The Role of Intermodal Transport in Promoting Horticultural Products' Export Trade in Kenya

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Abstract

In the modern global economy, intermodal transportationplays a critical rolein the promotion of international trade. This is important for Kenya, which needs to be integrated in the global economy. However, this is possible if her exports would reach world markets fresh and cheaply. This paper assesses the role of intermodal transport in the export of Kenyan horticultural products. In-depth literature review and questionnaire survey were used to obtain relevant data and information for the study.

The study reveals that several firms utilize more than one mode of transportation to move fresh products to overseas destinations depending on their relative cost advantages. Itwas established that railroad is the mode more frequently used in intermodal transport. It was also found out that the majority of respondents were dissatisfied with the cumbersome documentation process at the exit point for horticultural exports.

In order to make the intermodal transport of horticultural products from Kenya competitive, it is necessary to speed up and simplify cargo inspection and customs clearance. It would also be important to invest in the establishment of more cooling plants and warehouses at the Jomo Kenyatta International Airport to increase the capacity to handle fresh produce. The findings of this study may be of interest to the horticultural industry and to policymakers in Kenya and abroad.

Key words: Horticultural exports; Intermodal transport; Northern Corridor; Kenya.

Intermodal transport and horticultural products' export trade in Kenya

Introduction

In the modern global economy, intermodal transportationplays a critical role in the promotion of international trade. This is important for Kenya, which needs to be integrated in the global economy. However, this is possible if her exports would reach world markets fresh and cheaply. The implementation of intermodal transport systems has become globally relevant, given that they are environmentally friendly, they allow to minimize costs, and they increase conveniences (Shafi et al., 2019). As Brewer et.al, (2001) observe, intermodal transport service is a system aiming at efficient, effective and environmentally friendly freightmobility. Globalization has led many firms to restructure their supply chains. Currently, firms do not only operate within national boundaries but also in the international context (Sarker et al., 2018a). Intermodal transportation can represent the optimal solution for this movement within national and across international boundaries (Sarker et al., 2018b). In this context, airfreight is a critical enabler supporting integration of economies into the global value chains.

Kenya like other developing countries needs to be integrated with the global economy through efficient flows of its exports and imports. Consequently, the country needs to develop an efficient intermodal freight transport system to facilitate export of horticultural products, which being perishable tend to lose their value or quality over time, if not appropriately stored or transported. The main objective of the paper is to assess the role of intermodal transport in the export of horticultural products in Kenya. The paper is structured as follows. After a theoretical review of the relevant literature, a description of the global market of fresh agricultural products is proposed. This is followed by an analysis of the intermodal freight transport in Kenya that considers road, railway, maritime and air transport. An overview of the horticultural sector and of its related supply chain in Kenya is then presented. The next section introduces the survey that was conducted among a sample of stakeholders of the horticultural sector in Kenya. It emphasizes particularly the choice of modes of transport and the extent of use in Kenya and the challenges facing the development of intermodal transport.

Literature Review

According to Irandu (2018), several studies have been conducted on intermodal transport in other parts of the world, but none has been carried out in Kenya, itself a leading exporter of horticultural products among African countries. Bontekoning et al., (2004) define intermodal transport as the movement of /products using more than one mode of transport This facilitates the transfer of loading units from a given transport mode (such as road transport) to another (such as train or ship) in order to carry larger volumes in one transport operation (ITF, 2009). The movement of goods in a single loading unit or vehicle that successively uses two or more modes of transport without handling the goods themselves in changing modes (UN/ECE, 2001:17), is considered to be an important contribution to achieving sustainable transport activities throughout the world.

According to the available literature, the main advantage of intermodal transport lies in its comparatively low external costs. Forkenbrock (2001), observes that the estimated total external cost of an intermodal train per tonne-km, including the cost of accidents, air pollution, greenhouse gases and noises is only 28% of the external cost of a general freight truck. The main objective of intermodal transport is to consolidate loads for efficient long haul through rail or ocean liners. This is done to take advantage of the efficiency of local pick-up and delivery operations by truck. However, intermodal transportation is not restricted to containers and intercontinental trade. It also involves other items such as express and regular mail, and fresh produce that are also moved by several modes of transportation such as air, land, rail or sea (Sarker et al., 2018c).

Intermodal transportation of freight across the globe is one of the areas where technological improvements have been greatly witnessed (Shafi et al., 2020). Besides these changes, consumers are more informed and demand efficient service. This implies customers' satisfaction, which includes timely delivery of goods and services. Firms need to employ various strategies to ensure that customer expectations are not only met but exceeded (Cao et al., 2019). Intermodal transportation has the ability of reducing the supply chain costs incurred by various players and to improve on the time taken to deliver products to various destinations (Islam et al., 2020). However, intermodal transportation can only prove to be efficient and effective in regions and countries where the various modes of transportation are well developed and economical to use (Hossin et al., 2018). In Kenya, there seems to be overreliance on road transport and to a lesser extentrailroad.

Intermodal freight transport inKenya: An overview

This section surveys the state of intermodal freight transport in Kenya by discussing the situation that characterizes the various transport modes.

Roads

Implementing intermodal integration is not possible without a good and supportive road infrastructure system (Veenstra, et al, 2012). In Kenya, like in most other African countries, road transport infrastructure is in poor conditions. Most of the roads in the country were built in the 1970s and are now dilapidated due to poor maintenance. However, in recent times, road improvement has progressed rapidly in the country. Many access roads have been constructed improving last mile connectivity to the international market for fresh produce.

RailwayTransport

The metre gauge railway constructed during the colonial era, was almost obsolete and highly inefficient. It had become increasingly less competitive and lost most traffic to road transport. Moreover, the amount of freight carried by the metre gauge railway is limited due to the small size of wagons, which determines the gross weight to be loaded. This led to low evacuation rates from the Port of Mombasa. (SCEA, 2015, GoK, 2016). To address the perennial railway transport problems faced by the metre gauge railway, the East African partner states decided to switch to the high speed and high capacity Standard Gauge Railway (SGR). The plan to build a high speed and efficient standard gauge railway (SGR) serving the Northern Corridor is on course. The line between Mombasa and Nairobi (SGR phase 1)) is completed and commenced operation on June 1st 2017. Construction for the segment from Nairobi to Naivasha (phase 2A) has also been completed. For other segments, (Naivasha-Kisumu and Kisumu-Malaba) feasibility studies have been completed or are in advanced stages (Irandu, 2017).

Maritime transport

The cost of transporting fresh produce to Europe is the main challenge faced by Kenyan farmers and other operators in the commodity chain. Flying flowers to Europe is more costly than shipping those products by sea. If successfully developed, maritime transport can make Kenyan horticultural farmers more competitive and can improve profitability. More importantly, the cold chain can be controlled much better as shipments by sea face less handling and environmental exposure compared to air fresh. Both in terms of cost and quality, much can be gained through viable maritime transport. The port of Mombasa is the hub for sea freight of horticultural produce destined for export markets. With rather high-priced airfreight charges, most bulk produce (especially fruits and generally non- leafy vegetables) are increasingly being transported by sea.

However, few shipping lines service Mombasa Port and there is little service to European destinations from Kenya. No direct connections are currently possible, necessitating trans shipping. There are also no regular departures from Mombasa Port to destinations in Europe, Asia and North America. Delays at the Port of Mombasa have a limiting effect on exports of fresh produce. Several problems militate against efficient development of maritime transport at the Mombasa Port. On average, sea freight logistics activities at the port of Mombasa are completed within 96 to 120 hours. Moreover, current facilities at farms and forwarders are not capable of cooling and loading large volumes of flowers at temperatures close to 0°C. In addition to the above, they brought to light issues such as inadequate pre-cooling, underestimation of cold chain importance and the unavailability of packaging designed for sea freight.

Air Transport

In Kenya, about 18% of the total value of exports mainly consisting of high value fresh vegetables such as green beans, cut flowers, fruits and fresh water fish such as the Nile Perch and Tilapia destined for international markets is transported by air (KNBS, 2015). The imports consist mainly of electronic goods, pharmaceutical products and luxury items requiring quick deliveries, thus boosting airfreight. This shows that air cargo plays a leading role in the country's export and import trade. Cargo dwell times at the airport vary between 2 and 3 days, due to lengthy and cumbersome documentation procedures. This is compounded by the existence of numerous regulatory agencies with overlapping mandate, contributingto not only delays but also increases of costs for air cargo.

Estimates show that the logistics costs for horticultural produce at the Jomo Kenyatta International Airport (JKIA)[1] account for about 55% of the total export value of all the Kenyan exports (SCEA 2013). JKIA handles about 90% of airfreight in Kenya. However, the demand for air cargo is limited by cost, which is about 4-5 times that of road and 12-16 times that of marine transport.

Air cargo transport in Kenya has fluctuated in the past 10 or so years. A fire disaster happened at Jomo Kenyatta International airport in August 2013, leading to the closure of a large section for repairs. Strategic targeting of several cargos with a potential demand as export or import goods to Europe and other foreign countries by air should be considered. In addition, last-mile transport service from the airport to consumption or producing areas by truck and railway including long trip crossing borders should be properly established. Warehouse demand for the goods near the airport should be estimated and appropriate warehouse should be established around airport area.

Horticulture Supply Chains in Kenya

Smallholder horticultural farming in Kenya presents a logistical challenge due to the fragmentation of production into small individual units. Besides, farms are located far from the main rural road network. High value agricultural produce is generally grown for national and international markets; thus, it is highly dependent on efficient transport. Compounding transport challenges for the smallholder farmers include highly perishable produce and high cost of maintenance of transport infrastructure in view of heavy rainfalls received in the agricultural production areas of the country.

High value crops like fresh vegetables and cut flowers only fetch premium prices when they make it to the markets in Europe quickly and fresh. An optimal cold chain from farm to export market is an essential part of the Kenyan flower business. Oftentimes, cut flowers arrive in The Netherlands at temperatures that are too high. The cold chain starts at the farm. If the quality (including temperature) of cut flowers that feed into the supply chain is compromised, the supply chain can at best only maintain this input quality (Kangogo et al, 2013; SCEA, 2015).

Materials and methods

Data collection

A descriptive research design was used in the study. This design was selected because the researchers wished to collect information on people's attitudes and opinions as well as facts from existing reports in relation to the factors that influence freight transportation of horticultural exports in thecountry.Both primary and secondary data were collected. Primary data was collected using structured questionnaire survey. This study was conducted to establish the effect of intermodal transportation among Kenyan firms. A total of 100 Kenyan firms were selected using simple random sampling from fresh produce processing firms, distribution and logistics operators. Key informants from 5 big flower farms and 2 key officials of the Ministry of Agriculture and Irrigation (MoA&I) were selected using purposeful sampling for interviewing. Secondary data was gathered by reviewing different research outputs, manuals, policy documents, study publications and reports relevant to the study.

[1]JKIA is the biggest airport in East and Central Africa, and it is the regional aviation hub (Irandu and Rhoades, 2006b; SCEA, 2015). The airport has five cargo facilities and can handle more than 200,000 tonnes of cargo annually.

Data was analysed using descriptive techniques such as cross tabulation, charts, psychometric 5-points Likert scale and Cronbach's Alpha (α).The five categories of Likert scale response were used. These were: 1, very dissatisfied; 2, dissatisfied; 3, neutral; 4, satisfied; and 5, very satisfied. Respondents were asked to respond to each statement in terms of their own degree of agreement or disagreement. A Likert scale is a summated rating scale whereby an individual's score on the scale is a sum, or average, of the individual's responses to the multiple items on the instrument (Kerlinger, 1986).This scale was used to measure strength of opinion of selected service attributes. The means and standard deviations of the various items of the Likert scale were computed.

Cronbach's Alpha analysis was then undertaken. Cronbach's Alpha (α) was used to measure the internal consistency reliability of the questionnaire instrument used in this study. The model specification for Cronbach's Alpha(α) is:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum V_i}{V_t}\right)$$

The value obtained for Cronbach's Alpha (α) indicates the percentage of the reliable variance. An internal consistency estimate of the reliability of summated scores derived from a Likert scale requires only one administration of the instrument. Internal consistency refers to the extent to which there is cohesiveness or inter-relatedness among the responses to the multiple items comprising the Likert scale.

Results and discussion

A value of 0.96 was obtained[2] in the Cronbach's Alpha analysis. This means that 96.1% of the variance in the scores is reliable variance and about 3.9 % is error variance. This shows a very high reliability of the questionnaire instrument used in the research. The standard deviations derived from the analysis of the 5-point Likert scale were lower than the means indicating the reliability and validity of the questionnaire instrument used (Table 1).

Table 1: Responses to questionnaire items on a 5-point Likert scale

Item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Standard Deviation
Logistic firms satisfaction with tracking of cargo	2	4	8	5	1	2.95	1.023
Satisfaction of Distributers and Logistic Operators with departure time	2	4	8	4	2	3.0	1.095
Satisfaction with Documentation Process	3	2	7	1	7	3.35	1.432

Source: Authors' elaboration, 2023

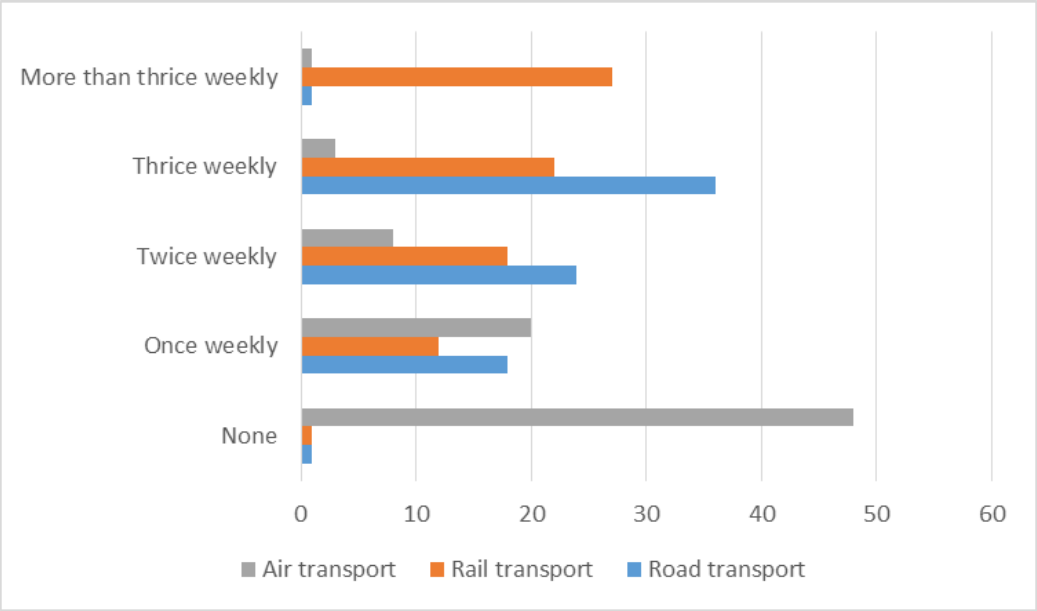
Choice of Modes of transport and extent of use in Kenya

The study sought to establish the various modes of intermodal transport used in the horticultural export trade in Kenya. The study findings reveal that several Kenyan firms utilize more than one mode of transportation to move fresh products to various overseas destinations. It is apparent from Figure 1that railroad is the mode of transport more frequently used in intermodal transport. It is used more than thrice weekly. This is mainly because it is much cheaper than other modes. Road transport is also significant as it is used at least thrice weekly. As it was mentioned above, in the last decade, the country has improved road transport in order to facilitate last mile transport of fresh freight to the overseas markets. About 42% of respondents were satisfied with documentation process (Figure 2).

Intermodal transportation has enabled most firms to reduce supply chain costs, reduce lead times, engage in cheaper global sourcing of goods and materials, reduce downtimes and maintain steady flow of goods. It has also enabled the firms to get value for money.

[2]The Cronbach's Alpha (α) varies from 0 indicating no consistency in the measurement while a value of 1.0 indicates perfect consistency in measurement. The acceptable range is between 0.70 and 0.90 or higher depending on the type of research. Generally, a Cronbach's Alpha value of 0.70 is acceptable for exploratory research such as this one.

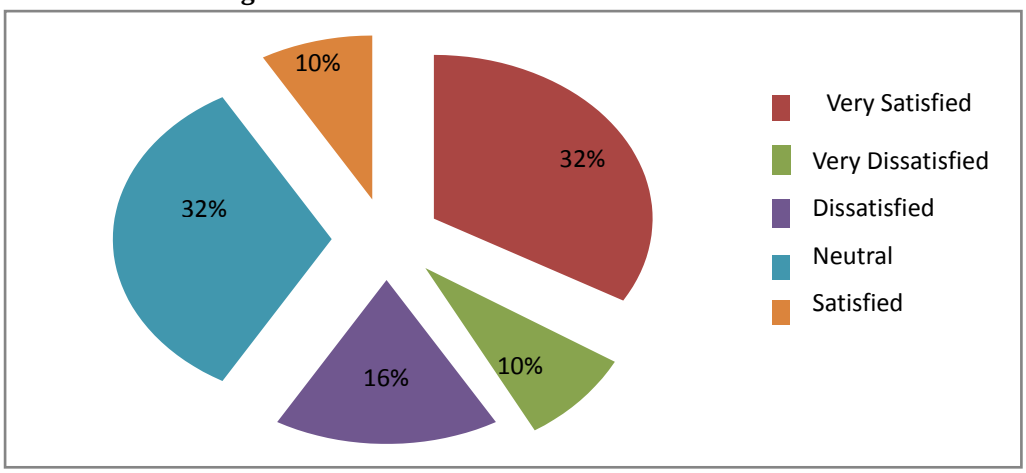
Figure 1. Frequency of use of various transport modes by surveyed firms



Source: Authors' elaboration, 2023

However, the recent snarl-ups caused by the closure of the border with Kenya by Uganda at the Busia and Malaba border have hampered seamless flow of cargo destined for landlocked countries in the Great Lakes Region. The responses for firms using road transport are shown in Table2. It reveals that road transport is popular among most operators in the horticulture industry. It is apparent from Table2 that 45% of the firms utilize road transport at least three times weekly, which is a high frequency. 30% of the firms utilize road transport at least twice weekly.Overall, about 97.5% of the firms depend largely on road for the transport of their horticultural products to various destinations, within and outside the country. This shows that there is high dependency on road transport in the country.

Fig. 2: Satisfaction with Documentation Process



Source: Authors' Elaboration, 2023

At present, road transport carries about 98.5% of freight along the Northern Corridor, a major transport artery linking Kenya and landlocked Uganda, Rwanda and Burundi (Irandu, 2017).

Table 2: Number of times road transport is used weekly

Response	Frequency	Percentage	Cumulative Percentage
None	1	1.25	1.25
Once weekly	18	22.5	23.75
Twice weekly	24	30.0	53.75
Thrice weekly	36	45.0	98.75
More than thrice weekly	1	1.25	100.0

Source: Authors' elaboration, 2023

Railroad is another important mode used for transporting fresh produce and other cargo in the country. The responses on usage of rail transport are presented in Table 3 below. It is apparent that about 84% of respondents stated that they used railroad transport about twice, thrice or more than thrice weekly. This underlines the significance of rail transport for the export of perishable/fresh produce fromKenya.

Table 3: Number of times rail transport is used weekly

Response	Frequency	Percentage	Cumulative Percentage
None	1	1.25	1.25
Once weekly	12	15.0	16.25
Twice weekly	18	22.5	38.75
Thrice weekly	22	27.5	66.25
More than thrice weekly	27	33.75	100.0

Source: Authors' elaboration, 2023

Air transport was also found to be one of the modes of transport that are used in intermodal transportation. The results on the use of air transport are presented in Table 4. The study findings reveal that only 25% of the firms in Kenya use air transport for movement of horticultural exports. The study revealed that 60% of the companies do not utilize air transport at all.

Table 4: Number of times Air transport is used weekly

Response	Frequency	Percentage	Cumulative Percentage
None	48	60	60
Once weekly	20	25	85
Twice weekly	8	10	95
Thrice weekly	3	3.75	98.75
More than thrice weekly	1	1.25	100.0

Source: Authors' elaboration, 2023

The firms indicated that the use of air transport was only favorable for those firms that deal in horticultural farming of fruits, vegetables and flowers since they are highly perishable and need to be moved faster to the markets. It was therefore established that most of the firms that rely on air transport dealing perishable products that are moved to market outside Kenya such as the European Union.

When logistic firms were asked to state whether they were satisfied with tracking of their produce from the time they left their departure point to the destination, their responses are as shown in Table 5 below. From the table, about 25% of the respondents stated that they were satisfied with tracking of cargo. About 20% of the respondents were dissatisfied with tracking and 40% of the respondents were neutral. Tracking of cargo is important to prevent tampering with it or cargo diversion.

Table 5: Satisfaction of Logistic firms with tracking cargo

Response	Frequency	Percentage (%)	Cumulative Percentage (%)
Very dissatisfied	2	10	10
Dissatisfied	4	20	30
Neutral	8	40	70
Satisfied	5	25	95
Very Satisfied	1	5	100

Source: Authors' elaboration, 2023

Challenges facing development of intermodal transport

An optimal transportation plan of perishable products needs to deal with several challenges. Twenty purposely selected logistics operators were asked to state the major challenges for the development of intermodal transport in Kenya.Their responses are summarized in Table 6. The respondents cited high airfreight costs (30%), inefficient rail transport (20%) and poor road connectivity (20%) as major challenges. Port congestion (15%) and lengthy customs procedures (15%) were also mentioned by some respondents. The results are coherent with the proposed review of literature that has shown that export of fresh produce practices in general and the implementation of multimodal freight transport system in Kenya have been hindered by various problems(Otieno, 2016; EAC, 2021, Nzomoi 2022). These problems include poor existing transport infrastructure, inefficient and ineffective freight

vehicles, and long and repetitive custom check points.

Table 6: Challenges for developing intermodal transport

Challenges	Frequency	Percentage (%)	Cumulative Percentage (%)
Port congestion	3	15	15
Inefficient rail transport	4	20	35
Poor road connectivity	4	20	55
High air freight costs	6	30	85
Lengthy Customs clearance procedures	3	15	100

Source: Authors' elaboration, 2023

Conclusions and policy implications

The study results reveal that the use of intermodal transportation by Kenyan firms has several implications on the efficiency of their supply chains. The respondents confirmed that use of intermodal transportation first and foremost enables the firms to reduce their supply chain costs. It was established that reduction of supply chain costs allows firms to drastically reduce their production and operational expenses thus offering them a competitive advantage.

The study also established that the use of intermodal transportation has made it possible for some Kenyan firms to deliver highly perishable products to foreign markets. The market for these products is mostly found in Europe and the products must get to the market still fresh. It was established that the use of both road and air transport has made it possible for the firms involved to overcome losses in their supply chains that may result due to perishability.

However, there are some issues that should be tackled by the various stakeholders involved in the horticultural export in order to make the intermodal transport of these products competitive. First, since dwell time at the JKIA was found to be long (2-3 days), there is need to speed up and simplify cargo inspection and customs clearance. There should be no duplication of functions by various regulatory agencies at the airport. Secondly, it is important to invest in enhancing the cooling warehouses at the airport in order to increase the capacity to handle fresh produce.

Moreover, the country's aircraft fleet is aging and there is need to modernize it in order to be able to handle the increasing volume of horticultural produce at the airport. In addition, traffic congestion on some of the City roads presents challenges on the last mile of the horticultural exports. Hence, there is need to ensure that access to the airport is as clear as possible so that fresh produce arrives on schedule.

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