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Transportation and Trade: The Impact on Agricultural Marketing and Food Security

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Abstract

Transportation and trade are vital in shaping agricultural marketing and food security, particularly in developing and agrarian economies. Efficient transportation networks enable the timely movement of agricultural produce from farms to markets, reducing post-harvest losses and enhancing the freshness and quality of food. Simultaneously, trade, both domestic and international, facilitates the distribution of food across regions, ensuring that surplus-producing areas can support deficit regions. The relationship between transportation and trade directly impacts food availability, pricing, and accessibility, all of which are crucial dimensions of food security. However, inadequate infrastructure, high transportation costs, and trade barriers can severely hamper market access for farmers, especially smallholders. These limitations often result in gluts in local markets and food shortages elsewhere, distorting supply chains and undermining food security. Furthermore, the lack of reliable transport systems can isolate rural producers from profitable markets, limiting their income potential and reducing incentives for agricultural investment and productivity. On the other hand, improved transportation and liberalized trade policies can expand market reach, lower food prices through competition, and stabilize food supplies across seasons and regions. They also encourage private sector participation and foster innovation in food logistics and storage. We explored link and interdependencies between transportation, trade, agricultural marketing, and food security. We emphasized the need for integrated policy frameworks that invest in rural infrastructure, streamline trade logistics, and support inclusive market access. Strengthening these components is essential for building resilient food systems and achieving long-term food security goals.

Keywords: Transportation and Trade, Agricultural Marketing and Food Security

Introduction

Transportation is defined as the movement of people, goods and commodities from one place to another either by land, water or air. Transportation is a critical aspect of modern societies, facilitating the movement of goods, people, and information. According to Levinson and Krizek [1], the efficiency and accessibility of transportation systems play a pivotal role in shaping

urban development and influencing economic activities. Moreover, advancements in technology have led to the emergence of innovative transportation solutions, such as ride-sharing platforms and autonomous vehicles [2].

Transportation is a multifaceted and integral concept that encompasses the systematic movement of people, goods, and information from one location to another. Rooted in the fundamental human need for mobility and connectivity, transportation serves as the backbone of societal and economic activities, facilitating trade, cultural exchange, and the overall functioning of communities.

At its core, transportation involves the physical transfer of entities, whether tangible goods or individuals, across various distances and spatial scales. This movement can occur within local environments, such as city streets and rural roads, or extend to regional, national, and international levels through more extensive networks like highways, railways, air routes, and maritime lanes.

One primary objective of transportation is to bridge geographical gaps, connecting disparate locations and enabling the exchange of resources, ideas, and cultures. It serves as a catalyst for economic development by facilitating the movement of raw materials, finished products, and labor between production centers and consumption areas. This movement contributes to the creation of integrated and interdependent networks that form the basis of global trade and commerce [Figs 1 and 2].

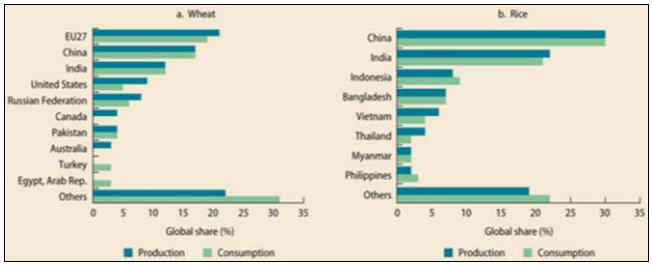

Fig 1: Using Trade Policy to Overcome Food Insecurity in: Global Monitoring Report

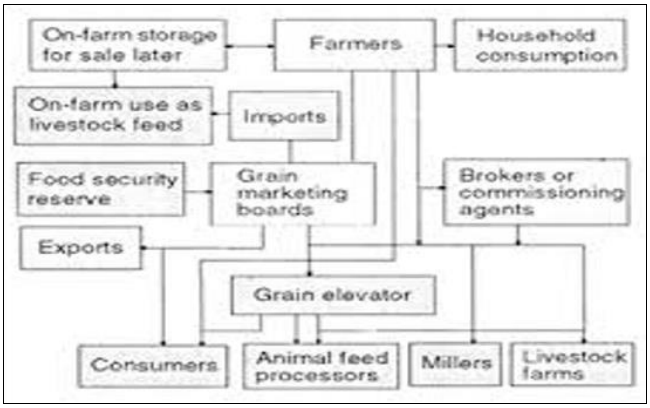

Fig 2: Agricultural and food marketing management

Transportation is not limited to the physical act of moving entities; it also encompasses the infrastructure, systems, and technologies that support and govern these movements. Infrastructure includes road networks, bridges, ports, airports, railways, and pipelines, while transportation systems involve the organized coordination of various modes to optimize efficiency and accessibility.

Technological advancements have played a pivotal role in transforming transportation. Innovations such as electric vehicles, autonomous transportation, and digital platforms for real-time tracking have reshaped traditional modes of movement. These advancements aim to enhance safety, reduce environmental impact, and increase the overall efficiency of transportation systems.

In addition to its economic significance, transportation plays a crucial role in shaping the social and cultural dynamics of societies. It facilitates human interaction, allowing individuals to explore new environments, experience different cultures, and build connections across geographic boundaries. Moreover, transportation contributes to the accessibility of education, healthcare, and employment opportunities, fostering societal well-being and inclusivity.

Transportation is a comprehensive concept that goes beyond the mere act of moving entities. It encompasses the infrastructure, systems, and technologies that support movement, serving as a cornerstone for societal development, economic prosperity, and the interconnectedness of our globalized world. As a dynamic and evolving field, transportation continues to adapt to technological innovations, environmental considerations, and the evolving needs of societies worldwide [3].

Modes of Transportation

Modes of transportation refer to distinct systems or methods used to move people, goods, or information from one place to another. This include the following:

Land Transportation System

Land transportation, a fundamental component of the broader transportation network, encompasses various modes of movement on the Earth's surface [4]. This includes road transportation and railways each playing a crucial role in facilitating the movement of people and goods.

Types of Land Transportation

Road Transportation:

Road transportation is a mode of transportation involving the movement of goods and individuals from one location to another via road networks [5]. It encompasses various vehicles such as cars, trucks, and buses, serving as a critical component in the global transportation system, road transport network is a route between two destinations, which has either been paved or worked on to enable transportation by way of motorised and non-motorised carriages. Road transport can be classified as transporting both goods and materials or transporting people. Most at times, this means of transport helps in the delivery of goods between cities, towns and small villages. Despite all the advantages that the road transport has over other means of transport, goods and services turn to get bad on way because of the mode of transportation. The mode of road transportation includes; bicycle, automobiles, or animals such as horse or oxen. These various modes helps to facilitate movement and carrying of agricultural produce to the various destinations.

With road transport network, raw materials are carried to the factory for processing, while the finished goods are delivered to the wholesalers, retailers and the final consumers. Imagine how distribution of agricultural products and business activities would look like without transportation systems, which enables long distance to be reached in a short time. Distribution of agricultural products between town, state and nations is made easy and smooth because of road transport system.

The integration of smart technologies in road transportation systems, such as Intelligent Transportation Systems (ITS), can enhance the efficiency of transporting agricultural products. Real-time data analytics and smart traffic management systems can optimize routes, reduce transit times, and minimize delays, ensuring that perishable agricultural goods reach their destinations in optimal conditions [5].

The rise of electric vehicles (EVs) is particularly relevant to the agricultural sector, as it aligns with the growing emphasis on sustainable and eco-friendly transportation. Electric trucks and vans are increasingly being used for the transportation of agricultural products, contributing to reduced carbon emissions and addressing environmental concerns associated with traditional fuel-based transportation International Energy Agency (2023).

Rail Transportation

Is a means of transport that transfers passengers and goods on wheeled vehicles running on rails, which are incorporated in tracks. Rail transport is one of the oldest means of transportation which uses rail systems for the transport of passengers and goods. It includes passenger trains, freight trains, rapid transit etc.

The latest developments in rail transportation focus on enhancing speed, efficiency, and sustainability. High-speed rail projects are underway in various countries, with advancements in rail technologies enabling faster and more reliable connections between major cities [6].

In terms of sustainability, railways are considered more environmentally friendly than certain other modes of transportation. Electric and hybrid locomotives, powered by renewable energy sources, contribute to reducing carbon emissions in the rail sector. Additionally, innovations in rail logistics and the adoption of digital technologies improve the overall efficiency of freight transportation via railways.

Water Transportation

Water transportation involves the movement of goods and passengers across oceans, seas, rivers, and lakes using various vessels. Cargo ships, container ships, and tankers play a crucial role in global trade, facilitating the transportation of bulk commodities. Passenger ships, ferries, and boats provide essential connectivity for both short-distance and long-distance travel. Water transportation is cost-effective, environmentally friendly, and vital for international trade, contributing significantly to the global economy [7-9].

Air Transportation

Air transportation is characterized by the use of aircraft to transport people and cargo swiftly across vast distances. Commercial airlines operate passenger flights, connecting cities globally, while cargo planes facilitate the rapid transport of goods. Air transportation is known for its speed and efficiency, making it essential for time-sensitive shipments and international travel. Despite its environmental impact, ongoing technological advancements aim to improve fuel efficiency and reduce emissions, aligning with sustainability goals in the aviation industry [5].

Marketing of Agricultural Products

Marketing of Agricultural products means the flow of products of the soil, stock farming, fisheries and products of first-stage processing directly to the consumers or users [10]. However, the primary role of marketing system is to add to form, place, time and possession utility, so that the subjective satisfaction of the consumer is maximised and return to the producer is assured. If agricultural marketing consist of these business activities, they go into making the products reaching the hands of the final consumer and at the same time, satisfying the interest of the farmers. Furthermore, marketing efficiency can be defined as the movement of goods and services (agricultural products) to consumer at the right time and place with lowest possible marketing cost consisting the interest of the producer.

From the definitions above, marketing of agricultural products involves the cultivation of soil; planting, raising, harvesting and making the crops available to the consumers. It also involves the rearing; feeding, and managing animals, which can be used for human consumption and for further production. The process of marketing of the agricultural products cannot be with examined without looking at the challenges or the factors affecting this sector. They include; the road infrastructure, prices of the crops, access to marketing information, educational level, farm size and access to storage. All these factors will go a long way to improve the selling of the farm produce.

Positive Effects of Transportation on Marketing of Agricultural Products

Market Accessibility

Efficient transportation systems improves the accessibility of agricultural products to diverse markets. Farmers can reach local, regional, and international consumers, expanding their customer base and increasing sales opportunities.

Reduced Post-Harvest Losses

Timely and reliable transportation minimizes post-harvest losses by ensuring that agricultural products reach markets quickly. Proper handling and refrigeration during transit contribute to preserving product freshness, reducing spoilage, and minimizing waste.

Market Timing and Seasonal Variations

Transportation allows farmers to strategically time their market deliveries, aligning with peak demand periods. This ensures that agricultural products are available when consumers demand them the most, maximizing profitability for farmers.

Diversification of Markets

Effective transportation supports market diversification, enabling farmers to explore various markets based on factors such as price, demand, and consumer preferences. Diversification enhances resilience to market fluctuations and provides options for selling products at competitive prices.

Negative Effects of Transportation on Marketing of Agricultural Products

Environmental Impact

Traditional transportation methods, often reliant on fossil fuels, contribute to environmental degradation. Emissions from vehicles and transportation activities can lead to air pollution and contribute to climate change, raising sustainability concerns.

High Transportation Costs
High transportation costs can negatively impact the economic viability of agricultural products. Farmers may struggle to cover transportation expenses, leading to reduced profitability, particularly for small-scale farmers.

Infrastructure Limitations
Inadequate transportation infrastructure, such as poor roads and insufficient storage facilities, can lead to delays, inefficiencies, and increased transportation costs. These limitations may hinder farmers' ability to reach markets or transport products efficiently.

Risks to Product Quality
Inadequate transportation conditions, such as poor handling practices or insufficient refrigeration, can pose risks to the quality and safety of agricultural products. This may impact consumer satisfaction and market reputation

Factors that Determine the Choice of Transport
1. **Nature of goods:** Rail transport is most suitable for carrying cheap, bulky and heavy goods. Perishable goods require quick delivery may be carried through motor transport or air transport, keeping in mind the cost and distance.
2. **Speed:** Perishable products need to reach consumer quickly. Air transport is the quickest mode of transport but it is very expensive. Motor transport is quicker than railways over short distance.
3. **Handling:** Sometimes goods are rough handled while transporting them. You need to select a particular mode of transport to be sure your product can withstand it.
4. **Cost of service:** The cost of transportation adds to the cost of goods. Rail transport is cheaper mode for carrying heavy loads over long distances e.g trains.
5. **Safety:** Safety and security of goods in transit also influence the choice of a suitable means of transport. Motor transport losses are less than railways.

Challenges in Transportation and Marketing of Agricultural Products
The transportation and marketing of agricultural products constitute a complex system crucial for linking farmers to consumers. While this system is vital for the global food supply chain, it faces various challenges that can impact the efficiency and effectiveness of agricultural marketing. The challenges and solution includes the followings:
Infrastructure Limitations
In many regions, inadequate transportation infrastructure poses a significant challenge. Poor road networks, limited storage facilities, and insufficient cold chain infrastructure can lead to delays, losses, and reduced product quality during transit [11].
Seasonal Variations and Perishability: Agricultural products are often subject to seasonal variations in production, leading to surpluses during harvest seasons and shortages in off-seasons. Perishable products, in particular, face challenges related to maintaining quality and preventing spoilage during transportation [12].

Market Access and Connectivity
Many farmers, especially in remote areas, face difficulties accessing broader markets due to inadequate transportation links. Limited connectivity hampers their ability to reach diverse consumer bases, affecting the profitability of their products [13].

Economic Viability
High transportation costs can erode the economic viability of agricultural products, particularly for small-scale farmers. The lack of cost-effective transportation solutions can limit the competitiveness of products in the market [14].

Environmental Impact
Traditional transportation methods, often reliant on fossil fuels, contribute to environmental degradation and carbon emissions. The environmental impact of transportation raises concerns regarding sustainability and contributes to climate change [15].

Relationship between Transportation and Agriculture
Transportation plays a pivotal role in the agricultural sector, influencing various aspects of production, distribution, and market access. The integration of efficient transportation systems is essential for ensuring the success and sustainability of agricultural practices. According to Schipmann *et al*. [16], the relationship between transportation and agriculture is multifaceted, impacting both the economic viability of farming operations and the overall food supply chain.
Efficient transportation networks are crucial for connecting agricultural producers to markets, enabling the timely and cost-effective movement of goods. This connectivity is essential for farmers to reach broader consumer bases, reduce post-harvest losses, and optimize the distribution of their products. Additionally, transportation influences the accessibility of inputs such as seeds, fertilizers, and machinery, contributing to the overall productivity of agricultural activities.
The study by Schipmann *et al*. [16] emphasizes the significance of transportation in enhancing market access, welfare, and nutrition. Improving transportation infrastructure positively correlates with increased market participation, better income opportunities for farmers, and improved access to diverse and nutritious food options. This interconnected relationship underscores the critical role of transportation in shaping the economic and nutritional aspects of agriculture.

Role of Transportation in the Marketing of Agricultural Products
Transportation plays a pivotal role in the marketing of agricultural products, serving as a critical link between producers and consumers. The efficient movement of goods from farms to markets is essential for ensuring product availability, reducing post-harvest losses, and meeting consumer demand. The multifaceted role of transportation in the marketing of agricultural products encompasses various aspects that contribute to the success of the agri-food supply chain.

Accessibility to Markets
Transportation facilitates the accessibility of agricultural products to a broader range of markets. It enables farmers to reach not only local consumers but also regional, national, and even international markets. This expanded market reach provides farmers with diverse selling opportunities and helps in maximizing their market potential.

Reducing Post-Harvest Losses

Efficient transportation ensures the timely delivery of agricultural products from the farm to the market. This is crucial in minimizing post-harvest losses, especially for perishable goods. Quick and reliable transportation methods help maintain the freshness and quality of products, preventing spoilage and waste.

Market Timing and Seasonal Variations

Transportation allows farmers to strategically time their product deliveries to align with market demand. This is particularly important for seasonal products where timely transportation ensures products reach the market when demand is high. Proper coordination helps farmers capitalize on favorable market conditions.

Supply Chain Coordination

Transportation plays a crucial role in coordinating the various components of the supply chain. Effective coordination between producers, distributors, and retailers is essential for seamless product flow. Transportation facilitates collaboration among stakeholders to optimize supply chain efficiency.

Agricultural marketing

Agricultural marketing, a critical component of the agri-food supply chain, is undergoing significant transformations in response to evolving consumer preferences, technological advancements, and global market dynamics. This intricate process involves the strategic promotion, distribution, and sale of agricultural products, posing both challenges and opportunities for farmers.

Challenges persist in agricultural marketing, notably in terms of limited market access. Factors such as inadequate transportation infrastructure and fragmented supply chains hinder the ability of farmers, particularly in developing regions, to connect with broader consumer bases [16]. Price volatility, influenced by weather conditions, trade policies, and global economic trends, adds complexity to the planning and income stability of farmers. Additionally, changing consumer preferences, driven by a growing demand for sustainable and locally sourced products, present challenges for traditional marketing approaches.

However, amidst these challenges, innovative strategies and opportunities are reshaping agricultural marketing. The digital transformation is a cornerstone, empowering farmers to establish their brand presence and provide transparent information about their products through online platforms, e-commerce, and digital marketing tools [17]. Sustainability practices are gaining prominence, with consumers increasingly inclined towards products that adhere to environmental and social responsibility. Farmers adopting sustainable practices can leverage this trend to differentiate their products in the market [18, 19].

Theoretical Framework

Three prominent theories were used to underpin the study, they were as follow:

Von Thunen's Location Theory, Sinclair's Theory, Olof Jonasson's Theory.

Von Thunen's Location Theory

The analysis of land use patterns has long been one of geography's basic concepts. At first, it might appear as if agricultural land use is little affected by relative location, ones the factor suitable market has been acknowledged. Indeed, the farmer thus adapt his land use to site conditions, climate, land forms and soils. However, the effects of the market situation cannot be disposed of as easily as all that. Johann Heinrich Von Thunen (1983- 1850), a German economist and estate owner of the early 19 century, develop a theory of agricultural location that is still well considering.

This model is based on an econometric analysis of his estate in Meckleburg, near Rostock in Germany. Most of the data used in explaining his theory were obtained by him through practical experience. He attempted to construct a theoretical model of land use pattern, given a particular arrangement of towns and villages in a situation experienced in Meckleburg. The main aim of Von Thonon's analysis was to show how and why agricultural land use varies with the distance from a market.

Two basic model of Von Thonon's

- The intensity of production of a particular crop declines with the distance from the market. Intensity of production is a measure of the amount of inputs per unit area of land; for example, the higher the amount of money, labour and fertilizers etc. that are used, the greater the intensity of agricultural production.
- The type of land used will vary with the distance from the market. The Von Thonon's location theory or model states that if environmental variables are held constant, then the farm product that achieve the highest profit will out bid all other products in the competition for location. The competitive position of a crop or lives stock activity (namely, how high the bidding needs go to secure a desirable site) will depend on the level of return anticipated from producing at the particular location. A product with a high expected return and therefore, high rent-paying ability will be able to outbid a product with a lower profit level and, therefore, a relatively modest rent-bid ceiling. By carefully compiling economic data on different farming activities on his own large estate Tellow in North-Eastern Germany, Von Thunen was able determine the relative rent –paying abilities of each major agricultural product. Of course, the technology and agricultural product he managed in the early 19 century were different from those of today. But there are sufficient similarities to allow the analysis to be updated for our purpose. Moreover, his explanation was truly general allowing his explanation approach to be applied to most contemporary agricultural situation. Following Von Thunen's reasoning, the ranking of agricultural activities on the basis of rent-paying abilities in a decreasing order are as follows.

Hierarchy of Agricultural Crops

1. Truck farming (fruits and vegetables)
2. Dairying
3. Mixed cropping and livestock farming (corn bear agriculture)
4. Wed farming and Ranching (yearlings often sold to feedlots of mixed crops and livestock).

Von Thunen's theory is based on certain assumptions. These are as follows:

- There is an, "isolated state" (as Von Thunen called his economy), consisting of 1 market city and its agricultural hinterland.

- This city is the market for surplus products from the hinterland and receives products from no other areas.
- The hinterland ships its surpluses to no other market except the city.
- There is a homogenous physical environment including a union playing around the city.
- The three hinterland is inhabited by farmers who wish to maximise their profits, and who adjust automatically to the market`s demands.
- There is only one mode of transport. That is, the horse and wagon (as that was in 1826).
- Transportation cost are directly proportional to distance, and are boned entirely by the farmers, who ship all products in a fresh state.

Von Thonon's model examines the location of several crops in relation to the market. The location of crops according to him is determine by:

1. The market prices
2. Transport cost,
3. The yield per hectare

The model compares the relationships between production cost, the market price, and the transport cost of an agricultural commodity and is expressed as follows:

R = Y(p-c) – Yfm

R = Rent per unit of land. Y = Yield per unit of land. p = market price per unit of yield.

c = Average production costs per unit of yield.

m = Distance from the market (in kilometers or miles).

f = Freight rate per unit of yield and unit of distance.

The transport cost varies with the bulk and perishability of the product. The crop with the highest locational rent for the unit of land will always be grown, since, it gives the greatest returns and all farmers attempt to maximise their profits. Two crops may have the same production cost and yields but different in transport cost (per ton/ km) and market prices influence the decision making of the farmers. If commodity A is more costly to transport per ton/km and it has a higher market price, A will be grown closer to the market than B. the locational rent of A decreases more rapidly than that of B, because of A"s higher transport cost. As the market price of A is greater than B, the total revenue is higher at the market for A than B. Thus, the market of the locational rent of A is greater than B, because production costs are the same and no transport cost are inquired. If the market price of B was greater than that of A, A would be grown at all. In his model Von Thunen has explained three stages of the growth of agricultural land scape in an isolated state.

Sinclair's Theory

Sinclair in 1967 has suggested an alternative land use pattern. Basically, his thoughts were based on Von Thunen theory, but he inverted Von Thunen model of anticipated urban encroachment distance relationship. Robert Sinclair dictated some interesting effects on production in the inner most agricultural land in the path of metropolitan encroachment. Spreading urbanisation appears to influence agriculture several miles and advance the building-up of frontiers because farmers realise they cannot compete against the coming on much-higher location rent earned by urban land uses. Thus, metropolitan expansion is perceived as displacement threat in the affected inner rural zone and this is reflected in the spatial behaviours of farmers. Those close to the urban frontier feel most threatened and keep their agricultural investment minimised. This investment rise with distance from the frontier to the outer age of this zone of anticipation where the specialised agriculture of the region takes over. Sinclair postulated four types of farming, the fifth zone/specialised feed-grain livestock or corn beer agriculture is the wider regional specialty beyond the belt of expanding urban influence. Proceeding outward from the beginning of Sinclair, there are:

1. Urban faming, a hodjepodje of small producing units, scatter through the already subdivided outer sub-urban environment, which favors poultrykeeping, green houses, mushroom –raising, and other building-oriented uses.
2. Vacant and temporary grassing where farmers leave much land empty to sell urban land speculators at the most opportune moment and allow grassing only under short leases.
3. Transitory field crop and grassing, a transitional agricultural type dominated by farm uses, but to be definite anticipation of near future displacement, express by little investment beyond the short term.
4. Dairying and field crop farming wherein farmers begin to shift to more agricultural fertile areas with a view towards encroachment in the foreseeable future.

Olof Jonasson's Theory

Olof Jonasson"s, Swedish geographer modified the Von Thunen"s model, relating to the economic rent of land in relation to market and means of transportation. The modified form of Von Thunen"s model devised by Jonasson is given in zones. Zone

1: The city itself and immediate environment, green house, floriculture. Zone

2: Truck product, fruits, potatoes and tobacco (and horses). Zone

3: Dairy products, cattle for beef, ship for mutton, veal, forage, oats, flax and fibers. Zone

4: General farming, grain hay, and livestock. Zone

5: Bread cereals and flax for oil.

Zone 6: Cattle (beef and range); horses (range); and sheep (rage); salt, smoke, refrigerated and canned meat, bones; tallow and hides.

Zone 7: The outermost peripheral area, forest.

Jonasson has applied this model on the agricultural landscape of Europe in 1925. He observed that in Europe and North America, zones of agricultural land used were arranged about the industrial centers in both the continents that is Europe and North America, the most intensive development of agriculture is the hay and pastures region in which the industrial centers are situated. Around these pasture are arranged concentrically the successive grades of land use pasturing and forestry. Jonasson advocated a model similar to the model of Von Thunen, around a theoretical isolated city in Europe. Jonsson also found an identical pattern of distribution on Edward plateau in Texas. Jonasson was also adopted by Valkenburg in 1952, when he prepared a map of intensity of agriculture in Europe.

Empirical Review

In a study carried out by Yusuf [20], identified the problem of poor transportation condition and marketing of tomato in Nigeria which discourages farmers and marketers in increasing production and marketing of tomatoes, as well as

increasing spoilage and wastage of resources which makes the country not to have a comparative advantage.

Olu and Yomi [21], assessed road transportation impact on rural development, with a view to determine the contributions of road transport to rural development. The study employed systematic sampling technique and chi-square analysis to administer questionnaires and run the analyses respectively. Findings from the study revealed that, the issue of poor rural road condition, which turns to influence the cost of transporting farm produce, increases poverty and causes the economy of the area to experience a fall.

Afolabi, *et al*. [22], analysed the effect of rural-urban transportation on agricultural produce in Ijebu north local government area of Ogun State. A well-designed questionnaire, personal observation, descriptive and inferential statistics were employed. Findings showed that combination of food crops, cash crops, tubers, fruits, vegetables and poultry products dominate Ijebu North Local area in which farmers combined cultivation of those crops. The respondent used the following means of transportation in the study area i.e. walking, motorbike, bus, pick-up van and car. Roads in the study area are in a deplorable condition, the type of vehicle used by farmers and traders depend on the volume of the agricultural produce, while petrol, maintenances, ticketing and extortion are the operating cost of vehicles in the movement of produce by the transporters.

Oni [23], investigated socio-economic factors that determined productivity and profitability of the crop in Nigeria. Regression and budgetary techniques were used in analysing primary data collected through a survey of farmers. Finding revealed that three significant determinants of net profit were land area planted with cassava, person-days of labour used and marketing cost incurred by the farmer. Effects of land area planted were positive, while those of person-days of labour and marketing cost were negative on net profit.

Orakwue, *et al* [24], investigated the effect of road transport on agricultural development in Ayamelum Local Government Area of Anambra State, Nigeria. Descriptive, graphical and analytical statistical methods were used to analyse the data obtained. The findings revealed that road transport has both negative and positive effects on agricultural development and general socio-economic status of the communities in the study area.

In an empirical study carried out by Iliya, [25], empirical examined survey of agricultural marketing practice in Central Nigeria comprising of Nasarawa State, Benue State, Niger State and Federal Capital Territory. Simple percentages and chi-square statistical tools were employed. The study explored that there is a significance relationship between marketing of agricultural products and economic growth, there is also a significant relationship between the marketing practice and agricultural produce.

Abur, *et al* [26], investigated the impact of rural road infrastructure on productivity and income of household farmers in North Central Nigeria. Three stages random sampling technique was employed to select 720 farming households in the study area. The study employed descriptive statistics, Cobb-Douglas production function and multiple regression models to analyse data. The study provided information that cost of inputs; farm size, access to inputs and access to good roads were identified as the significant factors influencing farmers‟ output and income. The study concluded that rural road infrastructure impact productivity and income of farmers which translate to employment generation and better welfare of the citizens.

Conclusion

Transportation and trade play vital roles in enhancing agricultural marketing and ensuring food security. Efficient transport systems enable timely delivery of farm produce, reducing post-harvest losses and connecting farmers to broader markets. Trade facilitates the exchange of agricultural goods, stabilizing food supply and prices across regions. Together, they contribute to economic growth, rural development, and resilience in food systems. Strengthening these sectors is essential for achieving sustainable and equitable food access worldwide.

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