ISSN No:-2456-2165

Road Transport Infrastructure and Agricultural Competitiveness: A Global Perspective

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Abstract:- The paper seeks to evaluate the influence of road transportation infrastructure on agricultural competitiveness. Agriculture is critical to Africa's and the world's development. Agriculture is the backbone of the African economy. Around 70% of Africans and around 80% of the continent's poor live in rural regions and rely mostly on agriculture for a living. Agriculture contributes for around 20% of Africa's GDP, 60% of its labor force, and 20% of total merchandise exports. Agriculture, among other things, is a key source of foreign currency earnings, raw materials for the global industrial sector and employment. The poverty impact of rural roads was demonstrated in Bangladesh, where greater transportation infrastructure resulted in a 2% gain in agricultural prices, a 22% increase in crop yield, and a 22% decrease in fertilizer prices. (Khandker et al, 2009). According to the study, a 10% reduction in transportation and waiting time costs could result in a 10% increase in agricultural production. The study also observed that locations sited near highways had a less impact of 10% productivity decrease than locations away from metropolitan highways in leading to a 0.5 percent increase in agricultural output. Tobacco production increased by 133 percent on average (from 7, 720 tonnes to 18, 060 tonnes), with significant changes beginning in the fifth year after road improvements. The price at the farm gate increased by $2.00 per tonne. Fieldwork, structured questionnaires, observation guides, and key informant interviews were used to acquire information on agricultural competitiveness and transportation infrastructure around the world. The data was presented in an SPSS (Statistical Package for Social Sciences) manner with a heavy emphasis on tables. Rural roads and transportation services must be enhanced to lower agricultural input costs, increase access to markets for agricultural output, and increase access to agricultural extension services.

Keywords:- *Road Transport, Transport Infrastructure; Agricultural Competitiveness, Economic Growth.*

I. INTRODUCTION

Affordable transportation is the lifeblood of modernizing the economy. efficient transportation is critical in increasing agricultural output and allow farmers to sell their products in markets. Intensive agricultural production is highly reliant on economical automobile access. In Africa, most agricultural production is created through a huge foot path of networks, community roads and tracks, with women's legs, heads, and backs serving as the primary route of transportation. Indeed, domestic transportation consumes most of a household's time. This condition puts farmers in a twofold price /costs /price squeeze, with increased farm-gate input prices and reduced farm-gate output costs. Findings revealed that efficient and effective road transport infrastructure in the Sub Saharian (SSA) Africa underlies all other initiatives to decrease poverty, enhance health and education, and assure agricultural competitiveness.

Sub-Saharian African (SSA) countries still have a poor degree of transportation infrastructure development. According to research, only around 30% of rural inhabitants have access to all-weather roads, and transportation costs are predicted to be twice as expensive as in South and East Asia. Kandiero (2009) The African Development Bank has acknowledged the importance of infrastructure investment in areas like as transportation, electricity supply, and telecommunications in promoting economic growth, eliminating poverty, and meeting the Millennium Development Goals (MDGs). (Improving road transportation infrastructure lowers production costs by lowering the cost of transporting products and services. Kiprono and Matsumoto (2014) According to Kandiero (2009), poor transportation infrastructure, high transportation costs, and missing linkages in the transportation network represent a hindrance to market integration and intra-African commerce.

According to Ogunleye et al. (2018), road transport infrastructure is the foundation of many rural and urban transportation networks. Crossley et al. (2009) highlighted to the need of providing suitable and adequate transportation networks to boost agricultural development. According to Crossley et al. (2009), transportation infrastructure is critical to agricultural growth because it ensures the availability of agriculture inputs whilst enhancing farm produce to the marketplace. Transportation acts as a major vein or as a critical link in deciding whether agricultural activities succeed or fail. Improvements to rural roads and transportation services are critical to ensuring agricultural input price reductions, improved market access for agricultural output, and improved access to agricultural extension services. (OECD, 2013; Taiwo & Kumi, 2013; Hine, 2014).

Improved road infrastructure and transportation services result in cheaper transportation costs and pricing, as well as higher agricultural productivity (Banjo et al., 2012). An enhanced and well-maintained road network is required to promote connection between collecting stations, marketplaces, and agro-industries (Chakwizira, Nhemachena & Mashiri, 2010). According to Oyatoye (1994), as stated in

Kassali et al. (2012), an increase in road condition in Nigeria helps farmers to realize lower marketing expenses and earn a higher price for their agricultural output. This is consistent with the findings of Ogbeide and Ele (2015), who asserted that road transportation infrastructure is a vital link in guaranteeing the smooth and effective allocation of national resources by offering efficient modes of commuting and freight transportation. In Pakistan, transportation's GDP contribution is stated alongside that of the telecommunications industry. (2018) (Ogunleye et al.).

Road transportation infrastructure also improves access to larger markets and reduces losses and delays in transporting farm commodities. Ikejiofor and Ali (2014) When agricultural products arrive at the market on time, in good condition, and at a cheap transport cost, the scenario benefits the farmers (Ikejiofor & Ali, 2014). Improved transportation facilitates the spread of new technologies and techniques. (2012) (Banjo et al.). Road transportation infrastructure supports more than just agriculture. It also contributes to improved access to public facilities and social amenities, less isolation and enhanced mobility, (Ikejiofor & Ali, 2014).Despite the enhanced road transport infrastructural developments, there are other essential factors which are key to agricultural competitiveness in rural areas hence there will be poverty reduction in rural areas (Chakwizira et al. 2010).

Road infrastructure investment, on the other hand, should ideally complement other rural development programs of innovation, such as irrigation system enhancement, vocational training, post-harvest storage technologies, financial support, and extension services. Little is known about the extent to which agricultural productivity improves because of improvements in transportation infrastructure and service. As a result, this article examines and experimentally quantifies the influence of increased road transport infrastructure for accessibility on agricultural productivity of global smallholder farmers, with an emphasis on Zimbabwean smallholder farmers.The purpose of this article is to investigate the link between agricultural product transport costs and smallholder tobacco growers' agricultural output. The report also demonstrates the potential improvement in agricultural output that may be realized if transportation costs are lowered. This is consistent with (Fuller et al., 2001), who agrees that improved transportation infrastructure improves agricultural competitiveness.

A. Overview of Agricultural Competitiveness

➢ *Measuring Agricultural Competitiveness*

A multitude of indicators may be used to define a country's agricultural competitiveness, such as unit prices, export levels, market-based product levels, private investment in the agricultural sector, yield levels, value addition levels, labor, and other productivity characteristics.

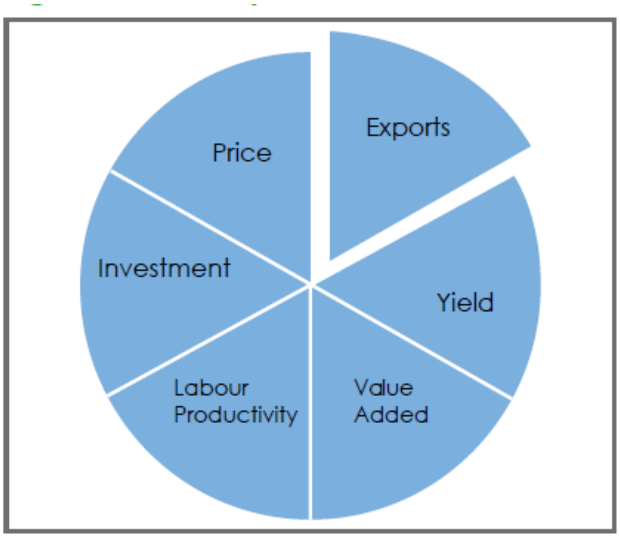

Fig 1: Important Indicators of Agricultural Competitiveness
Source: Research data (2021)

A country is considered competitive in that commodity or sector if it can command high prices for its agricultural commodities while maintaining or expanding its market share in that commodity on the global market. Similarly, high levels of domestic and foreign investment, high or growing returns, and sustained high factor productivity are indicators of competitiveness. It is critical to consider several indicators rather than making policy strategy/investment decisions based on a single indication.

➢ *Recognizing Agricultural Competitiveness*

The focus of an economy is on finding ways to correctly harness the benefit of actual competitiveness drivers such as private sector investment and entrepreneurship, while minimizing concessions that reduce their impact by raising costs or increasing risk, for example improving producers' value chain, improved product quality, contribution to meeting market requirements; improving producers' a and reliability; removing unnecessary risks; and increasing operational profitability are among these factors. Profitability is, of course, the essential to long-term agriculture, as it is to any economic endeavor. In a value chain, each actor's actions, as well as the overall value chain operations, must be profitable. A stable macroeconomic climate, the availability of high-quality infrastructure, and high-quality services based on that infrastructure at a reasonable cost are all enabling factors. They will not drive competitiveness on their own, but will instead lay the groundwork for competitiveness and the commercial activities that produce competitiveness. Similarly, the availability of talents, research facilities, and effective institutions serves as a facilitator and component of the competitiveness platform.

B. Research Objectives

The objectives guiding this research are:

- Establish the effect of quality of roads on agricultural competitiveness.
- Determine the effect of road connectivity on agricultural competitiveness.
- Evaluate the effect of transport costs on agricultural competitiveness.

II. LITERATURE REVIEW

A. Effect of road quality on agricultural competitiveness.

The kind of road surface, paved or unpaved, was used to assess road condition and to create a link with transportation costs. The length of unpaved, paved and gravel roads for trips was established basing on information obtained from road authorities, and the trip distance proportion that the truck traverses on paved sections of the road was stated and utilized to classify paved and unpaved journeys. Improvements to low-volume rural road infrastructure may result in longer journey times, higher vehicle utilization, and the use of larger vehicle sizes (Lancon et al,. 2014. Headicar, 2009). Improved rural routes make it possible for traffic from metropolitan areas with larger markets to reach out to remote areas. (Lançon *et al*., 2014).

Finally, the effect of road condition and distance traveled on transportation costs was studied. However, in this case, the pavement type was not used as a measure of road quality since the surface type alone does not provide an adequate explanation of the road condition. The surface type does not give surface roughness or other pavement or traffic information. Instead, the vehicle operating cost (VOC) was used since there is a well-established relationship between VOC and road condition. (Hide et al., 1975; Watanatada et al., 1987; Bennett & Greenwood, 2001; Archondo-Callao, 2004). VOC has both variable and fixed costs, and the state of the road, among other things, influences these expenses.

B. Effect of road connectivity on agricultural competitiveness.

Transport networks connect producers to markets and provide access to social and administrative services. By reducing travel time, accident costs, and transportation costs, an efficient transportation system promotes economic growth (Button, 2010). Transportation expenditures may result in lower commodity prices and higher output in the long run. Rural transportation networks and operations are particularly important for rural development and the agricultural sector because they provide rural residents with access to farm inputs (fertilizers, herbicides/pesticides, and improved seeds), outputs (agricultural produce), and other socioeconomic activities. Increased accessibility may result in increased agricultural product output. Agricultural development is a critical stage in the economic transformation and success of many African countries (Gajigo and Lukoma, 2011). Traditional road economic evaluation techniques such as the Highway Development and Management tool (HDM-4) and the Roads Economic Decision tool (RED) are used to capture the economic impact of rural road repair projects. These calculators compute the savings of the suggested alternative over the base or default situation. Savings include, among other things, lower car running expenses, shorter travel times, and lower accident costs, i.e., the direct advantages. A rural road improvement project is successful if the savings outweigh the costs of constructing and maintaining the new alternative. The approach adopted is known as the consumer surplus approach since the savings flow to the road user or "consumer" of the road. Farmers and agricultural commodity producers are expected to benefit from lower costs of transportation as a result of lower tariffs or transport pricing.

Transport prices, fees, or tariffs are the charges levied by a transportation company or operator on the end user. Transportation charges typically include several transportation cost components as well as a profit margin. Transport costs encompass all expenditure associated by a transport service when delivering freight or passengers, including overhead costs and vehicle operating costs (VOC) (Teravaninthorn & Raballand, 2009; Hine, 2014). (Teravaninthorn & Raballand, 2009; Hine, 2014). Bennett and Greenwood (2001) make no distinction between transportation costs and VOC, instead incorporating overhead expenses into VOC. As a result, the terms transportation cost and VOC are used interchangeably in this study. However, the term transportation cost used in this study should not be confused with the term total transportation cost, which includes road construction and maintenance costs as well as road user fees. Sezer, & Abasiz, (2017).

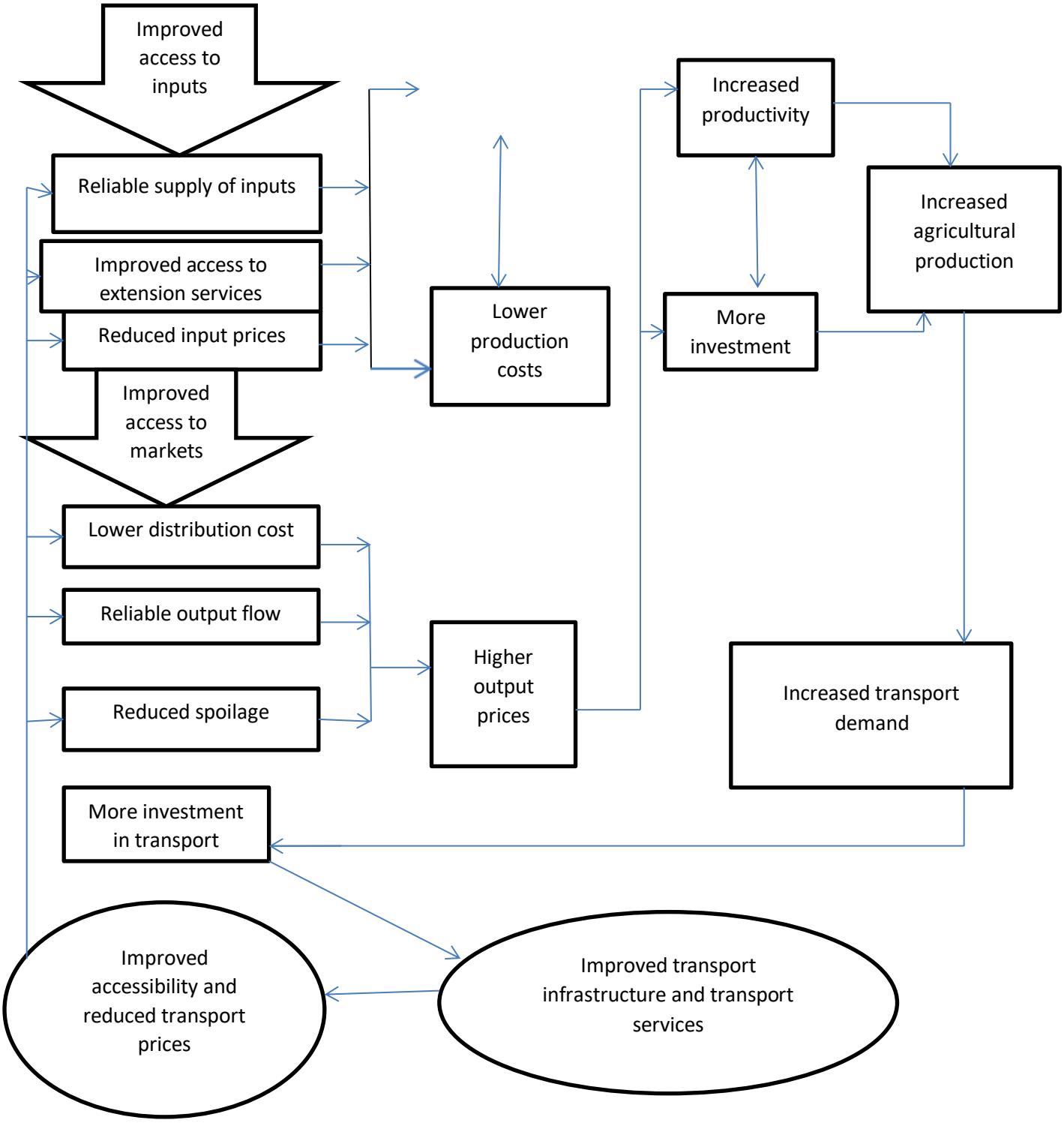

Fig 2: Implications of road transport infrastructure
Source: Research data (2021)

C. Effect of transport costs on agricultural competitiveness.

Among others, the agricultural community is expected to benefit from lower transportation costs, which will be reflected in higher farm produce prices due to lower distribution costs and lower production costs due to lower agricultural input prices. As a result, farmers' net income and crop yield may increase. This circumstance is expected to benefit the agricultural community. If transportation prices do not reflect transportation costs following a road repair, the economic evaluation may exaggerate the benefits to the agricultural community and, as a result, the benefits to economic development. Because road conditions have a direct and significant impact on transportation costs, upgrading and improving rural roads results in lower vehicle operating costs. (Kerali, 2003; Archondo-Callao, 2004). Unsurprisingly, a considerable proportion of studies have been done to determine the link between highway

construction and transportation cost reduction. (Kerali et al., 2006).

The agricultural community, among others, is projected to profit from the decrease in transportation costs, which will be reflected in higher farm produce prices due to lower distribution costs and lower production costs due to lower agricultural input prices. As a result, farmers' net income may grow, as will crop output; this circumstance is projected to boost the agricultural community's well-being. Tamene, & Megento, (2017).

III. STUDY AREA

The study was conducted in Zimbabwe, a developing country in Sub-Saharan Africa with a population of 13 million people in 2018. It is mostly an agrarian economy, backed by a few manufacturing enterprises and a wide range of service providers, primarily from the tourism, telecommunications, and public sectors. The Northern region was studied, which is made up of two provinces: Mashonaland West and Mashonaland Central. These are agrarian provinces, with agriculture playing an important role in economic and social development by providing jobs, adequate and inexpensive food, and helping to poverty reduction (Musemwa, 2011). The Provinces, which cover an area of 58 600m2 and have a population of 1 152 520 people, account for 8.23 percent of Zimbabwe's total population (ZIMSTAT, 2014b).

IV. METHODOLOGY

A cross-sectional survey approach was used for the investigation. A research design is described as a strategy that defines the techniques and processes for data collection and analysis (Zikmund, 2018). Similarly, Easterby-Smith, Thorpe, Jackson, and Jaspersen (2018) observed that a research design organizes research activities in terms of how data collecting methods might aid in the achievement of study objectives. Because qualitative and quantitative approaches alone were insufficient to completely comprehend the research topic, the mixed-method approach was deemed the optimal option for the study. The current study was able to explore the research objectives utilizing either qualitative or quantitative methodologies because of this methodological triangulation. (Carter et al., 2014; McHugh, 2014) In this investigation, both probability and non-probability sampling were employed. The study included stratified, convenience, and purposive sampling. Convenience and stratified sampling were used to pick 384 homes from a total of 530 668 in the Harare Metropolitan Region. According to Rahi (2017), stratified sampling is a probability sampling approach in which each stratum or subgroup has an equal chance of being chosen. The researcher collected data from all residential districts in the Harare Metropolitan Region using a household survey. Structured questionnaires and interviews were utilized to collect data for the study. Respondents and interviews were given plenty of time to prepare for and complete the questionnaires. SPSS was used to analyze the coded data, and ANOVA was performed to examine the degree of significance of the factors on the dependent variable (depreciation, vehicle age, vehicle usage, laws, maintenance expenses, and labor) at 95 percent confidence and 5 percent significance. In each discipline, information presentation and examination play a critical role.

V. FINDINGS

The paper's conclusions were summarized using the regression model results and Pearson's correlation results. The graph depicts the link between crop yield, transport cost, and distance factors.

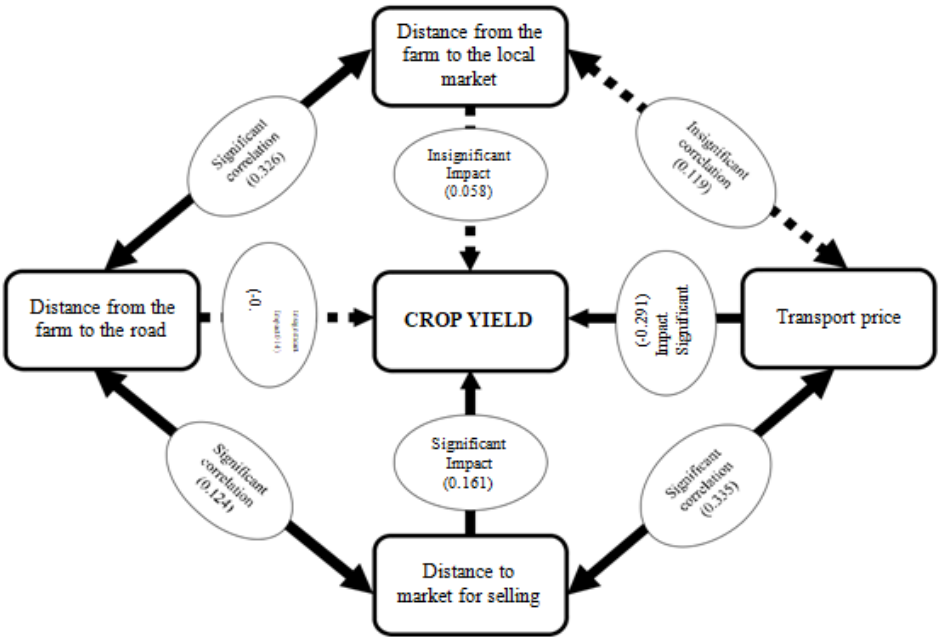

Fig 3: Crop yield relationship with transport services and road infrastructure.
Source: Research data (2021)

A reduction in the cost of transporting agricultural products boosts agricultural productivity. This influence has an elasticity of -0.291, which means that a one-percentage-point decrease in transport costs raises agricultural output by 0.2901 percent. This anticipated change is consistent with the findings of Hine and Ellis (2001), who estimate that a 1% reduction in transportation costs, fully passed on to farmers, will increase agricultural output by 0.3%. Investing in road infrastructure to reduce transportation costs and prices would be extremely beneficial to the agricultural industry. Samuel, (2018). This study also discovered that farmers who sell their products in a more distant market have higher crop yields than farmers who sell in a nearby (local) market. This could be due to the fact that people who sell in a distant market have access to goods and services that are not always available locally. They have a better chance of getting agricultural supplies and advice from extension agents and others they meet in a distant market. Samuel, (2018). The lack of effect of distance from farm to local market on crop output suggests that the local market does not supply enough goods and services to support agricultural yield increases. Again, producers who sell their products in a more distant (and potentially larger) market benefit from higher crop prices and lower unit transportation costs. The low unit transport price is attributed to factors such as efficient modes of transportation, distance economy, and travel on superior (secondary) routes that connect to larger markets. Improving farmers' access to larger markets may benefit them and, as a result, increase agricultural output. Tamene, & Megento, (2017).

VI. DISCUSSION

The findings indicate that road transportation infrastructure has a significant beneficial impact on rural agriculture as a result of the reality of improving many links to non-farm sectors of an economy. Tamene, & Megento, (2017). The researcher inquired further about the impact of road infrastructure on the ease of access to labor in the region. This was consistent with Gollin's (2012) observation that roads in rural villages are in poor condition and rural connectivity is extremely low. According to the research, the average farm distance from the community to the major road or nearest market was around 45 kilometers.

VII. CONCLUSION AND RECOMMENDATIONS

The essential subjects presented in this chapter were a scholarly perspective on the role of road transport infrastructure in the conveyance of agricultural goods to local markets, logistical obstacles, the factors driving road transport infrastructure, and its repercussions. Transport price reduction and improved access to urban markets lead to a substantial increase in crop production. This increase, that is the wider agricultural benefit, is much more significant than the total road user cost savings from the few vehicles traversing rural roads. Poor rural transport infrastructure and transport services are partly to blame for the under utilisation of agricultural potential In Zimbabwe, among others like Tanzania, the key problems facing farmers in marketing their products include prices at the open market being too low (67%); transport prices being too high (5%); the marketplace being too far (4.4%); and lack of transport (3%) (Tanzania National Bureau of Statistics, 2012a). These problems hinder the small-scale farmers from selling their crops which also affect crop production. To a large extent, these problems are related to the poor quality of rural transport infrastructure and transport services. Addressing the rural transport issue may reduce these problems and improve agricultural production.

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