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The Influence of County Government Agricultural Infrastructure Development on Food Security in Trans Nzoia East, Kenya

Flavia Akumu^{1,*} and Solomon Owuoche²

¹ State Department for Internal Security and National Administration, Ministry of Interior and National Administration, Kenya, flaviakumu@gmail.com

² Department of Political Science, University of Nairobi, solomon.owuoche@uonbi.ac.ke

* Corresponding author

Abstract

Food security is a prominent concern in Kenya, characterised by a multifaceted interplay of factors that hinder the consistent availability and accessibility of sufficient, secure, and nourishing food for the nation's population. This study investigates how county government infrastructure development has affected food security, particularly food accessibility and availability in Trans Nzoia East. The study was anchored on Schultz's Schultsian Theory of Traditional Agriculture Transformation. The study's research design was a descriptive research design incorporating a mixed methodology approach. The research used both primary data and secondary data. The results show that county government infrastructural initiatives have had a significant positive effect on food security in Trans Nzoia East. Subsidised inputs programs, such as fertilisers and seeds, have translated into high agricultural production rates with greater household food availability. Additionally, capacity-building programs and extension services have helped increase farmers' knowledge and skills to adopt modern agriculture practices, generating higher yields. Nevertheless, obstacles like a lack of adequate infrastructure, inability to reach markets, and governance have continued to undermine the full realisation of benefits. Although infrastructure development is widely acknowledged as one of the main enablers of economic growth and development, its role in agricultural productivity with respect to food security outcomes remains mostly neglected. This research emphasises that functional infrastructure consisting of road networks, storage facilities, and processing hubs is vital for value chain support and reducing the time spent accessing markets.

Keywords: Food security, United Nations Sustainable Development Goals, County government, infrastructure development

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Introduction

Food security remains one of the significant global issues in the 21st Century. According to FAO, millions of people all over the globe suffer from hunger and malnutrition (FAO, 2022). This is further emphasised by the United Nations' Sustainable Development Goals (SDGs), particularly Goal 2, which concerns the Zero Hunger goals; it focuses on ensuring that food is available and promoting sustainable agriculture for all (United Nations, 2021). Agricultural programs at different levels of government are of great significance in confronting this problem. Introducing policies or programs by national and local governments can help advance crop productivity, market access, and the resilience of farming communities.

The challenge of food security is made worse by climate change. Unpredictable weather occurrences, prolonged droughts, and irregular rainfall patterns have disrupted agricultural output and reduced crop harvests (UNDP, 2019). The livelihoods of smallholder farmers, who make up a sizable portion of the population and heavily rely on rain-fed agriculture, are impacted by irregular and unpredictable weather patterns (UNDP, 2019). Africa has long suffered from food insecurity, which has been made worse by conflicts, climate change, and economic hardships, as demonstrated in 2005 (Haile). Despite Africa's enormous agricultural potential, many African nations have not yet achieved food self-sufficiency as a result of this unrealised potential.

Recent developments stress decentralisation, allowing local governments to lead development, including measures to improve food security (Awortwi, 2010). A major issue in Kenya is food security, which is defined by a complex web of interrelated circumstances that make it difficult for the people of the country to consistently access enough safe, healthy food. A number of issues, such as population expansion, the effects of climate change, limitations on financial resources, and subpar farming methods, come together to cause the issue. Kenya's agricultural infrastructure has been severely strained in recent decades due to the country's exponential population increase and accompanying rise in food demand. The nation's capacity to meet its food production needs has been impacted by the reduction of available agrarian land due to the conversion of land for residential and commercial use (Kimenju et al., 2016). Increased population density is also linked to changing eating trends, which include a greater usage of processed and imported foods. This development puts enormous strain on domestic agriculture production (Kimenju et al., 2016).

Despite the country's agricultural potential, Kenya has consistently struggled to guarantee food security for its citizens. In early 2013, the Global Hunger Index (GHI) underscored the severity of the problem by rating Kenya's food security status as "serious" due to high levels of hunger and malnutrition (von Grebmer et al.). The ratification of a new constitution in 2010 resulted in a decentralised government structure, with 47 newly formed county administrations receiving significant authority and resources. This decentralisation was intended to strengthen local decision-making, promote development, and address regional inequalities. Agriculture, which is crucial to achieving food security, was one of the first sectors to be decentralised. Due to its rich soils and ideal climate, Trans Nzoia County, located in Kenya's Rift Valley, has been known as the country's agricultural centre. The majority of the people are employed in agriculture, which is the main economic activity. The county has a long history of growing wheat and maize, which has greatly increased the nation's food supply. Trans Nzoia County has considerable agricultural potential, but maintaining food security within its boundaries has been difficult.

Trans Nzoia County can make a substantial contribution to Kenya's food security; nevertheless, it has encountered many challenges that have hindered its progress. For instance, it has been observed that despite the significant agricultural productivity, there is a prevalent occurrence of post-harvest losses due to inadequate storage facilities and limited market accessibility (Kibet & Mutai, 2017). The region's reliance on rain-fed agriculture renders it vulnerable to the risks associated with climatic unpredictability, potentially leading to crop failures and reduced yields (Mutunga et al., 2015). In addition, agricultural productivity has been hindered by the predominance of smallholder farming,

characterised by the restricted availability of contemporary farming techniques and resources (Munene & Sule, 2019). Therefore, this study looks at the County government's agricultural initiatives and their influence on food security in Trans Nzoia East.

Kenya faces a critical food security challenge, with over 5.4 million people suffering from acute food insecurity and malnutrition (European Commission, 2023). Despite efforts at both national and County levels, food consumption in many regions continues to outpace food production, exacerbating the food insecurity crisis. Trans Nzoia East Sub-County, historically known as the country's breadbasket, is not immune to these challenges. Despite the region's agricultural potential, food security concerns persist, raising questions about the effectiveness of local interventions. The devolution process in Kenya, initiated over the past decade, has granted County governments increased authority and resources to drive local development. In Trans Nzoia East, the County government has implemented various agricultural initiatives aimed at enhancing food security. These initiatives include the provision of subsidised inputs, capacity building for farmers, and infrastructure development. However, a contradiction arises: despite these efforts, food insecurity remains a significant concern in the region.

This research problem centres on the apparent disconnect between the County government's agricultural initiatives and the persistent food security issues in Trans Nzoia East. While these initiatives theoretically address key aspects of agricultural production, their actual impact on food security, particularly in terms of food accessibility and availability, remains unclear. This study, therefore, sought to fill this gap by investigating the effectiveness of these initiatives in achieving their intended outcomes. The focus on food accessibility and availability is deliberate, as these are critical components of food security that directly affect the population's ability to obtain and utilise food. While other aspects of food security, such as food utilisation and stability, are important, this study prioritises accessibility and availability due to their immediate and measurable impact on the community's well-being. By narrowing the focus, this research aims to provide a more detailed analysis of how County-level agricultural policies influence these specific aspects of food security.

Literature Review

According to HLPE (2023), regarding food availability, the implied meaning is in the actual physical accessibility of desirable food stock levels. Food grain availability is determined by the country's production net of feed, seed, wastage, net imports, and a drawdown of inventories, which is appropriate considering that edible grains make up a significant portion of dietary consumption. Physical accessibility in any area of a country relies on integrating markets, transportation and storage facilities, and those facilities themselves. The privileges that relate to an individual's initial foundations, the things they can obtain concerning both financial and physical access to food, and the opportunities available to individuals for achieving entitlement sets with sufficient nourishment by self-help, government intervention, or the two determine food accessibility.

According to Rydge et al. (2015), by 2030, the world is projected to have a USD 90 trillion infrastructure deficit. To meet the severe issues brought on by increasing urbanisation, policymakers and governments have used these frightening numbers to boost investment in their urban sectors, whereas rural infrastructure requirements have received less attention. The study demonstrates that when it comes to infrastructure and food security, infrastructure plays a role in the accessibility and availability of food in the world, thus presenting a solid incentive to investigate the effects of infrastructure on the accessibility and availability of food. The gap presented by this report is in the predictive model and generalisation of the infrastructure deficit in the world; country-specific deficits would be ideal for research and corrective actions.

A report by Turley and Uzsoi (2018) highlights the different types of infrastructure and their effect on accessibility. Storage infrastructure offers producers bargaining power: regardless of whether farmers are aware of market values, it will only matter a little if they cannot store their harvest. Farmers must

have the choice to refuse to sell, at the very least, postpone sales, or schedule them in advance to have negotiating leverage. Rural transport infrastructure can link agricultural and non-agricultural populations while improving agricultural inputs, marketplace accessibility, and commodity freshness and quality. When weighed against rain-fed agriculture, irrigation infrastructure can double the farm yield per acre. All of this is made possible by energy infrastructure, which also enables additional on-farm services like telecommunications and cold storage, improving the quality of life in rural areas. The report's strength lies in demonstrating and considering different types of infrastructure and their effects on accessibility. This report presents an opportunity to consider the other types of infrastructure related to food accessibility and availability, including market infrastructure, as an avenue for research in different geographical areas.

Ako and Wanie (2022) evaluate rural-urban road transportation's challenges to food security in Cameroon. The study found that the roads in the area under study were dilapidated, inadequate, and seasonal. This increases the difficulty in movement, particularly in the rainy season when roads are muddy. In turn, the movement of perishable agricultural products is inhibited, thus affecting the availability of food in urban areas. The study's detailed investigation into the pathways that support accessibility presents a framework for research into transport infrastructure in food accessibility and security. However, this study looks at only one aspect of infrastructure that affects food accessibility and availability. More research is necessary to examine other infrastructure forms that affect food security.

Adoyele and Oluwagbenga (2023) evaluated the role of transport systems in food security in Nigeria. According to the study, Osun State faces food delivery and safety difficulties. The article describes how transportation infrastructures can increase the mobility of food products to other markets. Poor and difficult-to-use roads cause incidents that impact robbery and criminal activity on the roadways. This limits the movement of food items (groceries) from farmlands and nearby cities to many markets. They come up with the following recommendations: every road should be considerably improved because accessibility is essential. For the safe transportation of food goods (groceries), fixing dangerous or inadequate roadways that frequently result in accidents is vital. This research reaffirms the importance of transport infrastructure as a factor in food accessibility and brings a new aspect of security in transport infrastructure. As in the case of the previous source, the literature presents a significant gap in the study of other elements of infrastructure that affect food accessibility and availability.

Emongor (2014) highlights how, in Kenya, infrastructure development affects food accessibility and availability in multiple ways. Transport infrastructure, especially that link rural areas with high agricultural production to the other regions, is missing or underdeveloped, inhibiting the accessibility to food for those seeking consumption in urban areas and preventing the farmers from reaching the markets they require for their produce. Storage infrastructure critical for preserving perishable farm products is inadequate, limiting the availability of fresh produce and pushing farmers to sell their produce at throwaway prices. In addition to these critical issues, there is a lack of electricity in some areas, which hinders the development and investment in processing facilities. This implies that the agricultural value chains are underdeveloped, resulting in fruit and vegetable spoilage during their excess seasons and a lack of accessibility. This study extensively evaluates the influence of infrastructure on food accessibility and availability; however, the study only considers secondary data rather than primary data. This research, with a primary data approach, would result in a more accurate depiction of the situation in Kenya.

Similarly, Boulanger et al. (2020) consider different infrastructural elements as the challenges to food productivity and, by extension, food accessibility and availability. Poor rural infrastructure and informational infrastructure contribute to poor agricultural productivity and food availability. Another factor that affects food availability is the high cost of fertilisers, which lowers farmers' productivity. This study contributes to the literature by taking a different approach to the role of infrastructure in accessibility and food security, specifically, informational infrastructure. This study presents a gap in

the literature on the Effect of infrastructure on food accessibility because its primary focus is on food availability with little emphasis on food accessibility.

Theoretical Framework

Theodore W. Schultz's Schultzian Theory, developed in the mid-20th century, also holds relevance for this study (Schultz, 1963). Schultz's Theory focuses on the transformation of traditional agriculture to modern farming practices. The theory emphasises the role of human capital, specifically education and skill development, as a key driver of agricultural productivity. This theory focuses on human capital's pivotal role in promoting agricultural productivity and rural development, including knowledge, skills, and education. Within the context of County Government Agricultural Initiatives in Trans Nzoia East, Kenya, the Schultzian Theory underscores the significance of investing in human capital through education and training programs. These investments can empower local farmers with the necessary skills and knowledge to adopt modern agricultural technologies and practices more effectively, ultimately leading to increased agricultural productivity (Schultz, 1975). Additionally, the Theory aligns with the study's goal of assessing the broader impact of agricultural initiatives on rural development, emphasising how investments in human capital contribute to poverty reduction and, consequently, improved food security in the region.

Infrastructure is crucial in agricultural productivity and food security because it encourages the smooth and speedy transport of goods, inputs, and information. This comprises physical infrastructure such as roads, irrigation systems, storage facilities, and processing centres, and social infrastructure like education and healthcare services. Schultzian Theory underlines the significance of human capital, mainly education and training, in increasing agricultural productivity and facilitating rural development. In the context of County Government Agricultural Initiatives in Trans Nzoia East, Kenya, infrastructure development is the key to improving access to markets, input supply chains, and agricultural extension services. Roads, for instance, make it easier for farmers to transport their produce to markets, which reduces postharvest losses and increases incomes. Likewise, irrigation systems and storage facilities mitigate the effects of climate variability, and food security is ensured by storing the harvests for a more extended period.

Moreover, the education and training programs, backed by agricultural initiatives, equip the farmers with the knowledge and skills they need to use modern farming techniques and technologies. Through human capital investment, the policymakers can develop the ability of the local communities to innovate, adapt to the changing environmental conditions, and sustainably improve agricultural productivity. The Schultzian Theory also points out the broader social and economic advantages of infrastructure development for rural communities. Better access to education and healthcare services through infrastructure projects can be the key to human capital accumulation and poverty reduction. With the farmers becoming more educated and skilled, they can participate in value-added activities along the agricultural value chain; thus, food security and economic development in the region are further enhanced.

Methodology

The study employed a descriptive research design that involved a mixed-method approach. The mixed methodology entails the use of both qualitative and quantitative research methods in its research design (Creswell, 2014); in their discussion on the importance of research design, they noted that descriptive research is suitable when the primary goal is to explore and describe the existing conditions or relationships within a specific context. This study utilised document analysis and surveys, including questionnaires, for data collection. Questionnaires are prudent because they result in realistic results and are a cost-effective data collection method.

Simple random and purposive sampling were the appropriate sampling methods for this study. The most straightforward and popular technique of obtaining a sample is simple random sampling, whereby the sample is chosen unit by unit with an equal likelihood of being selected for each unit at each draw. Each person has a comparable probability of being chosen for the population sample in this methodology (Noor et al., 2022). The study involves a homogeneous population of farmers in Trans Nzoia East Sub-County. When choosing participants for a random research study, simple random sampling is used for homogeneous populations (Bhardwaj, 2019). Meanwhile, for the interview participants, the study used judgmental purposive sampling by interviewing individuals judged to have the relevant information for the study.

The research aimed to assess the influence of County government agricultural infrastructure development on food security in Trans Nzoia East between 2013 and 2022. The collected (quantitative) data was analysed using descriptive statistics, including average, frequency, and percentage. The statistical tools applied in this endeavour were SPSS 20.0 and Microsoft Excel.

The qualitative data collected was analysed using the thematic analysis technique. Thematic analysis is a qualitative technique that involves identifying themes from information collected through categorising and evaluating the data set. The most common procedure in the thematic analysis involves becoming acquainted with the data, creating preliminary codes, theme discovery, review, definition, labelling, and report writing (Dawadi, 2020). Researchers back the use of thematic analysis, as it is suitable for analysing qualitative data, especially when the primary goal is to understand the experience presented in a dataset (Kiger & Varpio, 2020).

Analysis of Findings

Infrastructure development ensures food accessibility and availability, particularly in rural areas like Trans Nzoia East. This section presents the findings regarding the impact of infrastructure development on food security, focusing on transportation, markets, storage facilities, and irrigation infrastructure. The analysis explores the relationship between infrastructure improvements and farmers' access to markets, storage facilities, and irrigation systems, shedding light on their contribution to enhancing food security in the region.

Table 1: Respondents' Views on the Effect of infrastructure development on food accessibility and availability in Trans Nzoia Eas

| | Strong Agree | Agree | Don't Know | Disagree | Strongly Disagree |
|---|--------------|-------|------------|----------|-------------------|
| 1. To what extent do you agree with the statement that county government development (transport infrastructure) affect food security? | 21 | 29 | 5 | 7 | 3 |
| 2. To what extent do you agree with the statement that county government development (market infrastructure) affect food security? | 20 | 40 | 2 | 3 | 0 |
| 3. To what extent do you agree with the statement that county government development (storage facilities) affect food security? | 25 | 35 | 2 | | |

Source: Fields data Questionnaire analysis (2024)

The respondents were then asked to rate the level of their agreement that county government development in transport infrastructure impacts food security. From the results, it is clear that most of the respondents agreed or strongly agreed with this statement; 21 (32.3%) agreed, and 29 (44.6%) partly

agreed, while only 5 (7.7%) did not concur. This implies a common trend among respondents that acknowledged transport infrastructure benefited food security. Better roads and transportation infrastructures facilitate the easy transport of agricultural produce from farms to markets, minimising post-harvest losses and, hence, early access for both producers and farmers by making food available on time.

The study also investigated the link between market infrastructure development and food security. The findings reveal a high level of consensus among respondents on the importance that county government development in market infrastructure has had for food security. In particular, 20 (30.8%) respondents strongly agreed with the statement, and 40 (61.5%) slightly agreed. This shows that investments into market infrastructural amenities like the building of market stalls, warehouses, and trading centres contribute immensely to the enhancement of food accessibility (Adeyeye, 2017). As a result of the availability of modern markets equipped with good production facilities, farmers can sell at fair prices, hence improving their income, leading them to transform lives and supply food to local people as well.

In addition, the assessment looked into how storage facilities contributed to food security. The results show a common pattern where most of the respondents agree with county government development in terms of storage facilities. In particular, 25 (38.5%) respondents strongly agreed, and 35 (53.8%) agreed with the statement, while only a few disagreed or did not know. Sufficient storage facilities, like silos and warehouses, reduce post-harvest losses by ensuring safe conditions for preserving perishable agricultural products. This creates food security in the region because it guarantees the availability of food during scarcity and price fluctuations.

However, in addition to transport market and storage infrastructure, irrigation is also vital for improving food security, especially among people living in arid and semi-arid regions like Trans Nzoia East. Although the survey did not measure irrigation infrastructure directly, its relevance in increasing agricultural output and adaptation to climate change is worth mentioning. Investments in irrigation schemes and water management systems can help significantly improve crop yields as well as agricultural production potential, which serves to ensure food security all year round.

The results underscore the significance of infrastructure development in ensuring food security for Trans Nzoia East. The development of transport infrastructure, market facilities, and storage and irrigation systems are essential ingredient in a comprehensive food security plan (Bjornland et al., 2020). The general agreement among respondents that infrastructure development has a positive influence draws out emphasis toward more investment in these fields by the county government and other stakeholders. Nevertheless, there are likely to be inequities in infrastructure provision and quality across areas of Trans Nzoia East, leading to variations in food security outcomes between regions. Thus, attempts should be made to eliminate these differences and provide equal opportunities for other communities in terms of infrastructure assets. Infrastructure development is vital in the promotion of food security through better access to markets, storage facilities, and irrigation systems, among others (Memon & El Bilal, 2020). This assessment highlights the need for continuous investment in infrastructure by the county government to address food security issues in Trans Nzoia East and other rural areas.

The participants noted that poor road networks negatively affected the movement of agricultural products in Trans-Nzoia East. The responses also revealed that bad roads, particularly during the rainy season, are a very big problem for farmers in their efforts to transport agricultural produce to market centres. This leads to time losses, higher transportation costs, and harvest losses, especially for highly perishable goods. Moreover, the matter of roads means that some farmers are forced to use other forms—donkeys, for instance—which in turn aggravates distribution problems in agricultural trade. Another major theme that has been identified is the limited space across storage units and processing centres in the region. A lack of storage facilities was another issue that the participants highlighted, which resulted in farmers selling their produce at giveaway prices and having no means to preserve surplus harvest. The

lack of processing centres also limits value addition to agricultural products, thereby reducing the chances for farmers to increase their income by selling processed goods. Below is a respondent sharing her views on the impact of roads and infrastructure on agricultural activities:

According to respondent 010,

Roads in Makutano and Bonde increase the cost of transportation. Poor roads in bad weather and the topography of some areas around Kabolet hamper agricultural activities. The Nyakinywa to Kapchepsir road is in a very bad state, especially during rainy seasons, and hampers the transportation of produce.

The interviewees highlighted that the state of infrastructure, especially of roads, storage facilities, and processing centres, has a great effect on agricultural productivity as well as the livelihoods of the people of Trans Nzoia East. Poor infrastructure not only obstructs the transportation of agricultural products to market but also worsens post-harvest losses and reduces possibilities for value addition and income mobilisation. A respondent (012) also shared that “Farmers in the interiors, where the roads are poor, end up selling their produce to brokers at low prices. Roads in the interiors are impassable, especially during rainy seasons, leading to after-harvest losses of perishable agricultural produce.”

The poor state of roads in interior regions forces farmers to sell their produce to brokers at lower prices, as they cannot access broader markets due to transportation challenges. During the rainy season, these roads often become impassable, leading to significant post-harvest losses, especially for perishable goods. This situation not only diminishes the profitability of farming activities but also undermines food security efforts by reducing the availability of agricultural products. Consequently, the lack of reliable infrastructure hinders both economic viability for farmers and the overall food supply chain, deepening food insecurity. This, in turn, impacts the economic responsibility that is attached to farming activities and the general situation of food security.

Results and Discussion

The Constitution of Kenya 2010 introduced a devolved system of governance, with County governments responsible for various sectors, including agriculture, rural access roads, and markets. County governments are mandated to develop and implement policies and plans to promote food security within their respective jurisdictions. Trans Nzoia County, and specifically Trans Nzoia East Sub-County, has taken various initiatives to improve infrastructure development to support food security. These initiatives include:

The County government has invested in constructing and maintaining rural access roads to facilitate the movement of agricultural inputs and outputs. According to the Trans Nzoia County Integrated Development Plan (CIDP) 2018-2022, the County government aimed to improve the condition of rural access roads by 20% by 2022 (Trans Nzoia County Government, 2018).

The County government has constructed and renovated market facilities to provide better trading environments for agricultural produce. The Trans Nzoia County Annual Development Plan 2021/2022 allocated funds for building and renovating market sheds in various Sub-Counties, including Trans Nzoia East (Trans Nzoia County Government, 2021).

The County government has invested in irrigation infrastructure to enhance agricultural productivity and mitigate the effects of climate change. The CIDP 2018-2022 outlined plans to develop and rehabilitate irrigation schemes in various parts of the County, including Trans Nzoia East (Trans Nzoia County Government, 2018).

The County government has strengthened agricultural extension services to provide farmers with technical support, training, and access to improved agricultural inputs and practices. The Trans Nzoia

County Annual Development Plan 2021/2022 allocated funds for recruiting additional extension officers and providing agricultural training programs (Trans Nzoia County Government, 2021).

The infrastructure development efforts undertaken by the Trans Nzoia County Government have significantly impacted food security in Trans Nzoia East. The following are some of the critical impacts: The construction and maintenance of rural access roads have facilitated the movement of agricultural produce from farms to markets, reducing postharvest losses and enhancing farmers' access to better prices. According to a study by the Kenya Institute for Public Policy Research and Analysis (KIPPRA), improved rural access roads in Trans Nzoia County have increased farm gate prices for agricultural produce by an average of 15% (KIPPRA, 2019).

The irrigation infrastructure development has enabled farmers to cultivate crops throughout the year, increasing agricultural productivity and food availability. A study by the International Food Policy Research Institute (IFPRI) found that adopting irrigation technologies in Trans Nzoia County led to an average increase in crop yields of 25% (IFPRI, 2020).

The strengthening of agricultural extension services has facilitated the dissemination of improved farming practices and technologies, resulting in increased productivity and resilience to climate change. A study by the World Bank found that farmers who received extension services in Trans Nzoia County experienced an average increase in crop yields of 18% (World Bank, 2021).

Market infrastructure development has provided better storage and trading facilities, reducing postharvest losses and ensuring better prices for farmers. According to the Trans Nzoia County Annual Development Plan 2021/2022, the county aimed to reduce postharvest losses by 10% by constructing and renovating market facilities (Trans Nzoia County Government, 2021).

Challenges and Limitations

Despite the positive impacts of infrastructure development on food security in Trans Nzoia East, several challenges and limitations persist:

Limited Funding

County governments in Kenya often face budgetary constraints, which can limit their ability to undertake large-scale infrastructure development projects.

According to the Commission on Revenue Allocation (CRA), County governments in Kenya receive an average of 15% of the national government's shareable revenue, which may need to be increased to address all infrastructure development needs (CRA, 2022).

Climatic Factors

Climate change poses a significant threat to food security in Trans Nzoia East, with the region experiencing erratic rainfall patterns and extreme weather events. A study by the Kenya Meteorological Department found that the frequency and intensity of droughts and floods in Trans Nzoia County have increased in recent years, negatively impacting agricultural production (Kenya Meteorological Department, 2021).

Inadequate Coordination and Stakeholder Engagement

Effective coordination and stakeholder engagement are crucial for successful infrastructure development projects, but county government initiatives sometimes need to improve these aspects. A report by the

Council of Governors (CoG) identified poor coordination among county governments and stakeholders as a significant challenge in implementing infrastructure development projects (CoG, 2020).

Insecurity and Conflicts

Insecurity and conflicts can disrupt agricultural activities and infrastructure development projects, leading to food insecurity. Trans Nzoia County has experienced land and cattle rustling disputes, affecting agricultural production and infrastructure development efforts (USAID, 2019).

Conclusion

The study analysed how infrastructure development affected food availability and access in Trans Nzoia East. Results showed that the provision of improved infrastructure, mainly transport and storage facilities, has a significant influence on the improvement in food security. For instance, interviewees pointed out the negative impacts of poor infrastructure, especially road networking and storage facilities, on agricultural operations, such as transporting commodities after harvesting. Difficult roads and insufficient storage facilities brought transportation delays, which were one of the challenges inducing post-harvest losses. Better road networks ensure agricultural produce is brought to the markets, thus reducing post-harvest losses and ensuring timely food availability for producers and consumers.

On the other hand, insufficient storage facilities were noted as a significant challenge, resulting in weaknesses along the agricultural value chain, which leads to food shortages and hunger. However, despite the benefits achieved from county government agricultural initiatives, participants noted undesirable consequences such as corruption in project implementation and delay of funding, among others. These challenges highlighted the importance of better governance and openness in program delivery. Based on these results, stakeholders proposed several recommendations to improve food security in the region. These included expansion of extension services, improved infrastructure, provision for sustainable input subsidies, and diversification in the types of farming implemented. Moreover, stakeholders highlighted the need for additional research to resolve emerging issues and direct evidence-based policymaking. Adding stakeholders' views contributes to an in-depth insight into the advantages and difficulties associated with agricultural projects, thereby creating a platform for making informed decisions, guiding policy development in this area.

Recommendations

To further enhance the positive impact of agricultural infrastructure development on food security in Trans Nzoia East, the following recommendations are proposed:

To support important infrastructure development projects that aim to improve food security, county governments are urged to push for more financing and resource allocation from the federal government. Counties should aggressively look into alternative funding sources in light of the constraints of local finances. This involves working with international development organisations, which can offer both financial and technical support, and establishing public- private partnerships (PPPs). Counties can improve their ability to carry out sustainable food security projects by broadening their sources of finance.

To address the growing challenges posed by climate change, county governments must take proactive measures to build resilience and sustainability. A key priority should be the development of climate-resilient infrastructure, alongside the adoption of sustainable agricultural practices to safeguard food security. Practical steps include investing in water harvesting technologies to manage scarce resources, promoting drought-resistant crop varieties to ensure stable yields, and supporting conservation agriculture techniques to enhance long- term soil health and productivity. These strategies will not only

mitigate the immediate impacts of climate change but also strengthen communities against future environmental uncertainties.

To provide smallholder farmers with access to the newest farming technologies, better farming methods, and up-to-date market information, county governments should place a high priority on bolstering agricultural extension services. This entails creating farmer field schools that encourage experiential learning and knowledge sharing among farmers, as well as hiring and educating additional extension officers to offer practical assistance at the local level. Counties should also make use of digital tools like internet platforms and mobile applications to spread agricultural information more effectively and to a larger audience. The agriculture sector's resilience, productivity, and competitiveness in the market will all be improved by these actions.

County governments should actively promote the establishment of value-added and agro- processing facilities as a method for increasing agricultural produce shelf life, reducing postharvest losses, and expanding farmers' market options. This can be accomplished by developing community-based processing centres in which local farmers can cooperatively prepare their goods, maintaining greater value in the local economy. Furthermore, counties should provide value-added training programs to farmers and agribusinesses, giving them the skills required to manufacture marketable items. Facilitating access to markets for processed agricultural goods is also critical to ensuring the profitability and long-term viability of these efforts.

To improve farmers' access to markets and lower postharvest losses, county governments should give the development of market infrastructure top priority. To maintain produce quality and guarantee on-time delivery to markets, this entails building storage facilities, collecting centres, and strengthening transportation networks. In order for smallholder farmers to profit from higher pricing and more demand for their goods, county officials should also endeavour to connect them with regional and international markets. Targeted investments in road infrastructure and the construction of storage and processing centres are urgently needed in rural areas like Trans Nzoia East in order to promote easy market accessibility, reduce postharvest losses, and eventually improve local food security.

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AUTHOR'S BIOGRAPHY

Flavia Akumu is an Administrative Officer in the State Department for Internal Security and National Administration, Ministry of Interior and National Administration, Kenya. She is primarily responsible for maintaining law and order, peace building and coordinating national government functions at the Sub-County Level. She has extensive experience serving in various parts of the country, including semi-arid and agricultural areas. She explores the influence of County Government agricultural infrastructural development initiatives on food security. Her current research focuses on how County Government agricultural infrastructure development initiatives influence food availability, accessibility and affordability.

Dr Solomon Owuoche is a Senior Lecturer in the Department of Political Science and Public Administration, University of Nairobi. He holds a Ph.D. and a Master of Arts Degree in Political Science, University of Nairobi. He has wide teaching experience. He has served as a visiting lecturer at Warsaw University (Poland) and, under the Linnaeus-Palme Grant and funding from UNOD, at Linköping University, Department of Management and Engineering, Sweden. He has authored a number of scholarly books and articles. He has also acted as an external examiner for postgraduate programs at MMUST and JKUAT.