and a supportive trade-transport chain tend to create a virtuous cycle of lower costs, increasing trade volume, and economies of scale and scope in distribution and production activities (Konings et al, 2008). Efficient trade logistics are also important for attracting foreign direct investment, which in turn can increase a country's export capacity. With current trends in reduction in maritime transport cost and more advanced logistics technology that compensates for the handicap of intercontinental distances, lack of direct sea-access presents growing challenges to the global integration and growth prospects of many landlocked developing countries. The problem mostly affects the poorest countries: 20 out of 54 low-income economies are landlocked, with a majority of them in Sub-Saharan Africa (Arvis et al, 2007), one of which is Ethiopia. The port charges at the monopolistic Djibouti port have become unbearably high for Ethiopian import and export goods.

The idea of dry port is emerging in the country to tackle the constraints related to ports and for cost effective use of the transport infrastructure. The need for freight and logistics system is, therefore, fundamental to manage and control the material flows with in the country, to and from ports, and logistical activities at the dry ports.

In this new era of economic development, both soft and hardware of logistics infrastructure are lacking in the country. Inadequate human capacity in the emerging economic and supply chain management system in governmental and private organizations is among the major bottlenecks in the field of freight transport and logistics activities in Ethiopia. In order to realize the objectives and ensure that the country's vision and dream come true, a coordinated and concerted effort on innovative freight transport and logistics system at national level is critical to aspire beyond what is required by the MDGs.

The constraints associated with logistics system in Ethiopia could be characterized as follows:

a. Underdevelopment of logistics management system
b. Inadequate fleets of vehicles (means of transport) for goods transport
c. The market possibility of the country is hampered by poor logistics system
d. Very high traffic accident (the highest in the world) in which contribution of goods transport is significant
e. Congestion in cities and at inlets/outlets
f. Lack of coordination of goods transport (which resulted in low load rate)

g. Damage of goods and quality deterioration while in storage, packaging transporting, and post harvest loss in food items (up to 70%)
h. Transport of animals (walking up to 10 days)
i. No or little study has been made related to logistics
j. Lack of Organization and management tools that are required to promote intermodal system

2 Objective

The main objective of this work is to assess the current status of logistics practice in Ethiopia with the aim of identifying the gaps, potentials and constraints for development of effective and efficient logistics systems so that researchers who would like to work on the problem will have information.

The specific objectives are to carry out assessment of the status of:

1. logistics infrastructure and freight vehicles of the country
2. main transport and logistics companies
3. the efficiency of organizations dealing with freight transport like customs office, maritime affairs authority, dry ports enterprise and national bank of Ethiopia
4. current situations of goods flow within, to and from the country and study specific supply chains of main goods
5. intermodal/multimodal transport system with special emphasis on Ethiopia, and
6. forward recommendations based on the analysis made

3 Methodology

The methodology used in this paper to make assessment of logistics practices in Ethiopia was

- collecting secondary data,
- literature review, and
- analysis to identify the gaps

4 Status of Logistics Infrastructure and Planned Future Actions

4.1 Status of Logistics Infrastructure and Gaps

Logistics infrastructure consists of roads, railways, airports, sea ports, ICT and energy production (Srivastava, 2006). Dry ports and freight stations, and warehouses are important elements of logistics system. Market structure contributes to efficiency of freight transport and logistics system by connecting producers and consumers.

4.1.1 Road Infrastructure

The development of road system in the country has been generally progressing on the basis of highway and road sector development programs. Apart from urban roads and rural trails and footpaths, the present road system could be generally divided into three hierarchical functional classifications: the Federal, Regional and Rural roads. The length of Federal and Regional road network is about 46,812 of which 6,938 is asphalt/concrete surfaced as shown in Table 2(Afro Consult & Trading PLC, 2010). This is road network density of 0.57 km per 1000 of population or 41.4 km per square km of area. These values for the weighted mean of road density in all of Africa is 2.6 km per 1000 persons and density of 58km per 1000 square km (Asnake, 2006). The trunk road network radiates from Addis Ababa to the regional cities with minimal of gridding. Often areas close by through air distance are hundreds of kilometers by road because one should pass through Addis Ababa. This makes agricultural freight transport within country from areas with excess produce to deficient areas often expensive (Wubshet, 2011). The federal road network gives good connectivity to all regional headquarters, main cities, ports and main international entry points. However, only about 30% of the rural areas are presently connected with all weather road and many of these roads are in poor condition (Asnake, 2006). Fig.3 gives the road network of Ethiopia.

Table 2: Road Network of the country (2009) (Afro Consult & Trading PLC, 2010)

Jurisdiction	Asphalt	Gravel	Earth	Total
Federal	6,938	14,234	-	21,172
Regional	-	25,640	-	25,640
Total/All-weather	6,938	39,874	-	46,812
Rural/Community	-	-	85,767	85,767
Total	6,938	39,874	85,767	132,579

4.1.2 Rail Infrastructure

Although the existing railway line that Ethiopia owns with Djibouti is under rehabilitation, it is in poor condition, has lost all of its traffic to trucking and the company seems to have a very difficult future. The Ethiopian Railways Corporation is a newly established railway freight service provider. The corporation is in the process of planning the development of modern standard gauge (1435mm) railways system along the corridors and trunk lines of the country with a first priority given to Addis Ababa-Djibouti corridor. The construction of the Djibouti line is already started in September 2011 and is expected to commence operation within the coming four to five years. The new corporation will be a significant factor in future corridor transportation and the development of railway network throughout the country. The share of the new railway of the corridor traffic could easily be up to 75% of foreign trade which will be incorporated in the second phase of the ten year plan period (Afro Consult & Trading PLC, 2010). Fig.4 shows the national railway network.

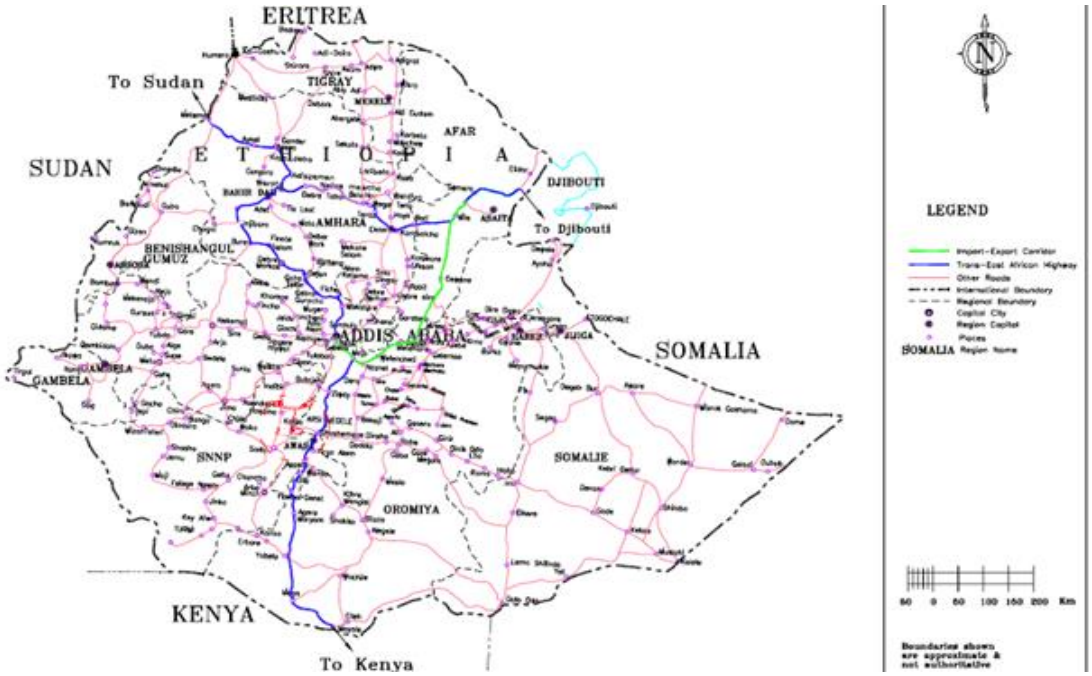


Fig. 3 Road network of Ethiopia (Ethiopian Roads Authority, 2008)

The ERC report (2010) says that single height container freight train wagons may be used. The US is using double stack container wagons. Europe is convinced that single container wagons will not give them competitiveness in the global market and are looking for way to change it to double stack. Lack of resources is not at all a reason in the case of Ethiopia to do a blunder that the country will regret about. Prudence is required in this decision!!

4.1.3 Air Freight

Air transport is very strategic, relatively efficient and important mode of transport in Ethiopia for topographic, distance and special demand and supply factors. The aviation sector in Ethiopia is now handled by the following three entities: (a) the Civil Aviation Authority (CAA), (b) the Airports Administration Enterprises (AAE) and (c) the Ethiopian Airlines (ET). The Ethiopian airports are of three levels: 4 international airports, 14 other concrete or asphalt domestic airports and over 30 other grass or gravel surfaced feeder airports many of which are being upgraded.
The Ethiopian Airlines, some 12 other foreign airlines and 6 small domestic private airlines provide air freight services.

The Airlines provides freight transport services to 17 major local destinations and 9 international destinations. It has 6 cargo airplanes and the recent (2009)

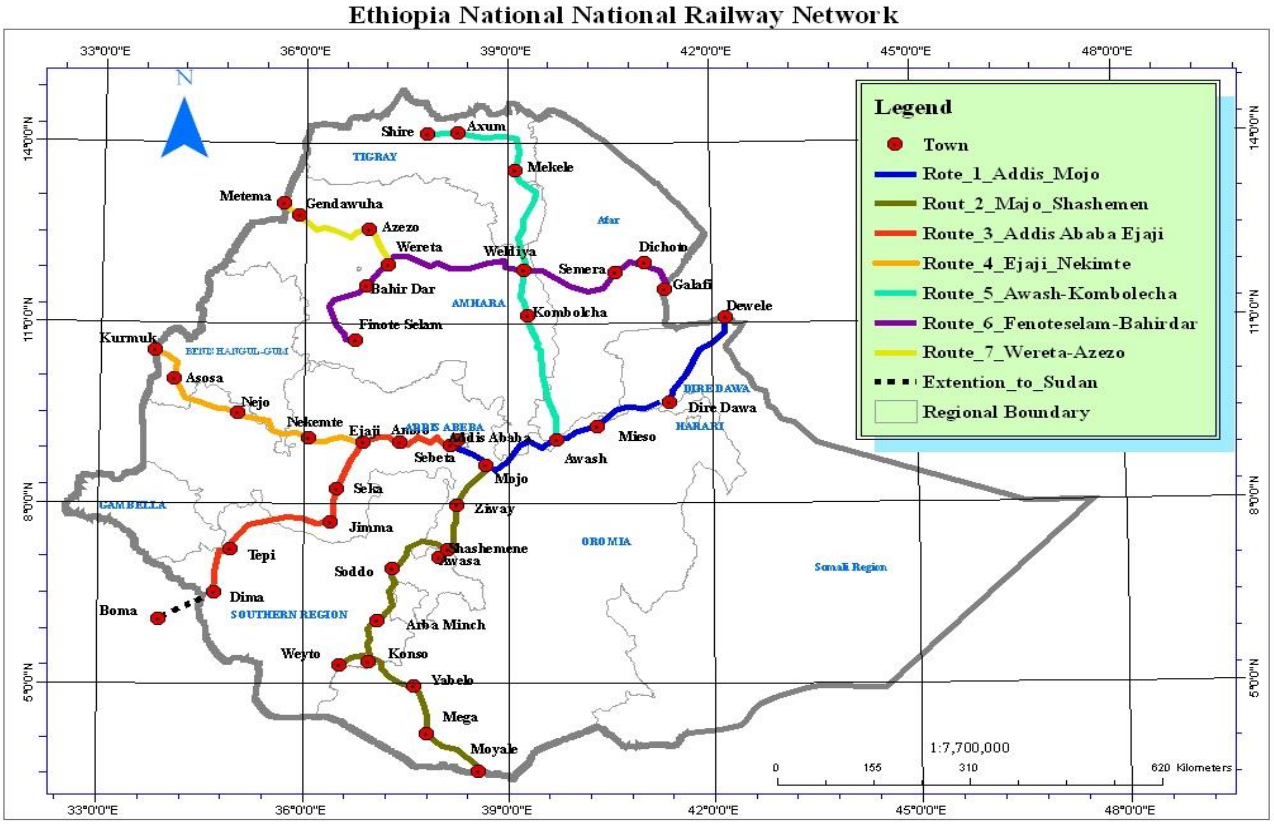


Fig.4. Ethiopian National Railway Network (ERC, 2010)

annual cargo uplift of the carrier was 117,682MT a year. According to the Management General of the Company, cargo remains the important part of its business, generating about 18% of the total revenue and is expected to increase by operating 777 freightliners in the near future (Afro Consult & Trading PLC, 2010).

The CAA is encouraging small, domestic, private airlines to expand their service which is going progressively. At present the Authority has licensed about 27 private airlines 6 of which are operational to provide pesticide spraying, charter flights and freight transport.

4.1.4 Sea Transport

Ethiopia as a land locked country owns no sea ports and is using Port of Djibouti for import/export trade. Ethiopia owns a public sea transport commercial enterprise called the Ethiopian Shipping Lines Share Company (ESLSC) under the Ministry of Trade and Industry. It is a modern shipping enterprise operating a fleet of 9 ocean-going vessels of which five are multipurpose general cargo ships, three semi container ships and one Roll-On-Roll-off vessel, with the total carrying capacity of over 150,000MT. The company provides trading services to Middle East and Red Sea, Europe, the Gulf and Far East and South Asia. It also charters vessels to supplement its own fleet and works hard to promote containerization and inter-modal transport handling all the facilitation and freight transport and logistics including customs clearance, inland transport up to Modjo dry ports of import goods. The enterprise has run a very successful pilot operation on intermodal transport.

At present the company handles about 83% of the country's sea-borne general cargo import with own and chartered vessels and operates about 4,000 owned and 200 leased containers. The company's share of export cargo is small because the ships are selected by the importers on the other side of the sea.
The Company is planning to buy 9 new vessels with the total capacity of 250,000 MT of which 7 are multipurpose with 28,000MT each and 2 tankers with 83,000MT. The company is using advanced ICT between head quarter and on board ships, training of its staff in its new DebreZeit center. In Djibouti the company has started intermodal transport services in two former container buses of Djibouti which has now become the enterprise's dedicated services.

At present about 12 shipping lines serve Ethiopia through Djibouti with 19 weekly. On the other hand no international shipping line directly serves Ethiopia except the Ethiopian Shipping Lines. The other big liners have hubs in areas like Yemen and Singapore where the Companies move their huge vessel capacity from and to major international O/D and provide feeder services to Djibouti.

4.1.5 Marketing Structure

In order to improve the efficiency of freight transport and logistics services in the country, it is necessary to expand and strengthen marketing structure and establish warehouses, freight stations and dry ports at strategic logistics stations with modern cargo handling equipments such as forklifts and cranes.

There are about 500 districts in the country subdivided into 15,000 administrative units (kebeles). Most of the existing rural markets are small, traditional, fragmented and not well developed at kebele and woreda levels. There are three tiers of markets at woreda level. The first one is small markets called "Gulits" or shops found in different parts within a Kebele. The second tier of markets is the Kebele centers themselves or sub-woreda markets. And the third one is at the woreda capitals.

Modern market needs to be created and it is proposed to facilitate establishment of 15,000 kebele markets and 500 wereda markets to create conducive situation for farmers to sell their produce (Afro Consult & Trading PLC, 2010).

4.1.6 Dry Ports and Freight Stations

Dry ports could handle many activities such as customs clearance, temporary storages, transshipment of goods, stuffing and un-stuffing of containers, consolidation of less than container loads and maintenance and repair of containers. Modjo and Semera dry ports have started working, building their capacity. The full implementation of Modjo and Semera dry ports and the construction of the remaining seven dry ports (Fig.5) will have big impact in reducing sea port and transit costs. Each freight stations should have at least one forklift to handle containers while dry ports will have more than one based on their freight volume (Afro Consult & Trading PLC, 2010). 12 freight stations are proposed in the locations shown in Fig.5.

4.1.7 Warehouses

One of the major obstacles for efficient freight transport and logistics system of the country in rural, regional and international freight movement and distribution system is lack of storage facilities, adequate loading and unloading equipment and efficient management of the system. At present, there is a total of about 0.8million metric ton capacity warehouses all over the country. Most of these are owned by public institutions such as Coffee Marketing, Ethiopian Grain Trade Enterprise, World Food Program etc. Most warehouses particularly the private ones are not designed to handle heavy truck trailers and semi trailers. Adequate doors and turning areas are not provided. In short, there is no standard set for commercial warehouse building. There is a serious lack of cargo handling equipment all over the country which normally is part of warehousing businesses. Cranes, forklifts and other equipments are rented as and when cargo is already waiting to be loaded and unloaded at the warehouses (Afro Consult & Trading PLC, 2010).

4.1.8 ICT

The use of ICT in logistics is non-existent. One area bar code is used is at cash register of supermarkets but it is not connected with inventory or warehousing management system. MOT's plan is to introduce tracing and tracking using GPS, and software, databases and other logistics ICT applications.

4.1.9 Energy Production

Source of energy for all freight vehicles is fossil fuel. It is important to have reserve at depots and make fuel available always at filling stations. Cargo handling equipments may run on fossil fuel or on electricity. When it comes to ICT, electric is required. As it stands now, there are interruptions often, which are due to inefficiency and incapability of Ethiopian Electric Power Corporation, as is expected from a public enterprise.

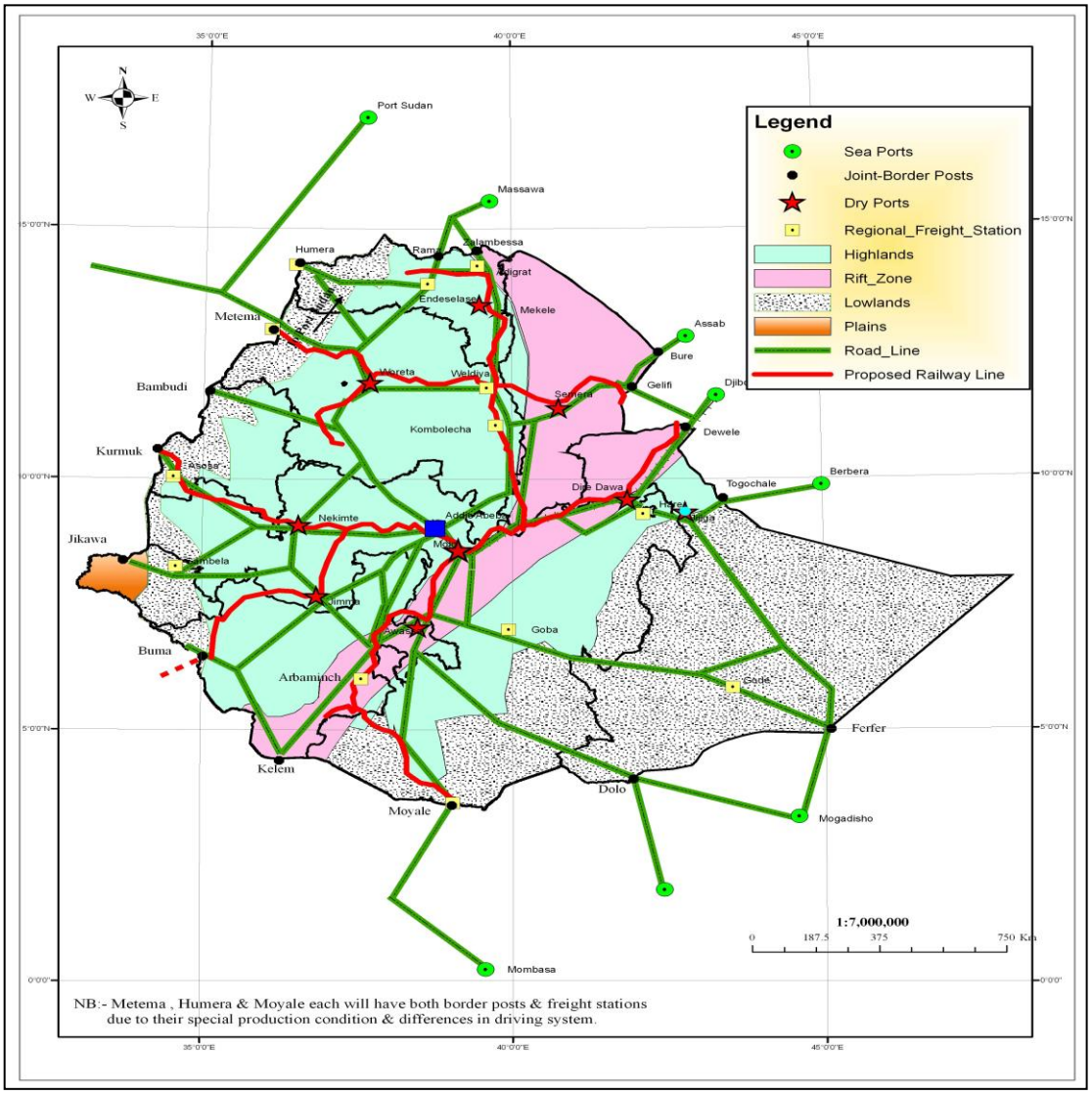


Fig.5 Basic Topography, Dry Port/Freight Stations on Road & Railway Corridors (MOT, 2009)

4.2 Existing Transport Pattern at Different Levels of Chains

At present at rural level which is a starting point of chain of freight transport and logistics system, the process of freight transport and logistics is as follows:

- Porterage or pack animals are used to transport produce from farm (threshing floor) to homestead
- Farmers transport their surpluses to the nearest market using porterage and pack animals
- Traders, middle men, wholesalers and cooperatives purchase the products and transport it to the nearest market or store using pickups, small trucks and even pack animals
- The product is prepared as required for instance, the coffee seed is washed, cleaned, dried and packed in its local warehouse
- Traders deliver coffee to the nearest ECX sponsored warehouses/freight stations

Farm to Homestead and Farm to Nearby Markets

About 75 percent of rural mobility is short and frequent movements from home to farm, home to nearby market, home to river or spring (to fetch water) and to forest (for fire wood) as shown in Fig.6. After collection of produce, it is transported by porterage or using pack animals to homestead (store).

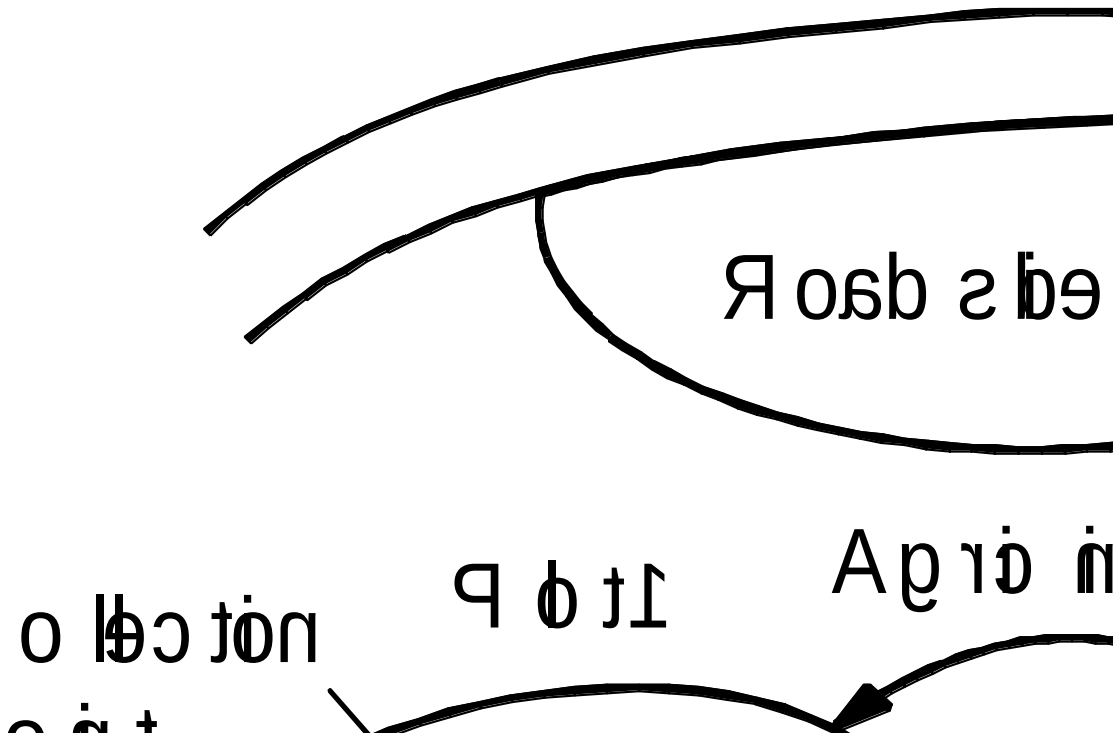


Fig.6 Rural mobility (Girma Gebresenbet, 2010)

Although the travel time varies from Kebele to Kebele, the average house hold (HH) travel time to market place is 2.5hrs one way or 5hrs round trip.

For the sake of rural freight transport and logistics, the districts are considered to represent the rural zones and their capital as the centroid of traffic. Although it is difficult to estimate the size of freight in the country, particularly the rural head loading and pack animals it could be possible to make an estimate of an order of magnitude based on CSA data and a sample of Ethiopian Roads Authority's Ethiopian Rural Travel and Transport Program studies (Afro Consult & Trading PLC, 2010).

- Average carrying capacity for household per market day is about 12kgs
- About 24% of rural HH own pack animals used by farmers to go to market and rural merchants
- Average carrying capacity of a pack animal (donkey) is 30-50 kgs.
- Average 1-way distance to market trip is about 10km
- The estimated surplus cash crop production per woreda is about 7,300 metric ton

At present woreda and kebele level transport infrastructure and logistics services are very poor. First there is no all wheather rural road in most of the kebeles, second, there is no regular public transportation in most kebeles and even in some woredas. According to the CSA Welfare Monitoring Survey of 2004 on the distribution of HH by distance in km to the nearest basic facilities, 45% the rural population travel 5-20km to reach all weather roads, 66% travel 5-20km to reach transport services and 71% of HH walk over 5-20kms to reach food market (Afro Consult & Trading PLC). Studies carried out in S. E. Asia shows that there is a strong correlation between lack of access to basic infrastructure and poverty (Somuyiwa, et al, 2011). Only 1.73% of the total HH in the survey own intermediate modes of transport (IMT) such as animal drawn carts and bicycles (Afro Consult & Trading PLC, 2010). ERA studies show that the major hindrances to the use of IMT in the Kebeles are poor availability, rugged terrain, and lack of infrastructure (Afro Consult & Trading PLC, 2010). The available travel and transport means are traditional walking, porterage and pack animals which is very expensive, burdensome, time consuming and incapable of satisfying the needs of modern economy and the transformation of the subsistent rural agriculture to market economy (Afro Consult & Trading PLC, 2010). This way of transport of significantly reduces the quality of goods due to contamination by dust, by sweat of animals and humans and by rain besides compromising the welfare of the rural people and fertility of women. Fig 7. shows hierarchy of rural road network in a wereda.

From Smaller Markets to Distribution Centers/Wholesalers

Small trucks of capacities 30 or 50 quintals are used by traders to take agricultural produce to distribution centers/whole sellers

Wholesalers to ECX Market and Export

Trucks and truck trailers are used for transport in this segment.

There is not a study giving data on the two last segments distinctively, some data for the total is obtained from the studies conducted by ERA. The major regional traffic generating factors are indicated in Table 3 and include population size and distribution, climatic & agro-ecology potentials,

agricultural surpluses, wholesale and retail trade and investment by number of projects and value size (Afro Consult & Trading PLC, 2010).

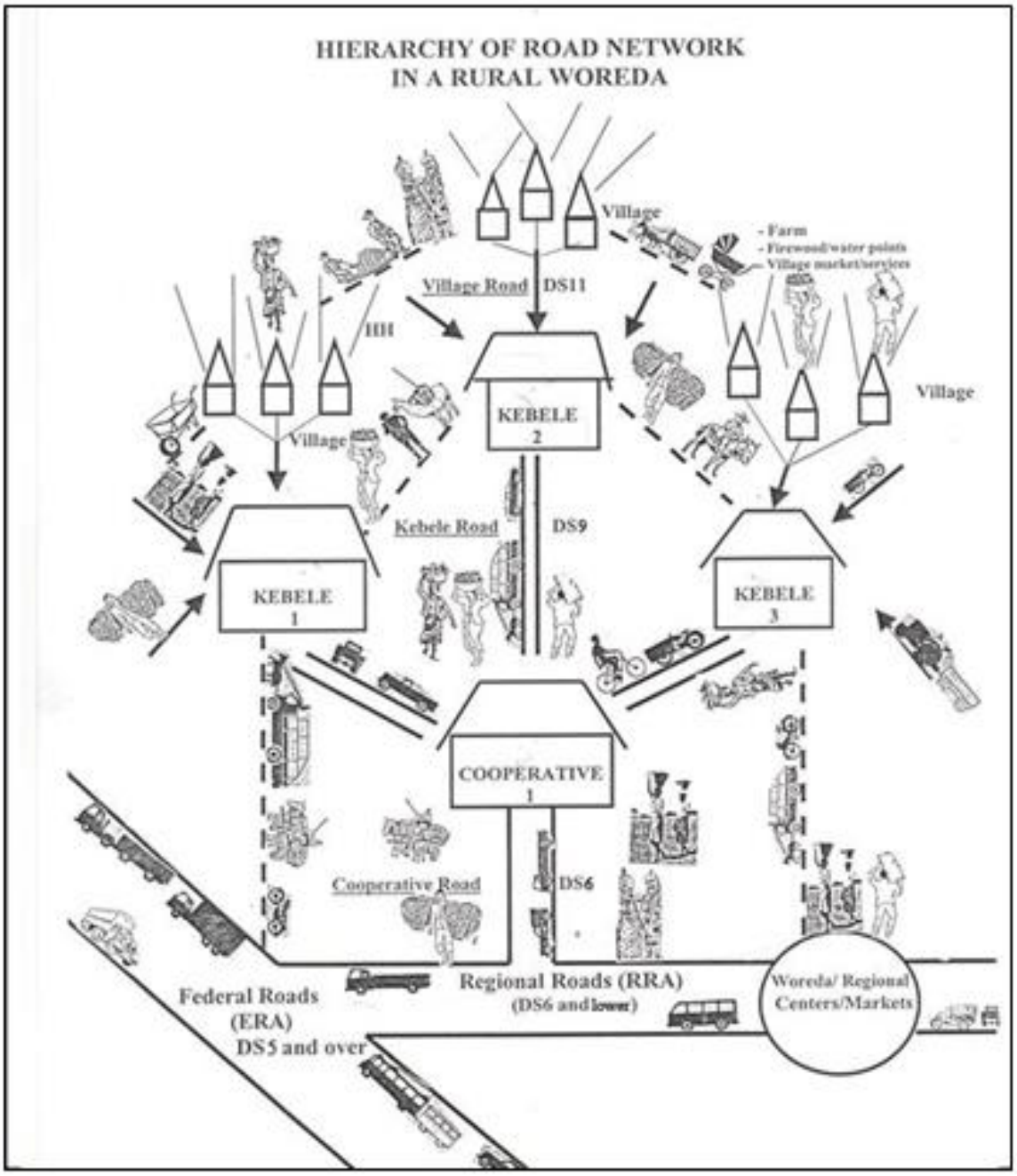


Fig.7 Hierarchy of rural road network in a district (Wubshet A., 2011)

Table 3: Comparative Regional Data: population, production, trade and investment

(Afro Consult & Trading PLC, 2010)

Region	Popn (000)	Surplus (000MT)	Wholesales & Retail	Investment	
				Projects	Birr (Mn)
Tigray	4,562	161	9383	2166	30,486
Afar	1,490	12	1600	178	13,370
Amhara	18,169	962	25475	4848	67,662
Oromia	28,717	2002	50685	10490	209,121
Somali	4,739	19	4353	123	982
SNNP	15,869	56	3886	513	2,549
Ben-Gumz	708	642	24180	4478	30,513
Gambela	325	2	1756	217	2,643
Harari	196	2	1775	432	994
Dire Dawa	367	1	3161	1193	22,022
Addis Ababa	2,956	5	42270	18867	293,307
Total	78,097	3,863	168,524	43,505	673,650
			Multi Regional	1,164	108,755
			Total	44,669	782,405

These surpluses are transported down the chain through trunk roads shown in Fig.8.

The major gaps observed at the regional level include the following:

- Obsolescence of trucks
- There are many federal & regional gravel roads
- Lack of freight stations at strategic markets
- Absence of regional booking services
- Lack of freight logistics coordination offices

4.3 Planned Future Actionsby Ministry of Transport

Recognizing the importance of investment for economic development Ethiopian government has been working hard to attract investors facilitating the process and cutting bureaucracy and allowing duty free import of equipments and machines. Investors who started working in the country were commenting that the logistics of the country is not competitive to export their products. Receiving these comments the government is pouring billions of dollars to develop the logistics infrastructure such as roads, railways and air transport. The government through the Ministry of Transport has established Freight Transport and Logistics Excellence Center (EthioLog), in collaboration with Addis Ababa Institute of Technology (AAiT), Addis Ababa University (AAU), Swedish University of Agricultural Sciences (SLU), Ethiopian Public and Private Transport Sector Organizations in April 2011.

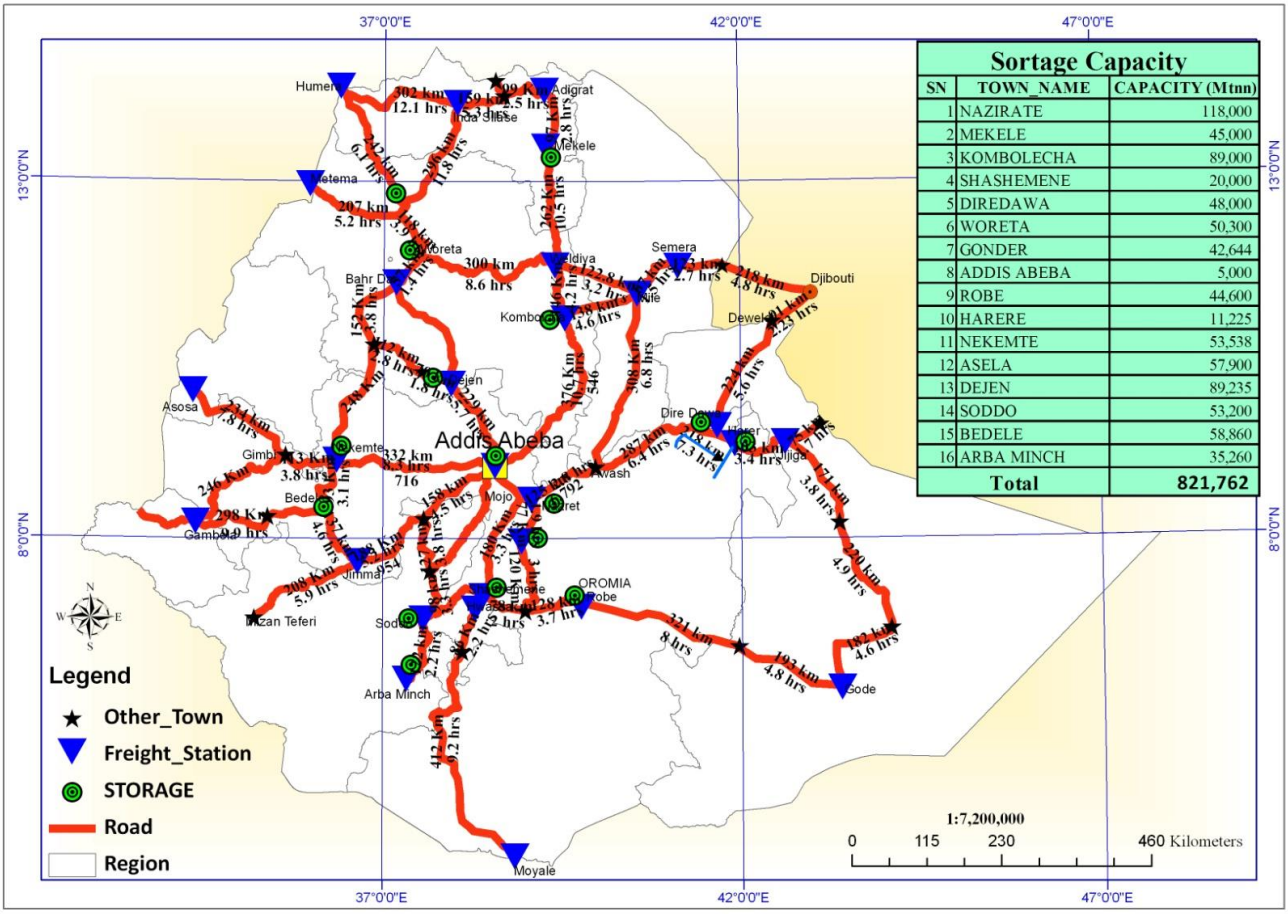


Fig.8 Regional Network, distance and trip time (Afro Consult & Trading PLC, 2010)

4.4 EthioLog Freight Transport and Logistics Excellence Center in Ethiopia

The strategic objective of EthioLog is to generate innovative knowledge, competence, tools, and methods that can be exploited by all stakeholders in order to develop **integrated and coordinated Logistics systems for the Ethiopian conditions** with respect to being efficient, effective, sustainable, and be able to deliver value added or quality maintained safe and secured goods at the shortest and right time and be able to achieve consumers' and market confidence. Thereby, the economic competitiveness of the Ethiopian value and marketing chain is promoted.

The main focuses of Ethiolog are:

(a) Research and development,
(b) Training at various levels,
(c) Demonstration and implementation of the research results obtained in the progress of EthioLog's activities.
(d) Consultancy

The specific objectives are to:

i. Map out and assess the overall Freight Transport /Logistics /Supply Chain Management issues as a whole, the case of Ethiopia;

ii. Develop innovative methodologies for the integration of freight transport and logistics systems;
iii. Optimize and determine locations of Hubs, Distribution Centers and Dry ports;
iv. Develop methods for efficient utilization of logistics resources;
v. Develop efficient logistics systems for perishable and cold chain systems;
vi. Perform economic analysis and models of production and supply chains of various sectors;
vii. Develop surveillance and security tools;
viii. Develop methods for integration of Network and Inter modal System in relation to economy and environment;
ix. Develop effective traceability system and perform risk assessment in various supply chains;
x. Develop training packages for various levels; and
xi. Develop methodologies for the implementation of research results.

The management structure of EthioLog is as shown in Fig. 9. The highest governing body of the center is a board, which is composed of:

- Director and Board Chairperson;
- Scientific Coordinator;
- Financial and Administrative Coordinator;
- Three private company representatives;
- Two public organization representatives; and
- One university representative.

5 Main Logistics and Transport Companis

5.1 Freight Vehicle Fleets and Their Age Distribution

Availability and Utilization of vehicles are the key characteristics of efficient and effective management of the transport system. Vehicles are very costly and ideally should be available for 95% of the time and used for paid work over 80% of this available time. But due to many factors such as delays through bad roads, border delays, weighbridge checks, customs delays at roadside and at destination, poor scheduling for loading and unloading, road accidents, single driver operation and congestion all reduce utilization (Elias W., 2011).

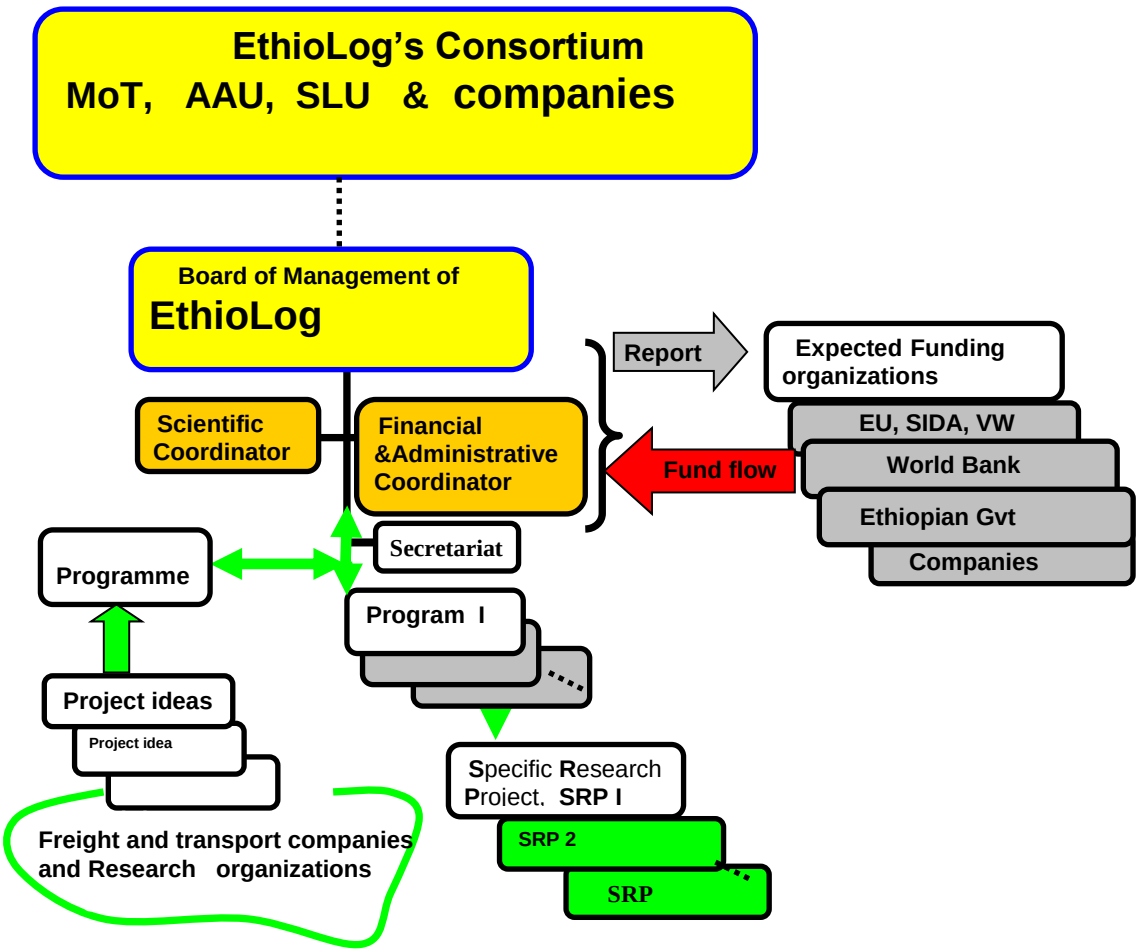


Fig. 9 Organizational structure of EthioLog (EthioLog, 2011)

Dry Cargo Fleet

According to the latest available transport authority data the dry cargo vehicle size in Ethiopia is about 65,534 of which 56,686 are public commercials and the remaining 8,848 private commercial vehicles as indicated in Table 4 (Afro Consult & Trading PLC, 2010).

Table 4: Freight (Dry Cargo) Vehicle Size in Ethiopia (2009)

(Afro Consult & Trading PLC, 2010)

No	Capacity (Qtl)	Public Commercial	Private Commercial	Total	Tonnage	%
1	≤70	28,905	7,189	36,094	126,329	21
2	71-120	9,699	716	10,415	104,150	17
3	121-180	12,338	659	12,997	194,955	32
4	181-300	2,264	23	2,287	50,314	8
5	>300	3,480	261	3,741	130,935	22
	Total	56,686	8,848	65,534	606,683	100

In Ethiopia, the current status of the dry freight vehicles age is very alarming and about 60% are older than 10 years as shown in Table 5. As per the interview with truck operators their replacement plan (service life) is 10 years and could be extended up to 15.

Table 5: Age of commercial vehicles (Afro Consult & Trading PLC, 2010)

No	Age in Year	Total No of Vehicle*	%
1	0-5	6,949	19
2	5-10	7,841	21
3	10-15	5,161	14
4	15-20	4,001	11
5	>20	12,608	34
	Total	36,560	100
NA		28,974	
	Total	65,534	

* About 28,974 (44%) of the fleet has no age data

Liquid Bulk Cargo

There are six oil companies using about 1000 liquid bulk cargo (fossil fuel) tanker trucks transporting from Duraleh petroleum terminal of Djibouti port (which is brought from Saudi Arabia) and from Sudanese refinery at El Geli located 42kms north of Khartoum. From these two points the petroleum is transported by tankers to the hinterland and sold at prices fixed by Ministry of Trade and Industry (MOTI) (Afro Consult & Trading PLC, 2010). The logistics has no or little problem. But cost can be reduced further and environmental impact of fuel transport can be minimized by using train tankers and/or pipelines.

There are three problem areas that need to be tackled by Ministry of Transport and other concerned authorities to promote the smooth running of freight transport and logistics system:

- ❖ The need to ensure the sustainability of supply and uninterrupted availability of adequate fuel in filling stations along all main routes and opening services stations in major rural roads. Sometimes fuel stations do not have fuel.
- ❖ Replacing all old tankers and augmenting the capacity with modern fleet
- ❖ Expansion of depot capacities nationally and in strategic locations

5.2 Freight Transport Companies

Table 6 gives transport companies involved in business of providing freight transport service.

Table 6: Freight transport service provider companies (2003/04) (Asnake, 2006)

No	company	Fleet size			Total capacity	Total Fright moved in tons		% share
		Truck	Trailer	Semi-trailer			Export/Import tons	
1	Bekelcha	-	-	162	4930	145,393,35	145393.35	100
2	Comet	66	48	95	4442	104320	99330	95.2
3	Shebele	101	-	-	3030	88725	84288.75	95
4	Tikur Abay	108	109	-	4104	187248	138427.4	73.9
5	Trans Etho.	-	201	-	7035	300156.4	155690.5	51.9
6	Walia	220	208	50	7290	218700	-	-
7	Tana		232	30	10350	322800	271520	84.1

The road transport industry is composed of three categories namely public enterprises, private companies and associations. The trucks of associations and private operators are mostly old (Wubshet, 2011).

The load factor of trucks with 2 axles was 58%, with 3 axles was 50%, and trucks with 4 axles and above was 51% (Afro Consult & Trading PLC, 2010).

Table 7: Proportion of Operating costs (Freight Transport Operations) (Afro Consult & Trading PLC, 2010)

Cost Item	Proportion of Operating Cost (%)	
	World Bank	Comet PLC.
Variable Costs		
➢ Fuel	20-30	38
➢ Lubricating Oil	1-5	
➢ Tires	10-15	13
➢ Spares	15-20	12
Fixed Costs		
❖ Driver and other cab staff	10-20	9
❖ Other Labor	About 5	5
❖ Depreciation and interest	15-20	13
❖ Overheads and other costs	10-15	10
Total	100	100

Although the tariff was growing steadily based on the rise in the annual operating costs, there were seasonal surges with bulk imports and harvest seasons. Moreover, the different rates for different road standards reflect the relative size of vehicle, availability of return cargo, the severity of facilitation problems in routes and terminals and variation in the quality of the road network.

According to the operators interviewed the profitability of their operation is not attractive due to mainly the imbalance and seasonality of traffic along the routes.

The total road freight traffic increased continuously but without satisfying all the demand. Actually the supply by all these transport companies and others is only 50% of the demand (Asnake, 2006). Transport rates are determined on the basis of tender (Wubshet, 2011). But due to shortage of transport supply, much benefit could not be gained from competition (Afro Consult & Trading PLC, 2010).

5.3 Forwarding Companies

Third Party logistics (3PL) service providers do a very important job of organizing safe, efficient and cost effective transportation of goods from origin to destination as an intermediaries between the shipper (importer, exporter, trader and other clients) and the carrier. They also provide auxiliary services such as packaging, documentation, consolidation, groupage, transit, warehousing and cargo clearing services. Cargo operation is one of the weakest links in the freight transport and logistics system of the country. According to the latest MOTI data, there are about 53 licensed freight forwarding firms and 21 Goods-Transit and shipping agents that are members of the Association of Ethiopian Forwarding Businesses, which basically serve the international trade traffic. These companies are small in size and capacity. These need to be strengthened.

The biggest forwarding company is publicly owned Maritime and Transit Services Enterprise (MTSE) which provides the bulk of freight forwarding, shipping agency and stevedoring service in the port of Djibouti. On the other hand there are many local forwarding or booking service providers including associations of truck operators and unlicensed individuals. The unlicensed individuals operating in trading centers throughout the country particularly in Mercato of Addis Ababa have no office but work using mobile phones and roving on foot, by taxi or car (Afro Consult & Trading PLC, 2010).

6 Organization Dealing with Documentation of Export-Import Goods

Customs authority, National Bank of Ethiopia, Maritime Affairs Authority and Dry ports Service Enterprise will be considered.

At customs check points for export goods due to the network problem, the software ASYCUDA ++ the authority uses is not working properly and trucks wait up to 8 hours until the checking is finished by manual system communicating head office staffs through telephone. By improving the network system and minimizing the check points, it is possible to lower the cost due to unnecessary delays.
The scanner device in Mille check point has a limited capacity of only 130 containers per day, while traffic flows on the Djibouti-Addis Ababa corridor is 300-350 trucks per day on average, a number that can increase in high-traffic periods. Accordingly, traffic congestion and long lines of trucks at this check point occur frequently (Wubshet, 2011).

Exporters and importers get foreign exchange from National Bank which requires a lengthy process. Table 8 illustrates the time it takes to get import declaration form from bank and submit to custom's office. This table illustrates the delays caused by customs and port handling and clearance also. It is to be noted that the average time taken to collect shipping documents from Letter of Credit (L/C) opening is about 30 days which includes time required for transaction, financing and insurance arrangements. National bank clearance refers to certifying that previous foreign exchange permit has been properly utilized by the importer and collection of original import documents from L/C opening bank refers to number of days from date of arrival of vessel at Djibouti.

At this juncture, it is advisable to mention that the Customs Authority has been improving its activities very much and will further upgrade its performance after joining the World Trade Organization (WTO). However, it is necessary to invest in this area to build the capacity of customs authority, each employee of customs authority through training program and make each accountable for any delay of trucks for unjustifiable reason and duration. In order to eliminate the possible truck idle stay time within customs premises, it is proposed that the inbound and out-bound time of all vehicles arriving from sea port be registered and submitted to truck owners

and customs office and regulators. The assessment of such timed registration will enable the concerned official to punish the culprit.

Table 8: The process of General consumer goods import process (Afro Consult & Trading PLC, 2010)

No	Activity	Days
1	Request for import/foreign exchange permit	1
2	National Bank Clearance*	5
3	Shipping quotation (Ethiopian Shipping lines)	0.5
4	Marine Insurance debit Note	1
5	Bank permit for import	3
6	Collection of Import Advice Note (IAN)	2
7	Time taken to obtain shipping documents	30
8	Collection of original import documents from L/C opening bank**	2
9	Submission of import declaration form to Customs	1
10	Collection of notice of payment from Customs	1
11	Preparation of CPO	1
12	Issuance of Customs receipt	1
13	Document transmission to Djibouti by Customs	1
14	Port handling and clearance at Djibouti	13
15	Truck transport to Mojo Dry Port	2
16	Total customs delay at checkpoint along corridor particularly at Mille	1
17	Cargo handling at Dry port	2
18	Customs release at Dry Port	7
19	Arranging local transport	1
20	Dispatch to importer	1.5
	Sub Total (excluding time taken for obtaining shipping document)	46
	Total time (including time taken for obtaining shipping document)	76

The Maritime Affairs Authority (MAA) is a government body under Ministry of Transport which is established to coordinate and regulate all maritime activities including sea ports, dry ports, shipping, coordination of sea port-land transport and dry port including multimodal transport operation and to handle corridor transport facilitation in bilateral, regional and international maritime relationships.

It is suggested as a solution for seasonality of goods transport that nationally the annual shipment of imported and exported commodities be submitted to Maritime Affairs Authority so that a schedule will be worked out based on the existing infrastructure capacity to optimize the service and reduce port congestions concentrated in few months (Afro Consult & Trading PLC, 2010).

Currently the two dry ports give services of temporary storage, consolidation and transshipment of export and import goods.

7 Case Studies of Specific Supply Chain

The biggest sources of foreign trade for Ethiopia are coffee, flowers and oilseeds.

7.1 Coffe Chain from Farmers to Export Port

7.1.1 Background

In Ethiopia, about 25 % of the total population of the country is dependent on production, processing, distribution and export of coffee. It accounts for more than 25 % of the GNP, 40 % of the total export earnings, absorbing 25 % of the employment opportunity for both rural and urban dwellers, and 10 % of the total government revenue GDP (Siber, 2011).

The total area covered by coffee in Ethiopia is about 600,000 hectares, with a total annual coffee production ranging from 300,000 to 350,000 tones about 40% of which is locally consumed. Out of this, more than 95 % of the coffee is produced by small-scale subsistent farmers, while the remaining comes from private and government owned large-scale farmers (Siber, 2011). Fig 10 shows coffee growing area of Ethiopia.

Ethiopia is the sixth largest coffee producer after Brazil, Colombia, Vietnam, Indonesia and India, and the seventh largest exporter worldwide. It is the largest coffee producer and exporter in Africa. Exports in 2005 were 2.43 million bags, a share of 2.82 per cent of world trade in coffee beans (Siber, 2011).

The bulk of current Ethiopian exports go to Japan, Germany and Saudi Arabia.
There are four main coffee production systems in Ethiopia (Siber, 2011):

- **a.** Forest (8-10%)
- **b.** Semi-forest (30-35%) (mixture of semi-forest and garden coffee in our sites –indigenous trees give shade to coffee plants, increasing yields)
- **c.** Garden (50-55%)
- **d.** Plantation (5-6%)

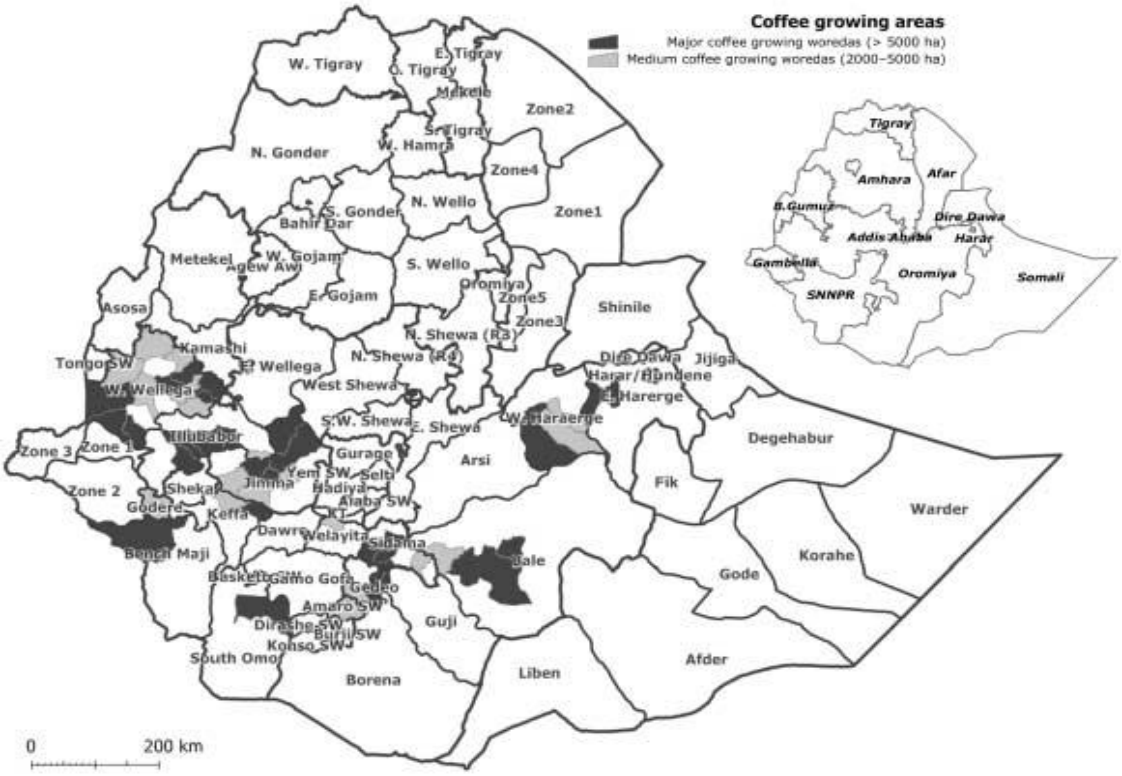


Fig.10 Coffee growing areas (Siber, 2011)

Yields are considered to be very low compared to other countries, with estimates of less than 400 kg per ha for forest coffee and around 450–750 kg per ha for semi-modern coffee plantations (Siber, 2011). Most coffee farmers do not use fertilizers, pesticides or herbicides. The garden and plantation embrace the basic characteristics of agro-ecological sustainability. As a consequence Ethiopian coffee deserves the reputation of being natural and organic (Siber, 2011).

Coffee production is increasing after appreciation of Ethiopian coffee in world market after the government's negotiation with Starbucks.

7.1.2 Stakeholders in the Supply Chain

Fig. 11 shows the coffee supply chain, with all the stakeholders.

a. Primary collectors and suppliers

Primary collectors buy the coffee cherries directly from many growers, transport and sell them to processors, brokers, or exporters. The collectors negotiate prices based on coffee quality followed by central market price information, which is reported daily on television and radio.

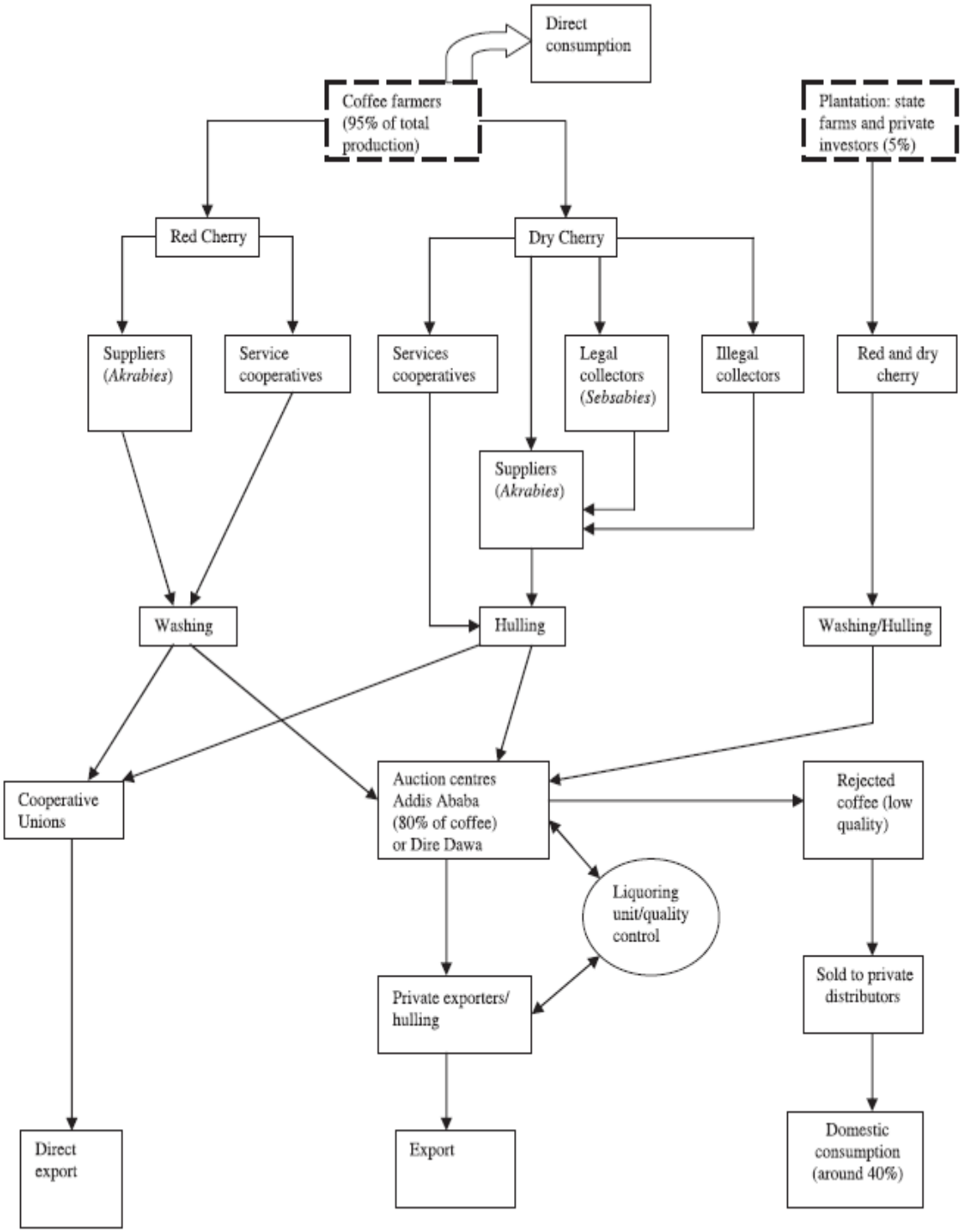


Fig. 11 Coffee supply chain (Siber, 2011)

They play an essential role to bring coffee from very remote areas to the market. They have no warehouses of their own and therefore transfer the coffee to suppliers down the chain immediately. There are currently 2291 legal collectors in Ethiopia.

Suppliers acquire red coffee cherries from collectors or they then have to process their coffee before bringing it to auction. They are not allowed to export on their own account. Some have storage facilities as well as their own hullers or pulpers. Currently there are 1068 suppliers in the country.

b. Processors

Processors are individual farmers who have the equipment to process coffee, or a separate processor, or farmers' co-operatives that pool resources to buy the equipment to convert 'cherries' into green coffee beans, after which they export.

Coffee processing involves:

- Picking
- Drying and hauling
- Sorting, grading, and packing
- Bulking
- Blending

Two method of coffee processing are used in Ethiopia. These are dry processing and wet coffee processing (washing). Under dry processing un pulped cherries are dried whole in the sun under natural conditions after harvesting. In the washing method the cherries are pulped immediately after picking, followed by fermentation and washing to remove mucilage cover. The resulting parchment is dried in the sun. Secondary processing is conducted by suppliers who generally operate hulling mills, where the dried cherry /perchant is hulled and prepared before transport to coffee auction centers. Export coffee processing of the green coffee is handled by exporters in their own facilities following central auction. In the case of sun dried coffee, this consist of sorting, either by hand or using electronic color sorter, then blending the different truck load lots to make up to export quality and quantity.

The most common method for post harvest primary coffee processing in Ethiopia is sun drying, followed by washed coffee processing using hand pulper and coffee washing station. 75- 80% of the coffee produced by small holder farmers undergoes sun drying and the remainder is washed. Fro a survey result, around 47- 50 % of farmers prefer sun dried coffee processing while 49 - 50% wished to produce washed coffee using hand pulper and the rest preferred washed coffee processed by central coffee washing station (Siber, 2011).

Farmers dry their coffee using different approaches. About 46% spread their coffee on the ground, 4.5% dry on raised beds and 2.5% dry on cemented floors (Siber, 2011).

A number of constraints are associated with coffee processing in Ethiopia. Among these are lack of drying beds, shortage of hand pulpers and central coffee washing stations and high cost of drying materials.

The choice of processing method to use depends on a number of factors. Among these are area under coffee, how long a farmer has been growing coffee, educational level of the farmer, access to water, distance to the nearest coffee washing station and age of farmer significantly determine the type of processing method to be used.

c. Government Market Agency, ECX

A government market agency, the Ethiopian Commodity Exchange (ECX), started operation since 2008 and is designed to be a marketplace where buyers and sellers meet to trade, assured of quality, delivery and payment. The ECX is a national multi commodity exchange with the aim of setting market price, providing market integrity, by grading the product and guaranteeing quantity.

The criteria ECX uses in setting coffee prices for the suppliers and their buyers is based on the quality of coffee they delivered and current coffee price on international market.
It manages a system of daily clearing and settling of contracts. It enhances market efficiency by operating a trading system where buyers and sellers use standardized contracts. Market transparency will be achieved by disseminating market information in real time to all market players. Finally, the ECX facilitates risk management by offering contracts for future delivery, providing sellers and buyers a way to hedge against price risk. However, contracts for future delivery will only be implemented after the ECX spot market trading has shown to be successful.

d. Exporters

An exporter often buys coffee from auction houses in Ethiopia and then ships the beans to the desired location. Exporters must have an excellent knowledge of where coffee is grown and the quality of the coffee produced.

Private traders founded an exporters association named Ethiopian Coffee Exporters Association (ECEA) the principal objective of ECEA is to promote coffee exports. It provides coffee trade information, lobbies on policies, and supplies technical support to its members. Both local and foreign exporters are normally competing at the auctions held at the two centers, in Addis Ababa and Dire Dawa and after purchase, they transport the green coffee themselves to sea port (Djibouti), pay insurance, storage and other fees until their commodity arrives at destinations.

7.1.3 Coffee Logistics Cost Build Up along the Chain

Transport Cost from Farmers to main road

Farmers incur high transport costs to move their coffee production from farm gate to market. Various studies have demonstrated the difficulty farmers face in transporting their goods from the farm gate to the market (Siber, 2011).

Siber said Harrison reported coffee passing from surplus area is handled from farm by farmers themselves or assemblers normally using donkeys. A donkey can carry about 70 kg for 5 km at an assembler fee of Birr 4 – 5.

Longer distance transport is largely being contracted by merchants, rather than merchants having their own vehicle. Since most of the harvest is transported by free lance truck owner located sparsely throughout the country, it is difficult to have a clear picture in terms of cost. The wholesalers of coffee are the main users of freight transport. They use trucks to move their grain from market to their terminal markets and other deficit areas. About 15% of the wholesalers have their own trucks and the rest depend on private and state owned freighters (Siber, 2011)

Handling is quite costly, ETB 0.5 or more for loading and unloading. Trucking cost varies through the season depending on supply and demand. At the time of the data collection, (relatively low season) the price for 300km from Jimma area to Addis was about ETB16 (0.92USD) per quintal.

Transport Cost with in the country main roads

Price seems to be a function of quality of the road and the transport cost increases only when triggered by some external factors like movement of fertilizer, food aid or shortage of transport trucks. Indicative price of freight transport in the year 1998/1999 was USD0.043 per ton per kilometer and USD 0.044 per kilometer in 1999/2000.

Transport costs in the Addis Ababa – Djibouti corridor seems to be competitive on a cost per kilometer, particularly when compared with other African countries except that it gets higher when there is shipment of food aid and fertilizer. In this corridor, the competition and availability of transport is plenty to support the need of the exporters. One reason for this fact is that Ethiopia imports around two times more volume than it exports, so there are plenty of capacity available on the way back to Djibouti and the Djibouti road is in good condition.

Transport cost from Addis Ababa to Djibouti for a coffee exporter is around 1.5% of the value of one ton of coffee (Siber, 2011).

7.1.4 Quality Issues along the Chain and Value Adding Activities

The present coffee legislations provide rigorous obligations in respect to suppliers. coffee suppliers are, among other things, obliged: to deliver coffee collected to processing plants within 24 hours; to sell processed coffee in the auction centres within six months; to ensure that the processed coffee be delivered to the quality liquoring and inspection centres meet the minimum quality standards and its moisture content does not exceed 12%; to purchase, process and transport coffee only in the areas designated to the firm or individual and without mixing coffees of different agro-ecologies.

7.1.5 Gaps/Problems Identified and Solutions

Ethiopian agriculture lacks, among others, market fairness, standardization, transparency and efficiency. It is characterized by long chain of market channel. In this channel, numerous participants engage in the market in different capacities.

In the first place, this traditional market comprises large number of farmers. Overwhelming majority of these farmers are smallholders. Also, they are illiterate, poorly connected to one another and with market systems. Moreover, they lack information and bargaining power which effectively deny them the required level of benefits from the high consumer price of their produce. Others include primary suppliers, local suppliers, farmer's cooperatives, local and central brokers, wholesalers, few investors and/or state farms, exporters, processors, retailers, consumers, various government institutions, etc.

Data was collected from two coffee producing districts on the problems/gaps and the solutions the stakeholders suggest (Siber, 2011).

Suppliers were asked to indicate problems related to the coffee trade in both districts. Overall, 96.5% of suppliers who responded to this question indicated that the lack of working capital is their most critical problem, followed by price instability or fluctuation (94.6%). An inefficient infrastructure like poor vehicle fleet condition, low level of all weathered road network and insufficient number of green bean processing machines is reported to be the third most important problem (86.5%) for all suppliers. Moreover, suppliers from both areas also indicated that competition among buyers regarding the purchase of the coffee, suspicion that buyers are swindling on weight scales and a limited quantity of coffee supply are also important problems that affect them.
In addition to expressing the problems existing in the coffee trade, suppliers were also asked to suggest possible solutions for these problems in order to facilitate smooth and effective developments in the coffee value chain. Different solutions have been proposed by Suppliers in both areas. Gaining access to reliable coffee market information is the first and most important solution proposed by suppliers from both areas. Improving the coffee seed supply through heightened production and supplying improved varieties of seeds, arranging credit facilities, gaining access to working capital, gaining access to local banking services and government intervention in regulating the coffee market are other solutions, in varying degrees, proposed by suppliers from both areas.

Exporters were asked to indicate problems related to the coffee trade. Overall, 85% of exporters who responded to this question indicated that fluctuation of daily world market is their most critical problem, followed by shortage of finance (74.2%). Unbalanced price of coffee in the world market and local market is reported to be the third most important problem (60.5%) for all exporters.
In addition to expressing the problems existing in the coffee trade, exporter was also asked to suggest possible solutions for these problems in order to facilitate smooth and effective developments in the coffee value chain. Different solutions have been proposed by exporters, arranging credit facilities, gaining access to working capital, gaining access to local banking services and government intervention in regulating the coffee market are other solutions.
Companies were also asked to comment on the efficiency of the infrastructure and transport facilities, the access to financial and non-financial services and the legal environment for coffee trade arrangements. Most of the companies consider the roads and vehicles for the transportation of coffee to be unsatisfactory. However, all agree that the introduction of a mobile telephone service has revolutionized the whole process and contributed a great deal to the efficiency of this business. Moreover, they complained about bureaucratic red tape at the National Bank and Customs Authorities, which, in turn, harms the efficiency of the business.

The key constraint to coffee processing are lack of coffee processing facilities, high cost of material for constructing the raised drying beds, limited technical knowhow and long distance to processing facilities therefore coffee processing can be improved through investment by provision of financial resource to purchase the requisite equipment and training so that the necessary technical, financial and commercial capability

would be created for sustainable management of the coffee processing facilities.

7.2 Sesame Oil Seed Chain from Farmers to Port

Sesame is the second largest export item in Ethiopia next to coffee. Sesame is mainly produced for the market and it is wanted for its seed and for the oil in the seed. It contains up to 60% oil of a very high quality and up to 25% protein. In the international market, its demand comes from the oil industry and the confectionary sector.

7.2.1 Background

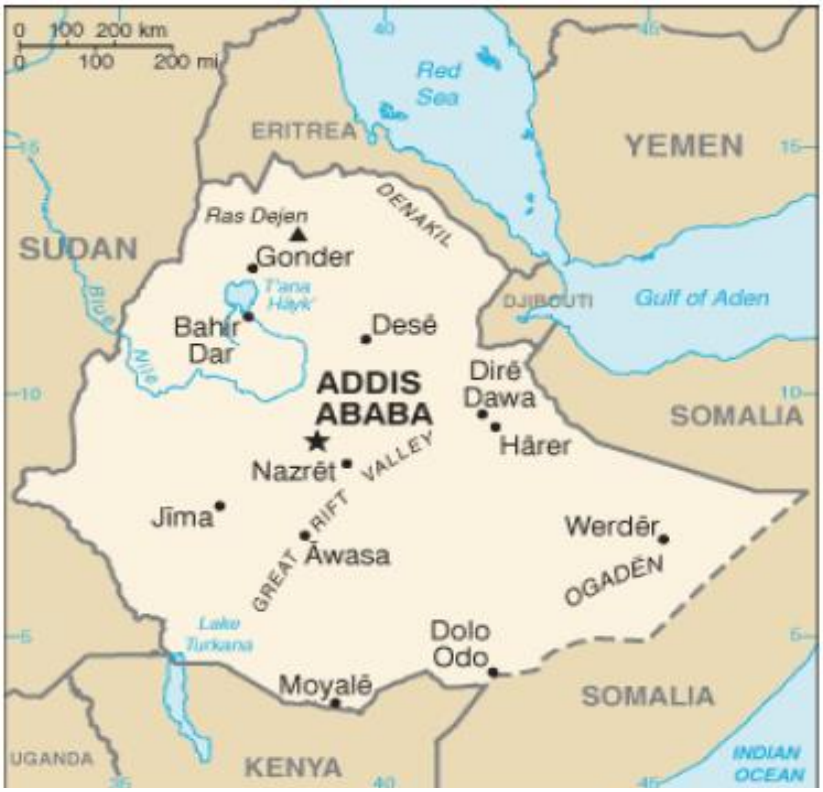
Ethiopia is one of the few countries in the world which has suitable land and climatic conditions for sesame oilseed production. This sector is one of Ethiopia's fastest-growing and important sectors, both in terms of its foreign exchange earnings and as a main source of income for over three million people. The sesame export quantity in 2006/07 reached about 149,000 tonnes (Kemal, 2011). The total land area of sesame production in 2007 was about 211,000 ha.

Of the sixteen countries who are the major producers in the world, Asia and Africa together produce 70% and 26% of the world's sesame, respectively. About 24% of the sesame produced in the world goes for export while 44% of Africa's production goes for export (Kemal, 2011).

Sesame producing areas are Humera, Wellega and North Gonder, Benishangul, Illubabor and many other places (Kemal, 2011), as shown in Table 9 and Fig.10.

Table 9: Sesame producing areas (Kemal, 2011)

Main Production Regions	No. Farmers	Area in ha.	Total Production	Yield /ha.	Land Holding /Producer	Production Contribution (%)
East Wellega	207,901	55,679	323,724	5.81	0.27	22%
North Gonder	235,323	61,347	561,143	9.15	0.26	38%
Humera	122,602	71,150	481,412	6.77	0.58	8%
Benishangul-Gumuz	70,739	21,693	125,584	5.79	0.31	8%
Other	16,040	1,443	2,004	1.39	0.09	0%
Total	652,605	211,311	1,493,867	7.07	0.32	100%



* Sesame production area

Fig10 Sesame producing areas (Kemal, 2011)

7.2.2 Stakeholders in the Supply Chain

Sesame supply chain starts from producers which may be individual farmers, large scale farmers/investors or farmers associations. After the introduction of ECX marketing for sesame, producers are allowed to sell their product only through this system. Due to lack of capacity, individual farmers sell sesame to retailers which have license to sell to Exporters through ECX channel. Investors and farmers associations have two alternatives, they can sell sesame to exporters through ECX channel or they can export sesame for foreign market. As for Exporters they are only allowed to buy sesame from ECX market for export. The supply chain is given in Fig.11.

7.2.3 Cost Build up along the Chain

All stakeholders do not carry out any value adding activities except exporters. All Exporters perform cleaning of sesame to 99% purity and standard packaging of cleaned sesame in 50 kg bags. The other cost is transport, which is discussed previously.

7.2.4 Quality Issues along the Chain

There are no quality losses due to handling and transport in the chain because this is a grain.

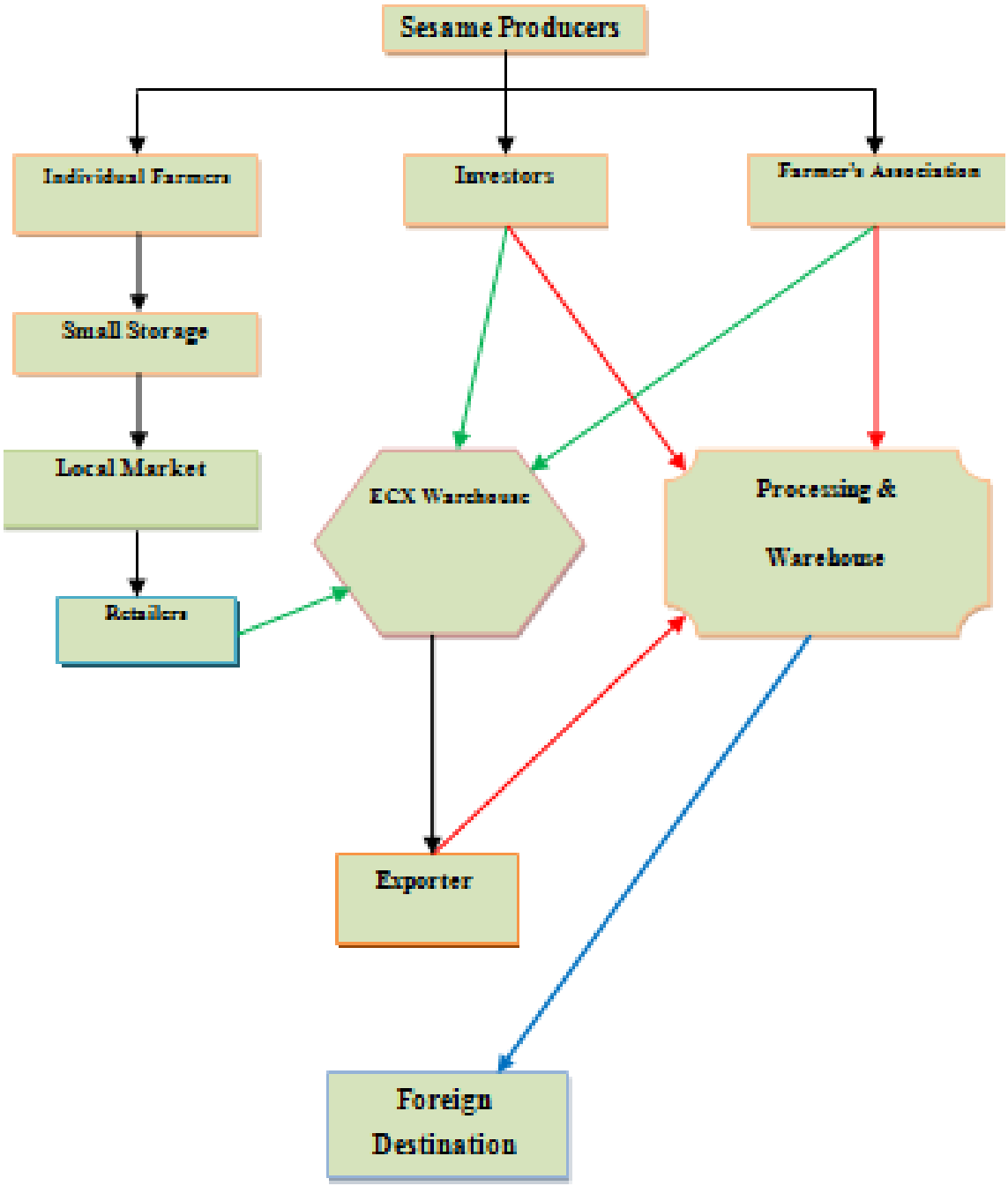


Fig. 11 Sesame supply chain (Kemal, 2011)

7.2.5 Gaps/Problems and Solutions

There are not much gaps because sesame export is began recently and farmers get technical support and guidance from agricultural extension workers.

7.3 Grains Supply Chain from Farmers to Port

7.3.1. Background

Grain export in Ethiopia is increasing from time to time, according to CSA in 2009/10 (Wubshet, 2011). The three export grains in order of value of export are: bean, maize and sorghum. Ethiopia gained USD 18.86 million

from bean, USD 15.84 million from maize and USD 13.19 million USD from sorghum during 2009/10 (Wubshet, 2011).
Producers of grain consist of small farmers and state farms, which account for 95% and 5% of the total marketed quantity, respectively.
Surplus grain producing areas in Ethiopia are localized as shown in Fig.12, implying the critical role of transportation to different and distant deficit areas. The size and topography of the country, limited transportation possibilities with road transport being the only available means for grain transport, and the radial configuration of transport network with Addis Ababa at the center has hampered inter-regional grain flows (Wubshet, 2011).

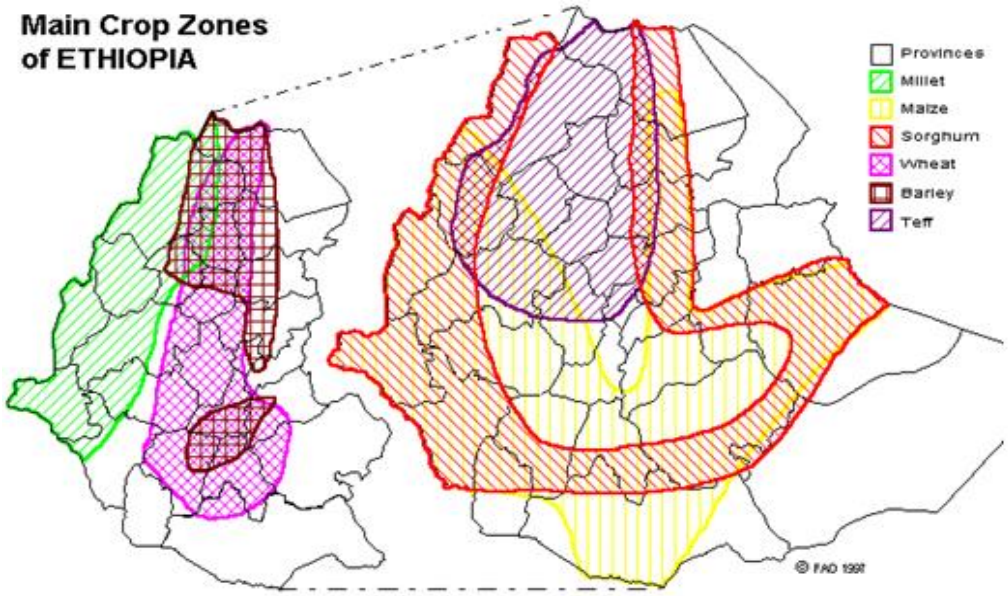


Fig.12 Major crops production areas (Wubshet, 2011)

It is difficult to determine precisely the volume of grain marketed annually, because it fluctuates from year to year depending on weather and rainfall conditions. According to the preliminary findings of the Rural Household Survey conducted in 1996, a relatively good crop year, it is estimated that the proportion of output marketed by farmers is about 27% (Wubshet, 2011).
About 79% of their annual grain sales occur immediately after the harvest when they need cash to purchase food, cover wedding expenses, repay outstanding loans, and pay tax (Wubshet, 2011)

7.3.2. Stakeholders in the Supply Chain

Grain supply chain is the network structure and operation flows based on resources integration and consists of farmers, grain-purchasing enterprises, grain processing enterprises, grain distribution enterprises, exporters and consumers. The operation flows include physical flow, property flow, capital flow and information flow; and the integration is dominated by large-scale grain enterprises as core enterprises, which usually are grain-processing enterprises (Wubshet, 2011)
ECX did not begin to facilitate sale of grains except white bean. The same procedure as for coffee and sesame is followed for the sale of white beans.

7.3.3. Grain Logistics Cost Build up

For the surveyed areas of two districts the different costs are follows.
The average rental rate of fully furnished warehouse is Birr 2.50/quintal/month. But if they want to rent for short period of time the rental rate is Birr 5.00/quintal/month. This rate might be composed of storage loss (9.20%), storage rent (16.15%), fumigation cost (9.00%), interest cost (24.00%), labor (12.77%), materials (9.67%), and others (19.21%). 89% of exporters said warehouse shortage is a problem at peak seasons.
The cost related to port operation is shown Table 10.

Table 10: Exporters port costs obtained from the survey (Wubshet, 2011)

Item	Description	Cost
1	Djibouti custom clearance	$14 per 20ft Container
2	Gate Pass	1$ per truck
3	Container Cleaning	$11 per 20ft Container
4	Container Stuffing	$68 per 20ft container
5	Container Handling after Stuffing to loading at Vessel	$120 per 20ft container

7.3.4. Quality Issues along the Chain and Value Adding

All exporters do screening, standard packing, container stuffing, and fumigation.
12% of exporters stuff and fumigate grains in container at their warehouse for export. The rest 88% of exporters stuff and fumigate at Djibouti port.

7.3.5. Gaps/Problems and Solutions

Over 80 percent of the rural population has no access to modern transport, while only half of grain markets in major production zones are served by all weather roads. Farmers normally bring their marketable grain to markets that are 5 to 20 km away from their villages. (Wubshet, 2011). They don't have market information either. There is no marketing extension that would help them in deciding which crop and what quantity to grow.

The majority of traders do not own means of transport. They rely on rented trucks, for which markets are incomplete. 19 % of traders were unable to obtain rented storage space.

72 percent of grain production is retained for use by farmers. The storage at farm level was inadequate in capacity, not ventilated and wet due to lack of surface drainage. Grain product loss caused by insects & rodents due to poor storage is reported to be 3-5 percent.

Lack of working capital and financial credit was a main problem especially by small traders.
Access to market information is extremely limited in the Ethiopian grain market (Wubshet, 2011).

Many customs check-points along the corridor cause unnecessary delay and increased costs which are borne in the end by the final consumer. Truck drivers are allowed to stop vehicles only at designated secured areas, situated along the corridor. There is also a time limit for the conclusion of the transport, whose length depends on the final destination of goods, which is 3 days for shipments from Addis Ababa to Djibouti.
Almost all of transporters and exporters transport goods without coordination which is due to absence of hubs that facilitate the goods coordination. In Ethiopia, the percentage of empty containers shipped back to Djibouti is about 90%, which means that importing companies have to pay transport costs of empty containers back to Djibouti (Wubshet, 2011).

Equipped quality warehouses should be constructed to increase quality of grain and minimize the weight loss due poor storage facilities. It is possible to minimize the weight loss at storage facilities by paving the working area and using standard packing bags.

All exporters subcontract the freight forwarding, custom clearing and transport services to transitors and freighters. According to the transitors response on average at normal operation 3 days for transport from Addis Ababa to Djibouti and 2 days to unload, stuff containers and stevedore at port are required. In the worst scenario trucks wait unloaded for more than 10 days(Wubshet, 2011). This may happen due to:

- Missing the vessel due inappropriate information delivered from the shipping agent therefore trucks wait till the exporter change shipping instruction to another available vessel
- Containers shortage at the port
- Late arrival of vessel
- Shortage of cranes at stuffing
- Limited working hours of the port that is 6 hours per day for stuffing

Besides, the rules and regulations of the port change abruptly by the Port Administration and the service charge is also increased whenever they want. Missing of vessels by incorrect schedule ordered by the shipping agent also cause a delay of 7-14 days unless the buyer change the shipping instruction.

7.4 Fertilizer Chain from Port to Farmers

7.4.1. Background

Low agricultural productivity of Ethiopia due to declining soil fertility and low level of commercial input besides high population growth resulted in low income and subsistence life of farmers. The use of yield enhancing technologies to increase production can help increase rural income and lead to agricultural transformation from a low income, low productivity, subsistence economy to one characterized by specialized, high input agriculture. Fertilizer is a key input for productivity of the sector and has a very significant impact on economy of the country as the livelihood of about 85% of the population directly or indirectly depends on agriculture.

Fertilizer is not produced in Ethiopia and therefore is an imported commodity.

However, the use of this commodity in the agricultural sector can be affected by its higher farm gate price which has especially adverse effect on low income farmers. The high farm gate price partly results from less effective logistics chain which results in higher total cost for the end users.

Agricultural Input Supply Enterprise (AISE) is the sole importer of fertilizer on behalf of farmers' cooperatives for the country's demand to the central warehouses shown in Fig. 13. AISE hired Maritime and Transit Services Enterprise (MTSE) as the wholesaler and distribution agent to collect the delivery from port and deliver to the central warehouses. Fig.14 shows the chain.

Fertilizer transport costs are high because it is a bulky product and distances transported are large. In addition, risks are high in investing in fertilizer due to seasonality of demand, storage costs and bank interests. Due to these factors and political importance of the provision of low-cost and stable fertilizer prices has usually meant heavy government intervention in setting prices and organizing distribution system. The seasonality of demand is also a basic factor that plays out in shaping market structure. Fertilizer is consumed primarily during the larger grain production season roughly from July to November, but also during the earlier small production season which spans from April to July. Most fertilizer is applied between March and July which is the sowing season. All fertilizer consumed in a given season cannot be off-loaded in the months immediately prior to distribution. Thus, coordination of imports is required in order to ensure sufficient fertilizer supplies by scheduling over the quarters of the year.

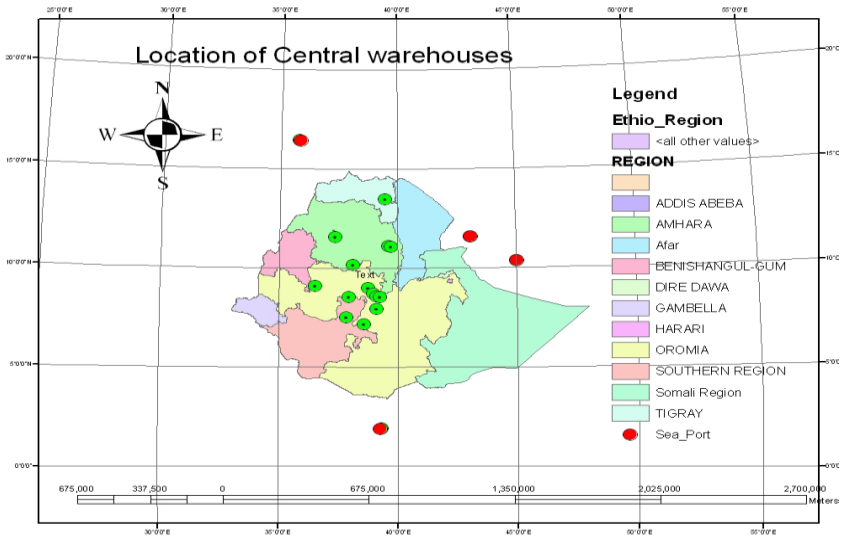


Figure 13. Location of existing central warehouses **(Chombie, 2011)**

Transport service was contracted to four national transporters which have assumed a capacity to handle the given assignment. These four transporters, Comet transport share company, Bekelcha, TikurAbay and TransEthiopia transports have taken the responsibility and risk of the given assignment.

7.4.2. Stakeholders in the Supply Chain

The stake holders are foreign fertilizer supplier companies, Ethiopian shipping lines to transport fertilizer by vessel, Agricultural Input Supplies Enterprise as the shipper (client), Maritime and Transit Services Enterprise as agent of the client, farmers cooperatives as distributors, the 4 transport companies which transport from port to central ware houses, bank as loan service provider and finally farmers as end users.

7.4.3. Fertilizer Logistics Cost Build up

The cost of getting fertilizer from port to the farms accounts for substantial proportion of the farm gate price, which comprise of international procurement, vessel shipping, port operations, bagging and warehousing, inland transportation, wholesale and retail operation costs. In recent years, procurement cost has been increasing on the international market and Ethiopian birr is inflating and is devaluated, which made the high price a serious constraint in using fertilizer by the small farmers. Transport cost is the largest single cost item in the total logistics chain of fertilizer. In fertilizer distribution for the year 2010/2011, the percentage of transport costs in total logistics costs was 72% of delivery cost to Addis Ababa central ware houses for Di ammonuim Phosphate (DAP) fertilizer excluding the unloading cost from trucks. The transport cost varied based on the distance of the warehouses from port, the road condition and the terrain conditions. Hence, the unit transport costs to Addis Ababa, Nazareth, Shashemene, Debreziet,

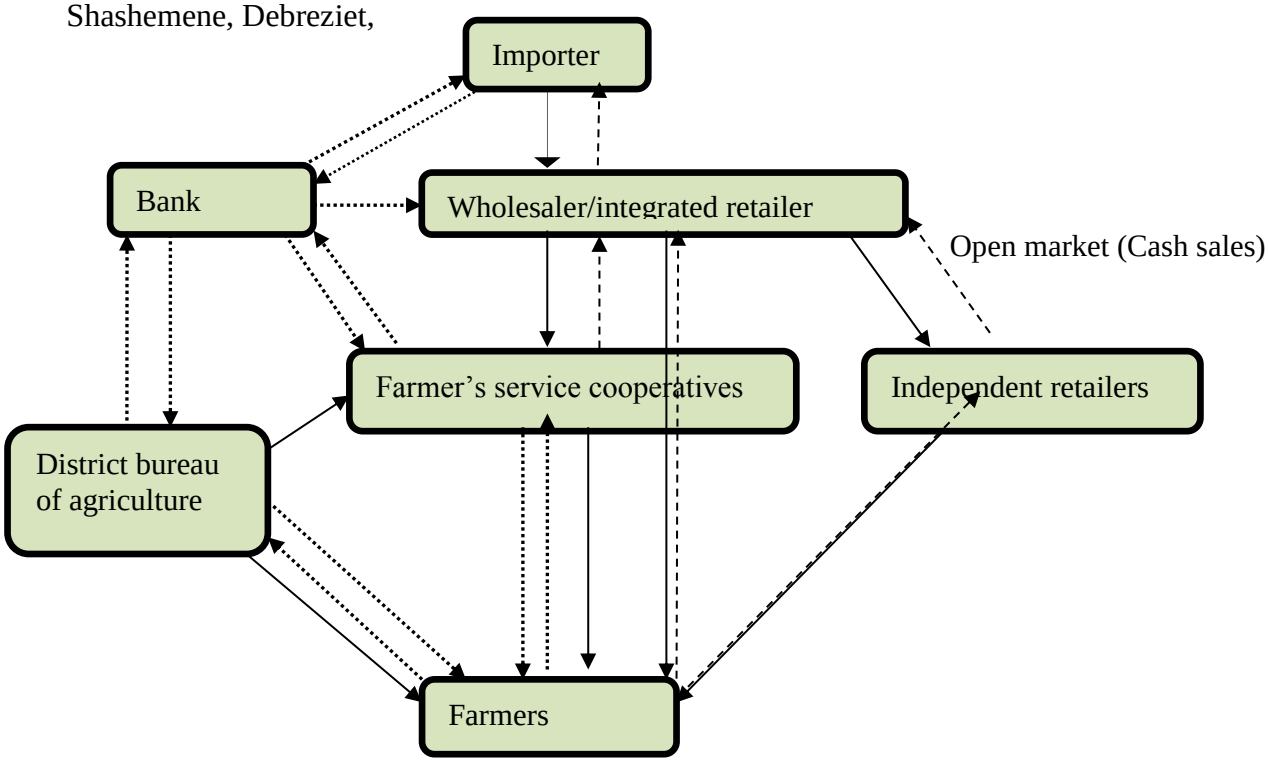


Fig. 14 Structure of fertilizer distribution market in Ethiopia
(Chombie, 2011)

Modjo, Woliso, Hosana, Nekempte, Dejen and Assela was 0.087 Birr per quintal per kilometer tariff and costs to Kombolcha, Bahirdar, Dessie and Mekele was based on 0.112 Birr per quintal per kilometer tariff in 2010/11 (Chombie, 2011).
Based on the above costs, for the year 2010/2011, the insurance costs of DAP and UREA were 2 Birr and 1.5 Birr per quintal respectively.
Clearing and transit service charge obtained from Ethiopian Maritime and Transit Service Enterprise was 2.75 USD per ton. On average, changing the USD to local currency of about 17 Birr for 1 dollar, service cost becomes 4.68 Birr per quintal.

Unloading and loading costs at central warehouses, warehouse rent, spillage and wear of bags, bank service charge, and administrative costs were added on importer delivery price at central warehouses. In addition, the price of fertilizer in unions' warehouses included the transport costs and bank interest of 13.5% of the final price received at the warehouses.

7.4.4. Quality Issues along the Supply Chain

Critical quality problems are caking and melting of fertilizer due to very hot temperature at Djibouti port during the month of import, which goes as high as 45^0C. The second serious quality problem is that the fertilizer absorbs moisture while unloading from ship to bagging areas or to silos due to very high humidity after month of April (Chombie, 2011).

7.4.5. Gaps/Problems and Solutions

Lack of road infrastructure was the major barrier in distributing fertilizer from central warehouses to the primary service cooperatives especially during the rainy season.
Late announcement of fertilizer price, which is in May (a busy time for farmers) resulted in the late delivery to farmers which increased fertilizer price by interest of 13.5% per quintal and warehouse rent.
The other key problems faced and resulted in lesser efficiency of the port operation was the arrival months of fertilizer in the port which were in the hottest season resulting in caking and melting of fertilizer. Moreover, the fertilizer also absorbs moisture when it arrived after the month of April resulting in difficulty in unloading from ship. These resulted in longer time for discharging fertilizer from ships to the silo and trucks. The cranes of most ships which are used to unload fertilizer from ships to hoppers were mostly ineffective as they are old.

There was also lack of coordination of ship agents with port harbour master in providing the right documents to the harbour master at the right time. In addition, the schedule of the ships arrival times to the port was not coordinated and when grains and fertilizer ships arrived at the same time results congestion of the port and shortage of trucks.

The following proposed additional ware houses located as shown in Fig. 15 may improve the efficiency of distribution of fertilizer throughout the

country and may reduce frequent loading and unloading at intermediate points when direct shipment could be made.

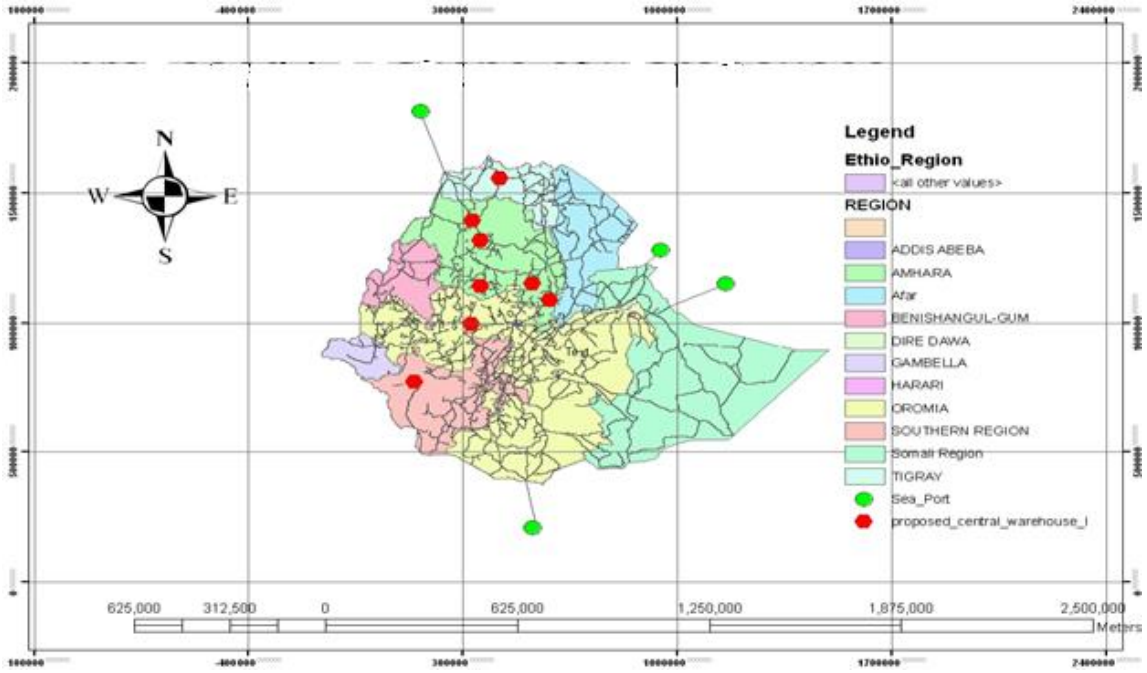


Fig. 15. Proposed locations of additional warehouses **(Chombie, 2011)**

7.5 Cold Chains

7.5.1. Background and Types of Cold Chains

It is surprising that Ethiopian abattoirs do not keep meat in refrigerators until they load onto trucks for distribution. In the case of Addis Ababa, the fact that it is temperate and the fact that they distribute immediately and do the distribution during the evening and the night reduces the risk but even then that is unacceptable. The second point is that non refrigerated trucks are used for the distribution. Trucks with closed containers and hangers at the roof for the meat are used. The other unacceptable point is the way loading and unloading is done. It is done manually using gloves and the workers carry the meat on their shoulders wearing gown and trousers.

Goods that are being exported using cold chain are flower and meat.

At present cut flower is the sixth largest export commodity of Ethiopia. Export of cut flower has grown from less than half a million dollars in 1995 to 69 million dollars in 2007 (Asres, et al, 2011). In this production period more than 139, 000 jobs were created of which 70 percent are women. Currently more than 100 private firms are involved in cut flower production and export of which 55 percent are foreign investors. Its share in export earnings has increased from 0.04 percent in 2001 to 5.39 percent in 2007 (Asres, et al, 2011).

Ethiopia is Africa's second largest exporter next to Kenya. Its world market share has now reached 3.9 percent. Other sub-Saharan countries such as Uganda, Tanzania, Malawi, Zambia, Namibia and South Africa have also begun to export.

Though the sector is showing dramatic increases, its contribution to the national economy is only 0.12 percent of the GDP. Ethiopia is not

exporting diversity of flower varieties because currently more than 80 percent of export is one type of rose. Further the competitiveness of Ethiopian flower with other African producers is low. Therefore, it requires a long term strategy to stay in the industry using the suitable agro-ecology of the country to benefit from its returns only by fostering world market competitiveness.

After the flowers are cut from farm, they are taken to refrigerator room by lorries where the flower is packed in bunches. The process from cutting to packing should not exceed 1 day. After packing, it is transported to Bole International airport in Addis Ababa in refrigerated trucks. Ethiopian Airlines provides airfreight service actually at subsidized rate to promote the cut flower industry. At airport the flower bunches are repacked into refrigerated containers to be shipped to Europe, Asia and the Middle East.

There are urgent issues that require government intervention concerning the safety and working conditions of employees. They are working with very harmful chemicals without protection. It is reported many have got sick, which are mainly women and the companies do not cover their medical expenses and they may even be laid off.

Ethiopian Meat Producers & Exporters Association (EMPEA) consists of 5 member companies that all together operate 7 abattoirs presently engaged solely in export of chilled shoat carcass via air freight to Saudi Arabia and UAE states.

The association hired a consultant on ways to scale up meat export to reach wider markets using sea vessel transport instead of air freight only. The consultant came up with a proposal for refrigerated transport to Djibouti port, cross-docked onto vessel and supplied to market destinations in Mediterranean and European countries, which will be scaled up to more lucrative far east markets. The quantities proposed for intermodal sea and air freight by the consultant are given in Table. Two alternative ways of managing the transport are given to choose from based on cost and efficiency (Texas Agricultural Experiment Station, 2009).

1. Using ocean containers in a ‘door-to-door’ mode based on ‘through bill-of-lading’ service contracts with certain ocean lines/logistics subsidiaries to certain market destinations.
2. Using ocean containers in a ‘port-to-port’ ocean freight contract with the shipping lines with ‘cross-docking’* of products in the Port of Djibouti. Land transport will be in refrigerated truck/trailers or a system of refrigerated transport containers operated by EMPEA for delivery of the product to the port.

* A covered trans-loading dock; an insulated and temperature controlled structure for transfer of cargo directly from refrigerated trucks to ocean containers

Table 14: Proposed Target Meat production for land/ocean and airfreight

(Texas Agricultural Experiment Station, 2009)

Product-types by export-volumes:	Chilled vacuum-packed	Frozen products	Carcass frozen	Total via land/ocean		Carcass chilled via air
Beef	12,000	6,000	0	18,000		0
Shoat	0	0	4,000	4,000		8,000
Total:	12,000	6,000	4,000	22,000		8,000

7.6 Route Optimization and Facility Location Analysis for Major Import/Export Goods

Most of the import-export materials are agricultural products and inputs which are large in volume and hence require large number of trips in the network. Their quantity is also increasing with time as shown in Figs. 16 and 17.

Optimization of facility locations plays a significant role in maximizing the effectiveness and efficiency of the supply chain. This includes location analysis, route optimization and vehicle coordination. Location analysis helps to determine locations that minimize the transport distance and travel time, reduce the vehicle operating cost and fuel consumption in the system, reduce congestion and environmental problems.

The collection-distribution centers selected through location analysis are based on the demand of import and export goods of the country. And the analysis gave the location that is close to the export commodity producing sites and fertilizer consumer zones. This would also simplify the freight consolidation and quality control activities (Elias, 2011).

Transport is an important and major part of logistics. Without transport, logistics cannot function. For example if we see logistics costs of distribution of imported fertilizers from port to consumers, around 79 percent of the logistics cost is transportation cost. And this is more or less similar for export commodities (Elias, 2011).

Over 90% of imports and over 75% of exports are consigned to or from Addis Ababa. The Comet yard in Addis Ababa has an estimated capacity of over 9 million tones of dry freight a year, well in excess of the 3 million tones currently imported in containers. If well managed, its capacity would be sufficient for at least the next 10 years. No other one area of the country accounts for more than 2% of imports. Fertilizer is delivered to central warehouses (Elias, 2011).

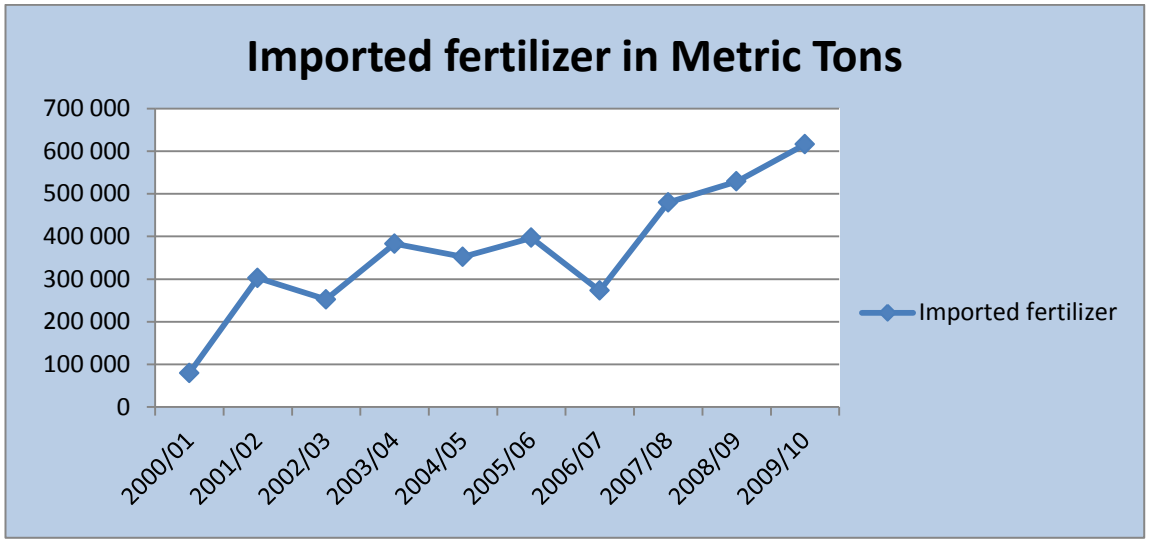


Fig. 16 Imported fertilizer trend in the last ten years (Elias, 2011)

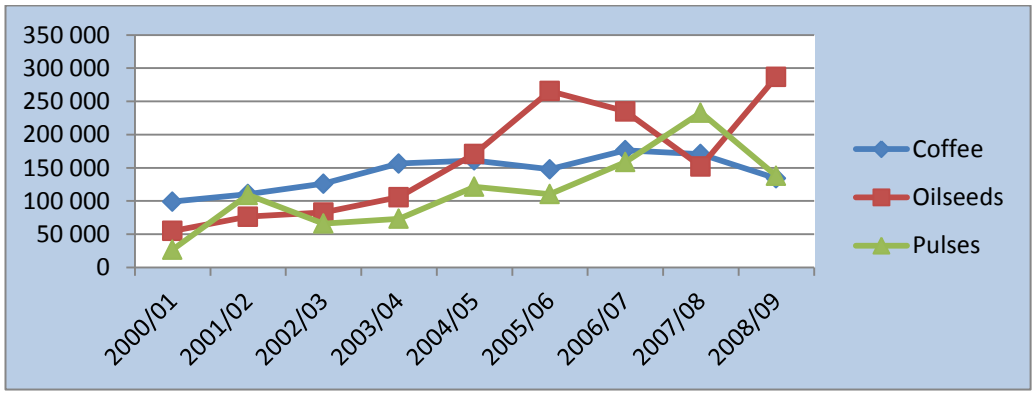


Fig. 17 Export commodity trend over 9 years (Elias, 2011)

Optimization of Fertilizer Distribution

For the distribution of fertilizer from Djibouti port to locations of consumer zones, the existing central warehouses do not give optimal distribution. Location analysis and optimization was made to determine location of distribution centers of fertilizer to farmers. Transport distance or tone-kilometer of fertilizer transport could be reduced for 40 percent of the consumer zones. A saving of 17, 993, 122 ton-km load-distance value was obtained, which is a significant saving. In addition, this could maximize utilization and availability of vehicles in the system. Moreover, appropriate quantity of fertilizer would be transported to the exact place without unloading and reloading at intermediate points, which minimizes wastage due to quality deterioration. These distribution centers serve also as collection centers for surplus agricultural produce for export. Table 15 gives the coordinates of the collection-distribution centers. Fig. 18 shows location of existing central ware houses and the collection-distribution centers.

Table 15: Locations of Collection-distribution (CD) centers (Elias, 2011)

Location	Name	Nearest Town	X-coordinate	Y-coordinate
Tigray	CD1	Inda Silase	435669.5	1549356
	CD2	Adi Gudom	552361.1	1470306
Amhara	CD3	Finote selam	322550.9	1198409
	CD4	Robit	338272	1372995
	CD5	Dogolo	548270.3	1138539
Oromia	CD6	Tulobolo	402033.5	964135
	CD7	Rob Gebeya	351851.3	1011248
	CD8	Digelu	540050	851094.7
SNNPR	CD9	Mizan Teferi	123176.1	766154
	CD10	Melka Jewe	374809.1	628786.7
	CD11	Awasa	432035.6	783669
Gambela	CD12	Itang	-37432.6	902070
Benshangul	CD13	Godere	125305.4	1160053
Harar	CD14	Harar	841847	1030080
Diredawa	CD16	Diredawa	809076	1063070

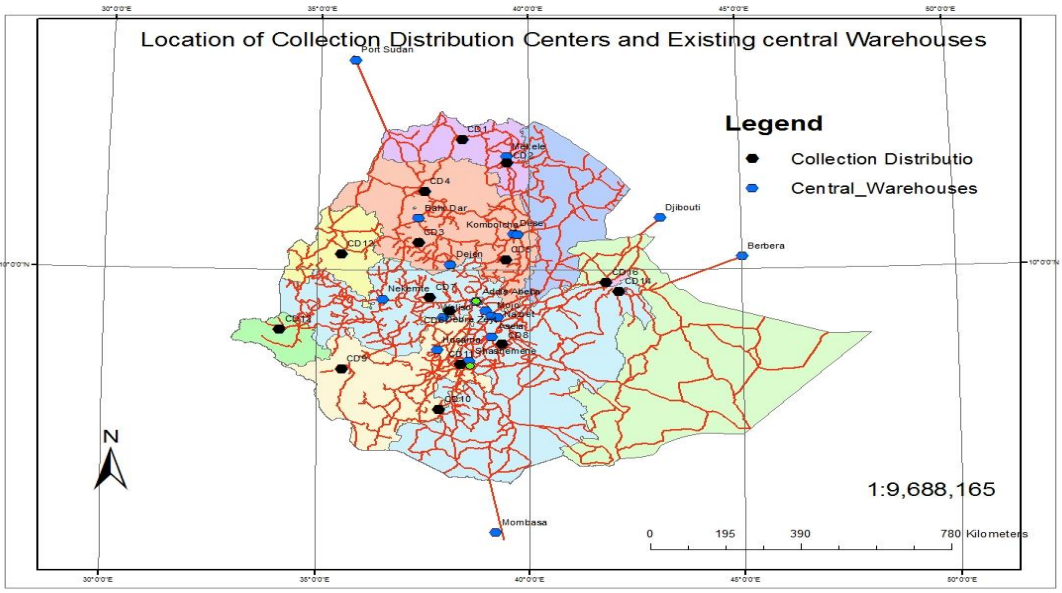


Fig. 18 Location of collectoin-distribution centers and existing fertilizer central warehouses (Elias, 2011)

Route optimization is also carried out for fertilizer import. Though the alternative routes are limited due to small road network density in Ethiopia, route optimization reduced the total transport distance in the system. The analysis also showed that Djibouti port is the closest sea port from most of the existing central warehouses as well as the selected collection-distribution centers. The optimal routes are shown in Figs.19 and 20 (Elias, 2011).

Optimization for Export Commodities

Oromia and South regions are the major coffee producer areas in Ethiopia. And there are around 34 areas that produce coffee for export. The existing route are optimal for all coffee export from production areas, which is transported to Addis Ababa for ECX market and then to port Djibouti, except for Wolayta area. Optimal route for Wolayta does not pass through Addis Ababa as shown in Fig. 21.

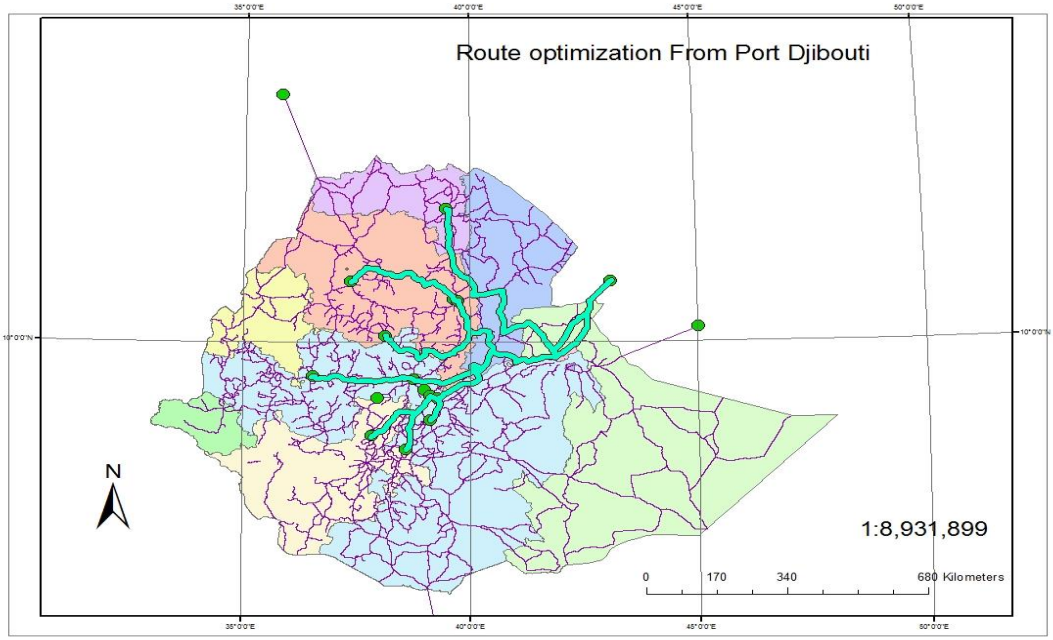


Figure 19 Optimized route from Djibouti Port to central warehouses (Elias, 2011)

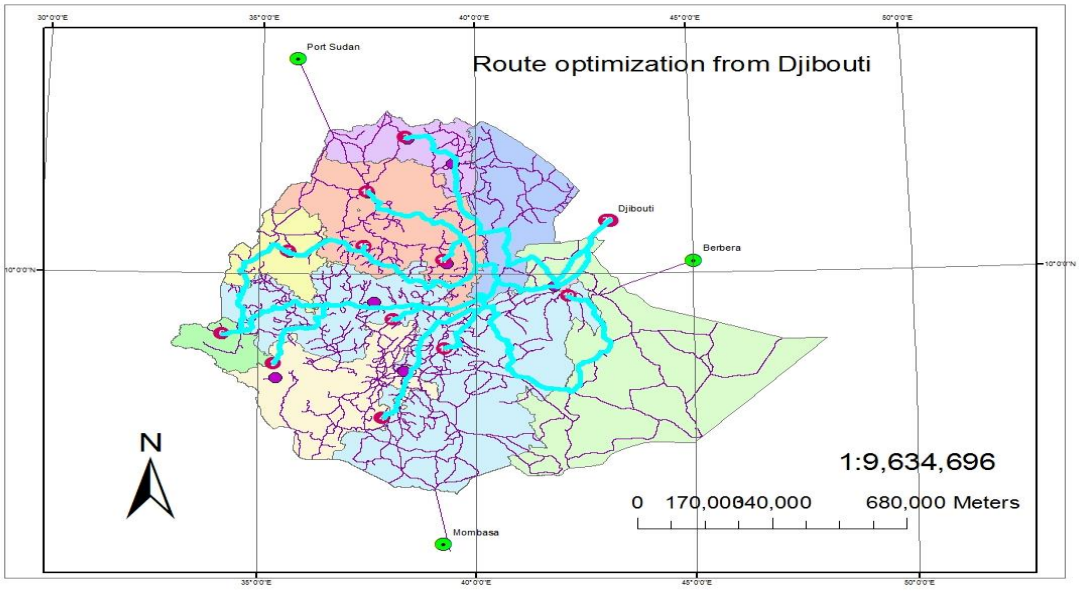


Figure 20 Optimized route from Djibouti to collection-distribution centers (Elias, 2011)

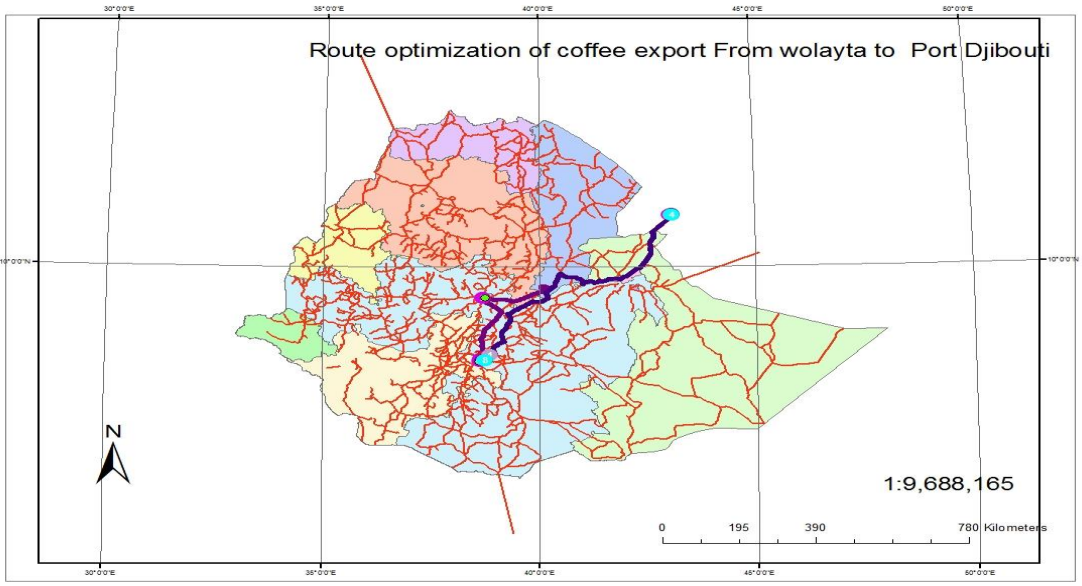


Fig. 21 Optimal route for coffee export from Wolayta (Elias, 2011)

Oilseeds are the largest export commodities sharing around 39 percent (in 2008/09) of volume of Ethiopian export trade. Oil seeds include sesame seed, niger seed, lin seed, ground nut, pumpkin seed, sunflower and others. Among these, sesame seed covers 80 percent of the total volume. Oromia, Amhara, Tigray and Benshangu Gumuz regions are the major oilseed producing areas in Ethiopia.

Vehicle Coordination for Break-Bulk Import-Export Goods

Vehicle coordination also has significant contribution in optimizing the supply chain system by maximizing the load rate of vehicles. This will

result in higher utilization of available fleet and reducing transport costs which could benefit all: the operator, the shipper and the national economy. The total volume of import and export are almost equal. The total quantity of imported fertilizer is 528,635 metric tons and the summation of the exported quantity of coffee and oilseeds is 420,878 metric tons. But the seasonal variation of imported fertilizers and exported commodities is highly variable especially after the month of January. In this study the vehicle coordination was made to utilize vehicles required for importing fertilizer to export coffee and oilseeds by coordinating the logistics system, as shown in Table 15. For the three commodities, there would be 52 percent of saving in terms of total number of vehicles required to transport the export commodities (Elias, 2011).

Table 15: Analysis of vehicle coordination (Elias, 2011)

Month	Fertilizer (ton)	Coffee + Oilseeds	No of vehicles req'd without coordinati	No of vehicles req'd with coordinati	Difference In No.of Vehicles	% saving Interms of vehicl
July	357	28,239	715	697	18	2
August	329	26,215	664	647	16	2
Septemb	545	20,011	514	487	27	5
October	547	15,537	402	375	27	7
Novemb	368	22,334	568	549	18	3
Decemb	544	16,926	437	410	27	6
January	7,492	39,622	1,178	803	375	32
Februar	80,088	42,187	3,057	948	2,109	69
March	101,792	60,451	4,056	1,034	3,023	75
April	127,936	45,715	4,341	2,056	2,286	53
May	36,457	60,222	2,417	594	1,823	75
June	172,174	43,419	5,390	3,219	2,171	40
	528,635	**420,87**	**23,023**	**11,817**	**11,921**	**52**

7.7 Addis Ababa City Logistics and Congestion

7.7.1 Background

Addis Ababa is the capital city of Ethiopia, with a population of 3,384,569 according to the 2008 population census. Addis Ababa lies at an average altitude of about 2,300 meters a.s.l with an estimated area of 530.14 square kilometers.

Addis Ababa is linked with important cities, towns and to agriculturally, commercially and industrially active centers of the country by road. International highways also link Addis Ababa with neighboring countries such as Djibouti, Eretria, Kenya and Sudan which made Addis Ababa to accumulate 77% of the registered vehicles in Ethiopia. According to the traffic data collected from field survey and the historical traffic data collected from ERA, on average a total of 19,088 freight vehicles enter the city per day and 18,428 leave through the 5 gates to the city in radial arrangement. Regarding the proportion of entering vehicle category it was found that 27.94%, 27.83%, 23.67% and 20.56% Medium Trucks, Heavy Trucks, Small Trucks and Truck Trailers Respectively. And leaving vehicles are 27.74%, 27.59%, 23.07% and 21.60% are Medium Trucks, Heavy Trucks, Small Trucks and Truck Trailers Respectively. Future prospects of the freight entering to the city reveals that the total entering and leaving freight traffic will raise from 19,088 and 18,428 to 90,633 and 86,124 by 2015 respectively.

More than 146 warehouses and 1 freight terminal are available where 59% of the warehouses are located within and surrounding the main city center attracting huge freight vehicles operating at a poor level of service. Freight transporting vehicles operate at an average load factor of 53% in the city due to lack of logistics measures to optimize use of vehicles.
Though the share of freight vehicles driven within the city is only 7.53%, these vehicles cause congestion due to their big size and difficulty of maneuverability. Traffic accident, emission, congestion and excessive delays are becoming the main challenge of the city as a result of the freight transporting vehicles. Statistical data from the office of Addis Ababa city traffic police shows that Addis Ababa is experiencing around 700 accidents per month which accounts for 60 percent of the accident that occurs in the country Ethiopia (Nebiy, 2011).

According to the traffic study carried out to analyze the share of vehicles by category within Addis Ababa results indicate that on average out of the total vehicles driven in the city per day 36.61% are automobiles, 26.61% 4WD, 26.54% small buses, 3.01% large buses, 4.98% small trucks, 1.44% medium trucks, 0.74% heavy trucks and 0.37% truck trailers where 7.53% the total traffic are freight vehicles.

7.7.2. City Freight Logistics Problems and Solutions

The freight transport and city logistics activities within the city of Addis Ababa have the following problems (Nebiy, 2011):

- Inappropriate location of freight transport facilities like warehouses which is one of the contributing factors for the delay, congestion, accident and environmental pollution within the city.
- Lack of city logistics measures leading freight vehicles to operate at a low load factor.
- Low load factor of freight vehicles contribute to the frequent entry of freight vehicles to the city which increase transport cost for the operation and congestion in the city.

- In adequacy of freight terminals contributing to the reduction of trucks efficiency and excessive delay.
- Freight transport data base management is quit poor.

Hence, in order to achieve sustainable mobility of goods in the city the following recommendations are given (Nebiy, 2011):

- As the freight traffic within the city is increasing appropriate freight terminals at selected periphery points of the city should be constructed before the existing problems get worse.
- Construction of bypass roads connecting the five gates can let freight traffic to go to its destination without passing through the city.
- Most of the warehouses are located within the city center attracting huge freight traffic to the city center and hence, to improve the efficiency, safety and environment it is better to relocate some of the warehouses from the city center to the periphery.
- Cooperative freight delivery practice should be introduced to maximize the efficiency of vehicles and the transport system in general.
- Attention should be given to improve the level of service of the available warehouses which will not be relocated.
- Capacity of stakeholders involved in the urban freight transport is better built with the help of trainings, workshops and seminars.

7.7.3. Addis Ababa City Congestion Problem and Its Cost

Traffic congestion is an ever increasing chronic problem in the transportation system of Addis Ababa due to increase in travel demand which followed economic and population growth. Many lines and junctions towards the city center are congested especially during morning and evening peak hours. This directly affects commuters with an increased travel time, excessive delay in a queue from job and important appointments and loss in productive hours and increased fuel cost. It indirectly affects the living standard and causes environmental pollution. Further, congestion correlates with accident also. Fig. 22 shows congestion and accident spots in the city (Wondwossen, 2011).

The average traffic congestion intensity in Addis Ababa is so high that ***38 vehicle-days*** and about ***352 person-days*** are wasted at each intersection leg or congestion spot per day. The average cost of wasted fuel and idle vehicle time at each entry leg of an intersection is above 0.5 million USD (Wondwossen T., 2011).

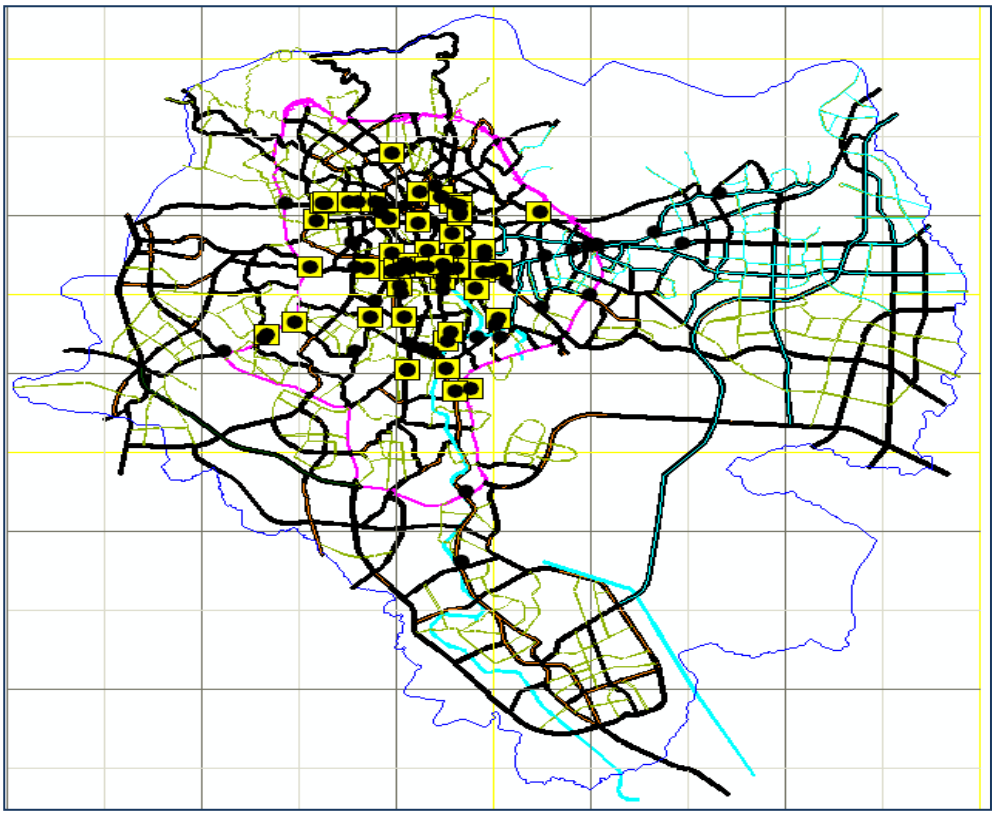


Fig.23 GIS plotting of traffic accident and congestion spots (Wendossen, 2011)

8 Logistics Performance Indices of Ethiopia According to World Bank Report

The Logistics performance index: Overall (1=low to 5=high) in Ethiopia was 2.41 in 2009, according to a World Bank report, published in 2010. Logistics Performance Index overall score reflects perceptions of a country's logistics based on efficiency of customs clearance process, quality of trade- and transport-related infrastructure, ease of arranging competitively priced shipments, quality of logistics services, ability to track and trace consignments, and frequency with which shipments reach the consignee within the scheduled time. The index ranges from 1 to 5, with a higher score representing better performance.

Number of documents required for export = 8
Number of documents required for import = 8
Lead time to export in days = 44 in 2010
Lead time to export in days = 46

Table 16 : Logistics performance indices (World Bank, 2010)

Evaluation Criteria	Rating (1=worst to 5=best)	Year
1. Overall logistics performance index (Quality of trade and transport related infrastructure)	2.41	2009
2. Ability to trace and track consignments	2.89	2009
3. Competence and quality of logistics services	2.14	2009
4. Ease of arranging competitively priced shipments	2.76	2009
5. Efficiency of customs clearance process	2.13	2009
6. Quality of trade and transport-related infrastructure	1.77	2009
7. Frequency with which shipments reach consignee within scheduled or expected time	2.65	2009

9 Intermodal/Multi Modal System with Special Emphasis on Ethiopia

The importance of freight transport for the functioning of both local and global economy is clear but transport volumes are ever growing and the problems of accommodating the freight flows in an efficient and sustainable way is real a challenge. Traffic congestion is rapidly growing; the quality of freight transport couldn't satisfy the ever increasing demand of customers; environmental deterioration, inefficient use of resources, space restrictions and traffic accidents are increasingly acknowledged as serious problems. In light of these problems, there is a great challenge to achieve a breakthrough in the performance of freight transport systems (Konings et al, 2008).
The European Union would like to raise rail transport share and would like to see a modal shift from road to rail mainly due to environmental problem and secondly highway maintenance cost can be reduced to a sixth if only cars use the roads. Intermodal transport is also seen as a solution to the congestion problem (Pedersen, 2005).
Although global movement of freight has been the major force behind intermodal infrastructure development in the US the use of intermodal services has been on the rise. Looking at the benefits of intermodal transportation (low cost, high capability and reach, competitive transit times), many shippers have started to use intermodal transport (Ishfaq and Sox, 2010)
The practices and developments trying to address the challenges of transport system vary in different parts of the world, both developed and developing countries.

9.1 Lessons learnt from the US and Canada Freight Transport System

A variety of interrelated factors have converged in the last quarter of the twentieth century and beyond to alter in significant and pervasive ways, the nature and scope of the US freight transport enterprise. There have been major changes in the volume and composition of goods, which are moved over longer distances in both domestic and global markets; freight is moved more frequently in smaller shipments, major freight routes (domestically and globally) are evolving, in short order in response to changes in global economy and in the geography of emerging production centres (Konings, et al, 2008).

A major factor underlying this transformation of freight transport is due to changes in the scale, in the composition and in the structure of the American and global economies. The demand for transportation has grown in response to the generally brisk performance of the US and global economies during this period. The US economy is dominantly becoming service oriented, and shifting from mass manufacturing to high value added custom manufacturing. The resulting combination of increasing information content and decreasing material intensity of goods changes the character and value of goods being moved. Further, the US and other Organization for Economic Cooperation and Development (OECD) countries have created global and regional free trade regimes, and globally organized production systems and value chains, which require speedy and timely movement of goods. These flows of goods are coordinated across national and global transport nodes and links in order to support the smooth functioning of the global economy.

Technological changes in the transport sector in the US occurred in form of Interstate Highway System, the jet aircraft, the container and container ships, container stacking in rails, roll-on/roll-off vessels, and a variety of micro infrastructure to facilitate operations at seaports and airports. The use of information technology (IT) greatly enhances transport operator and system efficiency, offering not only speedier goods transport at declining costs but also the ability to integrate goods supply chains regionally and globally while maintaining lean inventories.

The third factor underlying the major changes in the freight system is deregulation and privatization of the transport sector which stimulated technical innovations and enhanced productivity in the sector – in the process lowering costs and improving speed and reliability.

At the same time, two organizational innovations – business logistics system and intermodalism – provide major sources of change in the freight sector. Business logistics service systems, aimed at minimizing total logistics cost (transportation, warehousing and inventories, insurance, administration and so on) by freight transport companies add value to the operation of their customers conferring strategic competitive advantage on US firms operating in the global market.

Intermodalism is the fully coordinated door-to-door efficient delivery of freight using two or more dissimilar modes of transport (Konings et al, 2008). This is desirable since inefficiencies in the freight sector impact the competitiveness of US firms in the transport and transport using sectors. Intermodalism seeks to enhance the performance of transportation system by increasing safety, reducing congestion and decreasing delays, thereby enabling more efficient freight and passenger trips (Konings et al, 2008). Greater efficiency translates into lower costs and an increase in the competitiveness of US firms in the global market. The Intermodal Surface Transportation Efficiency Act (ISTEA) challenged transportation authorities to increase interconnectivity between the maritime, air and land transport modes to enhance effectiveness of the total network.

It is widely recognized in the US, in both industry and policy circles, that the cooperation between transport modes has the potential to reduce congestion, especially in major freight corridors. The traditional attitude toward infrastructure investment to increase capacity and reduce congestion didn't work because increase in capacity attracts more traffic (Konings et al,

2008). Thus the policy shift is towards addressing the unbalanced distribution of freight shipment across modes.
Until recently, the competition between different freight transport modes for the same shipments gave rise to independent infrastructure decisions taken in the optimal interest of different modes. As these facilities and terminals are locked into specific locations, adapting them to intermodalism requires not only major investments but also changes in attitudes and behaviour of modal actors. Transportation integration across modes also faces additional complex institutional and regulatory problems at federal, state and local levels. These problems are currently impacting the cost and quality of service of freight movement.
In conclusion, intermodalism is considered the solution to the above problems and its aim is to provide seamless movement of cargo across a transportation network in which the physical, institutional and information infrastructure are integrated to reduce transaction costs and maximize operational efficiencies. The US intermodal freight is bar far the most developed compared to other parts of the world but it is still in its early stages of development. The obstacles are not fully resolved transfer problem at ports, and information compatibility problem when goods are transferred between modes.

The development in Canada and the US are alike. One important point worth mentioning is that Canada-mid-west USA cross-border rail link is carrying large volumes of lorry trailers on piggyback trains (Konings et al, 2008). Canada Pacific Railway launched its Expressway scheme in 2002 and runs regular services between Montreal, Toronto, Windsor (Ontario) and Detroit in the USA. At the heart of this operation is the inland Port of Montreal, 1000 miles along the St Lawrence River serving as a gateway for trade to and from mid-west USA (Konings et al, 2008).

9.2 Lessons learnt from European Freight Transport System

The goods transport in Europe increased from 1.4 trillion metric tonnes in 1970 to 3.1 trillion metric tonnes in 2000, by 119 per cent (Koning et al, 2008). Fifty percent of this transport is over distances between 150 and 500 km, 20 percent over 500 km. The market share of uni-modal road transport increased from 35 percent in 1970 to 44 percent in 2000 and intra- European sea transport increased its market share from 27 percent to 38 percent. Domestic sea transport, pipeline and inland shipping volume remained nearly constant, implying significantly reduced market share. Rail transport share drastically decreased from 20 to 6 percent (Konings et al, 2008).
As reported by Site and Salucci (2007) a total of 2650 billion tone kilometer (tkm) of freight were transported in the EU-27 only considering the four land transport modes (road, rail, inland waterways and pipelines). More than two thirds of the total (72.7%) was attributed to road transport, while rail, pipelines, and inland waterways accounted for, respectively, 17.1%, 5.3%, and 4.9%. If we also consider intra-EU maritime transport and intra-EU air transport, then road transport accounts for almost half the total (45.6%), while rail and inland waterways contributions decreased respectively to 10.7% and 3.3% (the intra-EU maritime transport share is

37.3%). The average annual growth rate of freight transport between 1995 and 2007 has been 2.7%. It is also worth mentioning that the number of tkm run using road transport has increased by 49.6% during the period 1995-2007, while, in the same period, the rail freight transport trend has been fluctuating, but since 2002 it has increased by 17.7% (EU, 2009). Freight transport is expected to grow at roughly similar rates of GDP (2.1%) for the period 2000-2020. Modal split is expected to roughly stabilize in the longer term (Site and Salucci, 2010).

As a result of freight and passenger traffic, congestion has become a serious problem. Around 7000 km or 10% of European road network is daily affected by congestion (Pedersen, 2005). As reported by Pedersen (2005) it was estimated that congestion will account for 1% of the EU GDP in 2010 if nothing is done about it.

The following shifts were observed (Site and Salucci, 2010) :

• The trade sphere shows a shift from national to global markets. This results in a growth of congestion along trade corridors and at ports, airports and border crossings and poses challenges in terms of infrastructure capacity and harmonization of trade and regulatory policies.

• The economic environment shows a shift from a manufacturing to a service economy with decline in manufacturing employment but increase in manufacturing output. This is accompanied by an increase of small shipments of light, high-value goods, and the emergence of e-commerce and e-business. As a consequence, there are increased needs for packaging, air freight and customer oriented door-to-door truck services. The economic development is becoming more dependent on high-quality, multimodal transport services which need to be reliable and predictable.

• The business logistics regime shows a shift from push to pull systems. Logistics is increasingly less manufacture-to-supply and inventory based and more manufacture to-order and replenishment based. This brings about lower inventory levels and smaller order quantities. The transport system thus faces increasing demand for flexible, timely, reliable and visible door-to-door services. The search for cost effectiveness leads to the growth of third party logistics providers and currently even fourth party logistics providers. At the same time there is an increasing concentration of supply chain control through shipper consortiums and alliances. Main challenges for the transport system include the management of potential service disruptions for either unanticipated peaks in supply and demand or system failure, the impacts of e-commerce on local pick-up and delivery truck services, and the security of cargoes.

Main research topics underway in the domain of carriers and transport systems include the following:

• The shift from modal fragmentation to coordinated logistics is accompanied by the development and adoption of technologies for tracing shipments and managing vehicles and fleets, and an increasing carrier concentration and consolidation. At the same time this trend poses challenges in terms of:

- o harmonization of practices;
- o standards;
- o government regulation and information technology across modal boundaries (as well as national boundaries);
- o investment in information technology
- o barriers to market entry and competition because of economies of scale and scope.

• The shift from system construction to system optimization is driven by the need for cost-effective provision of more capacity. Road transport faces increasing congestion while intermodal transport suffers from bottlenecks at interchange points with ports and air-ports, again related to congested landside access. EU proposes modal shift from road to alternative modes of freight transport such as short sea shipping, inland waterways and rail as a solution to congestion problem (Site and Salucci, 2010).

The Marco Polo program has been implemented with the main aim of fostering combined transport and achieving a shift of freight traffic from road to rail and to sea.

In the rail sector it is proposed to open up national markets for cabotage, and to further push harmonization in the field of safety and interoperability and the dedication exclusively to freight services of a network of railway lines throughout Europe.

Much research work is done and recommendations are given with implementations assigned to member countries for the REORIENT corridor (connecting Nordic region to central and south eastern Europe covering 11 countries. Technical specification for interoperability didn’t progress substantially. Fund is reported as the major constraint (Site and Salucci, 2010).

Project 1 is a high-speed train line from Berlin
Through Munich to Northern Italy
Project 6 links Lyon toTrieste through Milan. This corridor
is heavily congested, especially around the French-Italian border
A'rolling road', a train where trucks including their tractors are
loaded onto a train, is planned from Aiton in France (near Grenoble)
to Obrassano in Italy (outside Turin) to reduce road-haulage in the Alps.
Project 17, linking Stuttgart and Vienna is also partly shown in
the figure (although Vienna cannot be seen).

Fig 24. Trans European high speed train lines
(Pedersen, 2005).

Fig. 25 The Nordic link corridor

(Pedersen, 2005)

In conclusion, inter modalism is considered the solution for congestion and environmental problems, and to attain competitiveness of European economy in the global market but much is not done physically on the ground.

Problems yet to be resolved concerning EU rail transport:

- -there are 5 different electrical systems, which force change of locomotive at border crossings
- there are three different rail gauges, 1524mm in Finland, 1668mm in Iberian peninsula and standard gauge of 1435mm in the rest
- the clear heights to the pantographs are short and cannot accommodate double stacking of containers on rails. The height at tunnels is also short. Railway freighting will not be competitive unless containers are double stacked
- sidetracking of freight trains to leave way for passenger trains

9.3 Lessons from freight Transport System in Other Parts of the World

In Ethiopia, Here will be discussed briefly about logistics system of Asia, Baltic Sea Countries and African countries based on the information that could be obtained.

9.3.1. Asian Freight System

The infrastructure and logistics system of the majority of Asian countries is under developed.

The transport modes used in India are road followed by railway and finally coastal shipping. Airfreight is limited to a small percentage of courier service. Trucking accounts for 70 percent of transportation. Water is the cheapest but it is not heavily used in India. And transportation in India accounts for nearly 40 percent of cost of production (Srivastava, 2006). Government is trying hard to develop infrastructure and developed a double stack container freight line which started working from 2006 (Srivastava, 2006). Problems are insufficient infrastructure, lack of integration of supply chains and low use of ICT. The entry of large 3PL and 4PL logistics service providers is transforming the nature of logistics services in India.

China's railway freight is very good but the road network density is low. This forces some foreign companies to handle their own logistics, McDonald of china started its own trucking subsidiary in order to ensure reliable deliveries (Bookbinder and Tan, 2002). China's international trade has progressed highly and three of the world's busiest sea ports belong to china.

Hong Kong, Singapore and Taiwan logistics infrastructure are highly developed in terms of both road infrastructure and sea shipping. Actually Singapore stood first according to classification of European and Asian countries into logistics excellence tiers by Bookbinder and Tan (2002).

9.3.2. Freight Transport System of Baltic Sea Countries

Estonia, Latvia, Lithuania and Poland serve as transit corridors for goods to Finland and Russia and themselves are fast developing consumer market economies. Estonian port of Tallin is one of the busy ports for transit goods. Freight traffic accounts for 90 percent of Lithuania's national railway income much of which is transit cargo to Russia and Belarus. In the case of Lativia, EU grant of Euro 150 million helped the country develop its railway. Lativia heavily depends on rail but its neighbour Poland heavily depends on road for transit cargo also (David Lowe, 2005). The transport system is developing but there is lack of coordination of efforts between different countries, which is not good (Lowe, 2005).

9.3.3. Freight Transport System of African Countries

South Africa's road infrastructure is comparable to the best in the world and stands fourth next to USA, UK and France. The transport modes road (55, 383km), railway (21, 163km), sea shipping (8 ports), pipeline and air (9 airports) (Nagel, 1994).

About the rest of the African nations Njoh (2008) says that colonial authorities developed road and mainly railway systems to maximize extraction of raw materials to take them by sea to their country. And they discouraged inter connection to defend their colonial territory. He says that

governments after freedom did not develop the infrastructure much and African countries are not interconnected well. He concludes that the infrastructure couldn't connect Africa to the global market.

9.4 Ethiopian Intermodal/Multimodal Transport

In developing countries, the lack of transportation infrastructures and regulatory impediments are jointly impacting economic development by conferring higher transport costs and delays rendering supply chain management unreliable, which needs to be improved. The Ethiopian federal road network gives good connectivity to all regional headquarters, main cities, ports and main international entry points. However, only about 30% of the rural areas are presently connected with all weather road and many of these roads are in poor condition (ERA, 2002:4-2).

Multimodal transport system is used in the country: human porterage, pack animals, trucks and ship or airplane in uncoordinated fashion. A pilot Intermodal transport is begun by Ethiopian Shipping Lines SC (ESLSC) for import goods from foreign suppliers through the port of Djibouti up to dry ports in the country through one bill of lading, which has run successfully. This has reduced the cost of delays, saved transport and warehouse charges and is able to provide prompt delivery of containerized goods. The service is expected to increase in the coming years. This service is better extended to include the transport and logistics segment from dry ports to customers. The ESLSC is in a better position to coordinate intermodal transport for import goods in the existing situations.

Intermodal transport experience in the USA and Europe show that intermodal freight transport is cheaper than trucking for longer distance than 500 km and for large volumes of goods transport and that it is more environmentally friendly. Ethiopian government is investing heavily to construct 10,000km of railway lines in the coming 10 years in different phases to interconnect raw material resource centers and production centers internally and to connect the country to global market through sea ports.

It would be competitive to develop IT supported intermodal freight transport system and put in place efficient management system for the local and international supply chains of all goods of the country. An important area of research and future direction for Ethiopia is *INTERMODAL TRANSPORT*.

International Overview of Research on Intermodal Transport

Bontekoning and Macharis (2003) reviewed publications on intermodal transport published from 1988 – 2001 and classified them into five distinct areas of research and the sixth group is miscellaneous: drayage, rail haul, transhipment, standardization, multi-actor chain management and control, mode choice and pricing strategies, intermodal transportation policy and planning.

Based on their review Bontekoning and Macharis (2003) concluded that the research community and their research topics lack integration and coherence and that the research is at a pre-paradigmatic stage of development. The papers published afterwards also concentrate on specific areas of the five classifications due to the complexity of intermodal network (Ishfaq and Sox, 2010, Meng and Wang, 2010, Sorensen, et al, 2011). Bontekoning

and Macharis (2003) proposed research agendas that would help integrate the intermodal research community into one or two large communities and help the research grow into a normal science stage. The agenda proposed are:

a. Actual short haul operations (drayage) accounts for a relatively large proportion of the overall cost (25-40%) and therefore more efficient drayage needs to be developed.
b. Research is needed in the optimal configuration of the service network and the consolidation production for the long haul mode
c. Research into terminals is required in order to obtain a fundamental understanding of the impact of the different arrival and departure dynamics of trucks and trains, terminal layout and operations strategy on terminal performance
d. The effects of standardization on intermodal efficiency needs to be explored and the decision making process on standardisation agreements
e. Research is needed in the mode choice decision making process
f. In this era of ICT and automation, we need to investigate how and to which extent it can contribute to the improvement of the efficiency, profitability and competitiveness of intermodal transport
g. Research is needed into policy formulation and evaluation in order to identify effective and efficient policy measures.

Research needs to be done on agenda items a, b, c, d and e for the Ethiopian case with the following peculiarities of the country taken into considerations:

i. That the economy of the country is based mainly on agriculture
ii. That more than 75% of the transport activities are with villages and from farms to main road using human power walking and back, head or shoulder carrying
iii. That it is land locked.

85% of the population is engaged in agriculture and 70% of this population is not connected to roads (Asnake, 2006). This constrains the farmers from taking their produce to the market and benefit from their effort. On the other hand, the urban population is using imported processed and packed food items, i.e., the farmers are disconnected from the market.

The farm produce of even those farmers who take their produce to market has got inferior quality especially for export market mainly due to poor handling and transportation problems. Due to lack of intermediate means of transport and appropriate infrastructure, animal transport is either misused or underutilized. The possibility of introducing packaging units that can be packed into standard loading units suitable for animal powered transport need to be explored to reduce transport cost and to maintain quality. The packaging units prevent quantity and quality loss due to radiation, physical damage and from contamination.

The other problem that needs to be worked on is lack of organizational and consolidation infrastructure and services to link producers (farmers) and consumers (market).

10 Discussion

Table 17 summarizes and gives status of logistics practices in Ethiopia.

Table 17: Overall assessment of logistics practice in Ethiopia

General attributes	Specific attributes	Assessment
I. Infrastructure	1. Distribution infrastructure	1.The distribution/collection of goods is generally inefficient due to poor road infrastructure
	2. Infrastructure maintenance and development	2.Infrastructure maintenance and development is/is not adequately planned and financed due to limited resources
	3. Water transportation	3.Land locked, no international waterways. Rivers with rapids and falls, non-navigable except Baro
	4. Air cargo	4.Cargo handling throughput is good
II. Performance	5. Customs administration	5.Hinders the efficient transit of goods, there is much delay caused by customs
	6. Process management	6.Process management (quality, time to market, . . . is not emphasized in Ethiopia)
	7. Customer orientation	7.Does not emphasize customer satisfaction adequately
III. Information system	8. New information technology	8. Implementation does not meet business requirements, use at rudimentary level
	9. Electronic commerce	9.Is not developed at all for business opportunities
IV. Human resources	10. Labor regulations	10.Regulations (hiring and firing practices, minimum wages, etc) are flexible enough
	11. Immigration laws	11.Do not prevent from hiring foreign labor
	12. Skilled labor	12.Is available with searching country's labor market
	13. Industrial disputes	13.Are very low
	14. Industrial relations	14.Labor relations are generally
	15. Employee training	
	16. Worker motivation	

		productive 15.Is not high priority in companies 16.Does not identify with company objectives due to very low wage rate
V. Business environment	17. Export credits and insurance 18. Exchange rate policy 19. Cost of capital	17.Are not available at reasonable prices for companies interested in exporting 18.Hinders the competitiveness of enterprises 19.Hinders competitive business environment
VI. Political environment	20. Political stability	20.There is risk of political instability but heavily controlled by police

11 Concluding Remarks and Recommendations

The following conclusions can be drawn from the assessment made about logistics practice in Ethiopia

1. The density and quality of transport infrastructure is very low. 70 percent of rural population is not connected to all weather roads. The freight vehicles are not adequate in number and age to meet the transport demand of the country.
2. The main freight transport companies lack capacity in terms of skilled human resource, management skills and number of fleets of vehicles. They are fragmented. The main/big companies are government owned, this will result in inefficiency
3. The efficiency of customs authority is very low and this causes a lot of delays at check points. The number of check points is also too much. The number of days required to get foreign currency from national bank is also very long.
4. 70 percent of rural population, which is the major part (85% of the total) is not connected to all weather road which hampers marketing of the farmers produce. A significant proportion of urban population is using imported food items. Even the produce of farmers that reaches market has got inferior quality especially for export market mainly due to poor handling and transportation. There is lack of organizational and consolidation infrastructure and services also to link producers(farmers) to consumers(market).
5. Multimodal transport system is used in the country: human porterage, pack animals, trucks and ship or airplane in uncoordinated fashion. A pilot Intermodal transport is begun by Ethiopian Shipping Lines SC (ESLSC) for import goods from foreign suppliers through the port of Djibouti up to dry ports in the country through one bill of lading, which has run successfully. This has reduced the cost of delays, saved transport and warehouse charges and is able to provide prompt delivery of containerized goods. The service is expected to increase in the coming years. The ESLSC is in a better position to coordinate intermodal transport for import goods in the existing situations.

From the analysis made during the assessment, the following recommendations can be made

1. There is urgent need for research on the logistics gaps identified and human resource needs in freight transport and logistics needs of the country. EthioLog may be supported financially by government of Ethiopia and international funding agencies and technically by SLU to carry out research and human resources development in the sector.
2. There is urgent need of development in the following areas to change the livelihood of Ethiopian farmers and develop the economy of the country. First is need to develop more road, rail and airfreight infrastructure to make Ethiopian export goods competitive on the international market. The second is need to develop organizational and consolidation infrastructure and services to link producers (farmers) to consumers (market) and to create managing body for efficient and effective goods flow in the network from producers to consumers.
3. Transport companies need to be supported and encouraged to build their capacity in terms of human resources, number and better age of their vehicle fleets, coordination of their services, and integration of their services with the services of warehouses and terminals. Warehouses and terminals are recommended to do value adding activities like consolidation, packaging, etc.
4. The development of logistics service providers, transitors, shipping agents and brokers need to be encouraged in terms of technical skills, human resources and finance because they add so much efficiency to goods flow at lower costs.
5. Customs authority and national bank of Ethiopia need to overhaul the way they give services to exporters/importers and align their services to expedite freight movement for the benefit of the country.
6. Ethiopian government, as the infrastructure provider, better invest the limited resources prudently on road, railway, dry ports and terminal infrastructures in line with intermodal transport requirements. I especially strongly disagree with single height container freight train wagons because the whole world is developing double stacked container wagons for competitiveness of their goods on the global market.

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