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INFRASTRUCTURE AND INCLUSIVE GROWTH: EXAMINING ROAD DEVELOPMENT AND RURAL TRANSFORMATION IN EMERGING ECONOMIES

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This paper reviews how road infrastructure development affects inclusive rural transformation in the emerging economies, with particular emphasis on the disparate effects in the agricultural and non-agricultural sectors. The research design was an evaluative research design using the systematic sampling methods to access primary data on the form of structured questionnaires and semi-structured interviews with rural households and community leaders and secondary data were sourced from the Ghana Statistical Service, district assemblies and national development databases. The results showed that there were profound developmental differences between communities with good versus poor access to roads, with communities along the engineered roads showing a better connection to the market, greater access to facilities of learning and health system, greater agricultural output, higher household earnings, more diversified economies and lower transport expenses. On the other hand, settlements that had no engineered roads had significant barriers to market entry, reduced access to important services and limited economic prospects. Nevertheless, the two types of communities were not sufficiently equipped in terms of social infrastructure, such as Community-based Health Planning and Services and good schools, which means that, as much as road infrastructure may be necessary in terms of economic integration, similar investments in social services and community participation systems are necessary to support inclusive rural transformation. The study identifies gaps in national rural development policy frameworks and recommends integrated infrastructure development approaches that combine road investments with comprehensive social service delivery to maximize inclusive growth outcomes in emerging economies.

KEYWORDS: *Infrastructure Development, Inclusive Growth, Rural Transformation, Emerging Economies, Road Networks, Economic Diversification*

INTRODUCTION

Rural growth plays a crucial role in overall national development (Buragohain and Landge, 2014; Mohapatra and Chandrasekhar, 2007; Kyeyamwa et al., 2008; Kishor and Basanta, 2021; Jemal and Genet, 2019; Adeniyi et al., 2018). Rural development involves increasing agricultural productivity, enhancing livelihood opportunities (Ale, 2013; Adeniyi et al., 2018; Asafo-Adjei, 2020), expanding access to basic services (Ali et al., 2015; Adeniyi et al., 2018; Asafo-Adjei et al., 2020), and ensuring food security (Okakunori, 2006; Ugwuanyi and Chukwuemeka, 2013). It also supports poverty reduction (Cook et al., 2017; Adeniyi et al., 2018; Asafo-Adjei et al., 2020).

In many rural areas, road transportation is regarded as the most important contributor to socio-economic development. Therefore, improving transportation networks significantly influences the competitiveness and attractiveness of rural areas (Cook et al., 2017; Adeniyi et al., 2018; Asafo-Adjei et al., 2020) and results in the accomplishment of most of the Sustainable Development Goals formulated by the United Nations (Cook et al., 2017). Rural roads connect settlements and provide links to other modes of transportation options, including rail, air and sea (Asafo-Adjei et al., 2020; Blankespoor et al., 2017; Ali et al., 2015; Ugwuanyi and Chukwuemeka, 2013; Olorunfemi and Basorun, 2013; Okakunori, 2006). A feeder road network facilitates the exchange of products and services, people movement and information (Adeniyi et al., 2018), reduces travel time to

educational institutions (Okoko, 2011; Asafo-Adjei et al., 2020; Asafo-Adjei, 2020), and facilitates access to healthcare towards the reduction of maternal mortality (Tayler-Smith et al., 2013; Schoon, 2013; Peters et al., 2018). Most significantly, non-farm economic activities such as cottage industry, crafts and tourism all hinge on improved rural transportation infrastructure (Asafo-Adjei et al., 2020; Asafo-Adjei, 2020; Ali et al., 2015; Okoko, 2011).

Constructing new road networks and improving existing ones through the construction of culverts and bridges, sidewalks, hard-surfacing, street widening and landscaping (see Litman, 2010) facilitates the conveyance of raw materials, semi-finished and finished goods (Howe, 2010). This promotes spatial interactions and enhances access to social services and enhances the productivity of the workforce (Asafo-Adjei et al., 2020; Amo and Meirmanov, 2014; Holmgren, 2014). Notwithstanding this recognition, large swaths of rural areas remain inaccessible by roads, hence creating difficulties in terms of mobility of freight and passengers to market centers (Amo and Meirmanov, 2014; Litman, 2010) and limiting the overall socio-economic development (Adeniyi et al., 2018).

Poor road infrastructure in rural areas poses significant constraints to the development of non-agricultural sectors and activities, undermining economic diversification and overall rural development (Ali et al., 2015; Berg et al., 2017). This infrastructure deficit represents a significant barrier to rural transformation, as adequate transportation networks are essential for market access, service delivery and economic integration. Notwithstanding widespread recognition of these challenges, rural road connectivity remains inadequate across many developing regions. The extent of this infrastructure gap varies considerably by region, with South Asia and South America experiencing moderate deficits where approximately 45-55% of rural communities lack access to adequate transportation infrastructure. The situation is markedly more severe in Sub-Saharan Africa, where an estimated 65% of rural communities remain without improved road access, which represents one of the most significant infrastructure challenges facing the continent (Kishor and Basanta, 2021; Jemal and Genet, 2019; Jayne and Headey, 2014). This disparity in rural road infrastructure perpetuates spatial inequalities and limits the potential for sustainable rural economic development and poverty reduction across these regions.

These poor road conditions have several negative implications. First, low road density and the lack of all-weather roads not only limit access to farmlands but also contribute to increasing transportation costs to markets and to agricultural service centers, thereby limiting productivity and profitability (Jemal and Genet, 2019), (Okoko, 2011; Asafo-Adjei et al., 2020; Asafo-Adjei, 2020) and (Olorunfemi and Adenigbo, 2017). Poor rural roads have contributed to more than 40% post-harvest losses to fruits and vegetables (Yeboah, 2015).

Secondly, large tracts of potential farmland remain largely inaccessible and uncultivated (Jayne and Headey, 2014). Communities are unable to harness their tourism potential (Ali et al., 2015) and exploit their natural resources such as gold ore and stone quarry (Berg et al., 2017; Kishor and Basanta, 2021; Sileshi and Tebarek, 2017). Thirdly, even though education and health are critical for human development, many rural residents are unable to access these social services due to poor transportation infrastructure (Ibrahim, 2011; Sileshi and Tebarek, 2017). These conditions contribute to higher concentrations of poverty (Gollin and Rogerson, 2014; Minten et al., 2013; Ugwuanyi and Chukwuemeka, 2013; Emran and Shilpi, 2012; Okakunori, 2006) and food insecurity (Emran and Shilpi, 2012; Minten et al., 2013).

In the case of Ghana, rural roads are generally underdeveloped relative to inter-urban and intra-urban roads (Asafo-Adjei et al., 2020). Most of the rural roads are impassable during rainy seasons and hence isolate communities from the rest of the other settlements (Yeboah, 2015). As a result, rural residents have limited access to education facilities and health delivery and market centers due to the high cost of transportation (Okoko, 2011; Asafo-Adjei, 2020).

Preliminary investigation in the study area shows that, though certain roads are engineered, others are un-engineered and impassable during the wet season. This situation limits access to farmlands, market centers and social infrastructure, which has negatively impacted rural development. The overall effect is that the area is characterized by productivity and livelihood mechanisms. According to Asafo-Agyei (2020), about 60% of the residents travel long distances to get access to social infrastructural facilities, particularly education and health (Asafo-Adjei, 2020).

This research proposition is that improved road networks contribute significantly to farm production, non-farm economic activities and improve access to social services, thereby contributing to the achievement of many of the Sustainable Development Goals. In line with this proposition, this research compares rural development in villages located along engineered cocoa roads with those located on un-engineered roads using several indicators. In light of this central research proposition, the following research questions are posed:

Research Questions

1. What are the characteristics of road networks connecting roads in the study area?
2. How do the road conditions impact crop production and non-farm activities along the selected transportation corridors?
3. How do the road conditions influence access to social services, especially health and education, in the study area?

The research questions outlined above are designed to understand the problem for policy intervention to promote the competitiveness and attractiveness of rural areas for investment through road development. In this light, this broad goal, the following specific objectives are outlined.

Research Objectives

1. To explore the nature of road infrastructural development and its contributions to rural development.

2. To examine the effect of improved roads on agriculture and non-agricultural sectors for socio-economic development.
3. To explore the nature of access to healthcare services and education on engineered and engineered roads.

Methods and Procedures

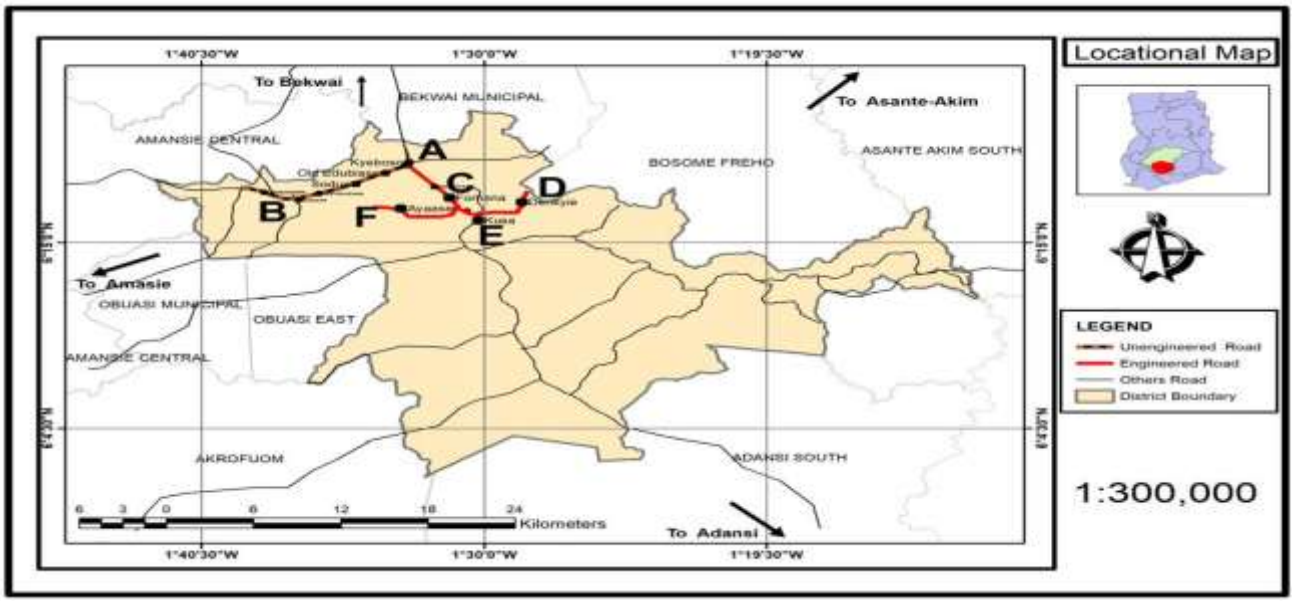
The research design used in this study was a summative evaluative research design that aimed to determine the effects of the cocoa roads project on the rural development of the Adansi North District, Ghana, which is mainly rural with about 70 percent of the road systems in need of enhancement (DCPU, 2014). In this study, the outcomes of socio-economic developments were compared between the communities using the engineered roads (Fomena to Denkyie route and Fomena to Ayaase route) that can be used throughout the year and those using un-engineered roads (Kyeaboso to Akrokerri route), which can only be used in dry seasons. Physical accessibility and cocoa production level were used to select six communities purposely: three along engineered roads (Denkyie, Kusa and Ayaase) and three along un-engineered roads (Kyeaboso, Old Edubiase and Sodua). Primary data collection entailed a structured questionnaire survey of 43 systematically sampled household heads per community (the study used every 3rd house with a 95 percent confidence level and 5 percent margin of error) and the key informant interview of officials with the Feeder Roads Department, Ghana Cocoa Board, District Planning Office, traditional leaders and assembly members. The preliminary investigations yielded secondary data in the form of district profiles, road maps, medium-term development plans and Ghana Statistical Service records. The questionnaire targeted four key areas, namely, respondent demographics, contribution made by road infrastructure and rural development, impact of road quality on agriculture and socio-economic development and access to healthcare and educational services. Analysis of data used SPSS software version 27.1 in quantitative analysis of data using descriptive statistics and association analysis and qualitative data in the form of interviews was subjected to content analysis to determine patterns and themes underlying the quantitative results.

RESULTS OF THE STUDY

Conditions of the road networks in the study communities

To carry out a comparative analysis to assess the influences of road networks on rural development, three communities were selected for the study along the engineered road corridor and another three were selected on an engineered corridor. For the road network connecting Kyeaboso to Akrokerri (A-B) (un-engineered road network), the selected communities were Kyeaboso, Old Edubiase and Sodua (refer to Figure 1.1). In terms of the Fomena to Denkyie to Ayaase road (C-D, E and F) (engineered roads), the selected communities were Denkyie, Kusa and Ayaase (refer to Figure 1.1). Finally, the impacts of road networks (both engineered and un-engineered) on agricultural activities, non-agricultural activities, services and on the market were assessed. The engineered road network was asphalted under the Cocoa Roads Project and is in good condition, hence providing access to markets and farmlands throughout the rest of the year for day-to-day activities (Okoko, 2011; Tayler-Smith et al., 2013; Schoon, 2013; Peters et al., 2018; Asafo-Adjei et al., 2020; Asafo-Adjei, 2020).

Figure 1.1: Adansi-North Road Map



Source: District Planning and Coordinating Unit (2022)

On the other hand, the unimproved road corridor was characterized by potholes, dusty and muddy conditions, which impeded access to educational and health facilities and market centres. While the initial 8 kilometres of the road were in good condition, a significant proportion of the road network was in poor condition, which not only impeded agricultural activities but also access to social services. Table 3.1 shows that the majority (65%) of the respondents from communities located along the engineered road stated that the nature of the road network enhanced their physical accessibility to facilities such as education, health and market centres since there were no developed potholes as well and the road was not dusty or muddy during the dry and rainy seasons, respectively. Consequently, they have regular access to transport services within the

communities. The other majority (85%) of the respondents stated that the nature of un-engineered roads inhibited their physical accessibility to essential infrastructural facilities such as education, among others (Refer to Table 3.1). Generally, the physical accessibility of residents in the community is impeded due to the poor nature of the road network; the road networks have developed potholes, very muddy during rainfall, making maneuverability difficult for motorists.

Table 3.1: Nature of Physical Access on the Road Networks

Variable	**Nature of Physical accessibility to facilities**		
Types of road networks	Yes	No	Total
Engineered Road	65%	35%	100%
Un-engineered Road	15%	85%	100%

Sources: Field Survey, 2022

The in-depth interview of the Akwamuhene of Old Edubiase community expressed his dissatisfaction with the road conditions in the following words:

> *"The road becomes flooded with water anytime it rains. Also, the road becomes very muddy, such that it becomes very inaccessible to vehicles".*

He also iterated that due to the poor nature of the road and potholes in the area, inhabitants were exposed to accidents, people with emergency cases even died on their way to health facilities and that some pregnant women delivered prematurely due to the delay on the road and difficulties in getting a vehicle to convey them to Fomena Health Centre and Bekwai Government Hospital. The Ashanti Regional Feeder Roads Department have not tried to rehabilitate the road to enhance its condition. Funds from the government for roads are not forthcoming, leaving bad roads in their poor state. A plausible explanation is that the communities along the un-engineered road network are not producing any goods or services that are of high economic value to merit investment in their road networks. Consequently, the road network is left in a poor state with its associated negative effects on members of the communities and adjoining areas. The outcome of the study is consistent with the findings of Berg and Ihlstrom (2019), who established that most rural roads are in poor condition in the northern part of Ethiopia. Similarly, Starkey and Hine (2022) argued that more than 40% of rural roads in Nepal are in poor condition, with the negative consequence on access to education and healthcare services.

The field investigation revealed that the un-engineered road network from Kyeaboso to Akrokerri, marked in Figure 1.1, was impassable during the rainy season, due to floods and gullies, thereby making it impossible for vehicles to ply the road. Though the 25-kilometre stretch of road network is accessible during the dry season, it becomes dusty, thereby predisposing the road users to respiratory diseases. This finding is consistent with the study by Afukaar et al. (2019), who established that the road network connecting Gyasikrom to Goaso, which is about 19 kilometers long and an unpaved feeder road, becomes impassable during the rainy season, most especially with its associated negative effects, such as inaccessibility to essential social infrastructure.

Impacts of road infrastructure on agricultural activities

Agricultural activities were the mainstay of the economy of the inhabitants of the study area since they were involved in the cultivation of crops such as cash crops (citrus, cocoa, etc.) and food crops such as plantain, cocoyam, maize, cassava and yam. Therefore, they require access in the form of good road networks to market their food produce and get farm inputs such as fertilizers. For instance, about 95% of the respondents along the engineered road stated that the engineered road network impacted their farming activities positively (refer to Table 3.2). However, this was not the case according to the household survey conducted. For instance, about 85% of the respondents stated that the unimproved road networks impeded their ability to transport their food products to the markets for sale and easy access to farm inputs from market centres and towns (refer to Table 3.2). The situation was worsened by the inability of traders to purchase farm produce directly from the farmers, as well as their inability to easily carry their harvested produce to market centres such as Bekwai, Akrokerri, Fomena and the like.

Similarly, bush paths leading to various farms are greatly underdeveloped in communities such as Kyeaboso, Old Edubiase and Sodua, thereby making it very difficult for farmers to commute to their farms in the hinterlands, especially during rainy seasons. This phenomenon has to some extent contributed to postharvest loss for farmers in the study area. The challenges inhibiting farming activities included irregular transport services and the wastage of farm produce on transit due to the non-motorable road network and conditions. An interview with an official of the Agricultural Department of the Adansi North District showed that:

> *"Farming communities located along un-engineered road networks are unable to sell their goods on time due to the poor nature of the road networks. Therefore, most of the farm produce gets spoiled, particularly perishable farm produce such as vegetables, resulting in post-harvest loss"* (Agricultural Department of the Adansi North District).

This finding resonates with the findings of Jemal and Genet (2019), Okoko (2011), Asafo-Adjei et al. (2020), and Asafo-Adjei (2020), who established that the lack of all-weather roads not only limits access to farmland but also increases transportation costs to markets and agricultural service centres, thereby limiting productivity and profitability.

Table 3.2: Impacts of road infrastructure on agricultural activities

Variable	**Impact on road networks from farming activities**		
Categories of Respondents	Yes	No	Total
Respondents along the engineered Road	95%	5%	100%
Respondents along an un-engineered Road	15%	85%	100%

Sources: Field Survey, 2022

Impacts of road infrastructure on annual Farm produce

According to Berg et al. (2018), the nature of rural road infrastructure affects their agricultural activities. The field survey conducted revealed that (60%) of the farmers produced between 10-20 bags of cocoa yearly before the improvement of the roads, with a minority (15%) of the farmers producing between 20-30 bags annually (refer to Table 3.3). Notwithstanding, this trend is not different from cocoa-producing communities along an un-engineered road network. For instance, on average, about 20 bags of cocoa were produced annually.

The factors accountable for this phenomenon, as established by the outcome of the field survey, were that farmers were unable to cultivate more land since they were inaccessible. Worst of all, vehicles get stuck in cocoa farms during the rainy season in the course of transporting the farm produce, thereby resulting in the food produce getting rotten on the farm. This finding resonates with the finding of Angmor (2012), who established that adequate road transportation led to the development of agricultural activities in the form of enhancing farmers' access to farm inputs within a reasonable time, among others, at Esa-Odo in Osun State, Nigeria.

On the other hand, following the improvement of the roads connecting the communities, the total quantity of cocoa produced annually increased by more than 10-fold, thus increasing incomes. For instance, the majority (50%) of the farmers produced between 40-50 bags annually, whereas the minority (5%) produced between 10-30 bags of cocoa within the Adansi North District (refer to Table 3.3). On average, about 400 bags of cocoa are produced annually by farmers in the study communities. The improved road networks enhanced access to large acres of uncultivated lands, which were eventually cultivated. For instance, the respondents stated that the improved roads allowed some traders to directly come to the farm to buy farm produce, purchase vehicles, produce along the roads and some also come to the farm to carry the farm produce home, as well as purchase farm inputs, which are directly delivered to the farm due to the improved nature of the roads. For instance, a respondent (Cocoa Farmer) stated the following;

"We have easy access to farm inputs, especially pesticides and herbicides to apply on our farms. Aboboya easily comes to our farm to deliver the purchased farm inputs. Most importantly, Aboboya comes to our farm to convey the fermented cocoa beans to the house and dry them." (Assemblymember from Ayaase).

This finding is consistent with that of Bonsu (2014), who established that improved road transport infrastructure enhances the easy transportation of farm produce, which is intended to increase agricultural production and incomes.

Table 3.3: Level of Cocoa production in the Communities

Quantity Produced	Percentage	Quantity Produced	Percentage
Before road improvement		**After road improvement**	
1-10bags	25%	10-40bags	5%
10-20bags	60%	40-50bags	20%
20-30bags	15%	50-60bags	50%
31+ bags	-	61+ bags	25%
Total	100%	Total	100%

Sources: Field Survey, 2022

Impacts of road infrastructure on annual Income earned from Farming activities

Poor road networks hinder the transportation and marketing of farm produce, with the consequence being less income for farmers (Kyeyamwa et al., 2008). Therefore, improved access to markets improves access to markets for agricultural produce and facilitates access to modern techniques, farm inputs and extension services, which potentially boost commercial agriculture Minten et al., 2013; and Damania et al., 2017), and contributes to increased incomes (Angmor, 2012; Damania et al., 2017). The study revealed that the farmers from the study communities along the un-engineered road network earned less money from their farming activities, particularly cocoa farming. For instance, a majority (45%) of the farmers earned between GH₵2,100-GH₵4,000, followed by GH₵4,100-GH₵6,000 (30%), Less than GH₵2,000 (23%), with a minority of 2% of farmers earning GH¢12,100 and more annually (refer to Table 3.4). The cocoa farmers stated that due to the unimproved road networks, large tracts of potential farmland remain largely inaccessible and uncultivated. Also, the farmers lacked easy access to farm inputs needed for farming purposes. For instance, a cocoa farmer, who doubles as the Odikro of Sodua, stated the following during an in-depth interview;

"*We, as cocoa farmers, find it difficult to buy pesticides and herbicides to apply on cocoa farms due to the nature of the roads, especially during the rainy season. As you know, cocoa is a delicate farm produce; therefore, if you do not apply pesticides and herbicides in time, it affects the yield.*

(Assembly Member (Cocoa Farmer) from Sodua)

Conversely, farmers from communities connected by engineered roads earn more money annually from their farming activities (refer to Table 3.4). This is because cars and tricycles easily access the farmlands and transport their farm produce to market centres fast and reliably. Also, the market centres became easily accessible all the time, irrespective of the weather conditions and hence easy access to the market centres without any delays or hindrances concerning the transportation of farm produce. Thus, the engineering works carried out on the roads were purposely to improve them, making them all-weather roads without developed potholes, reducing transport costs and enhancing access to the market centres. Yeboah (2015) established that farming activities along a good road network boomed, which translated into high income for the farmers in Jaman South District of Ghana.

Table 3.4: Annual Income earned by Cocoa Farmers'

Income Earned	Percentage	Income earned	Percentage
Un-engineered Road		**Engineered Road**	
Less than GH₵2000	23%	Less than GH₵2000	-
GH₵ 2100-GH₵4000	45%	GH₵ 2100-GH₵4000	-
GH₵4100-GH₵6000	30%	GH₵4100-GH₵6000	5%
GH₵6100-GH₵ 8000	-	GH₵6100-GH₵8000	20%
GH₵8100-GH₵12000	2%	GH₵8100-GH₵12000	40%
GH12,100 +	-	GH12,100 +	35%
Total	100%	-	100%

Sources: Field Survey, 2022

Impacts of road infrastructure on access to Markets

From the survey conducted, about 80% of the residents located along the engineering road stated that the rehabilitation of the road networks enhanced the marketing of their farm produce (refer to Table 4.9). Additionally, the rehabilitation of the networks resulted in the marketing of items along roadsides. For instance, activities such as petty trading in the sale of farm produce (palm oil, plantain, cocoyam, etc.) sprang up along the stretch of roads connecting Kusa and Denkyie due to their good and dust-free nature. For instance, during the field survey, about 30 and 25 individuals were engaged in the sale of food produce as well as the marketing of other items along the roadsides at Kusa and Denkyie, respectively.

The outcome of the household survey further revealed that 20% and 80% of the respondents stated that the conditions of their respective road networks affect access to market facilities positively and negatively, particularly for communities without market facilities and hence have to cover a long distance to access market facilities in neighbouring communities (refer to Table 4.5). Additionally, due to the poor nature of the road networks, they were unable to market their farm produce, as well as other items along the roadside, to earn a living. Kyeaboso, Old Edubiase and Sodua were connected by an un-engineered road (see figure 1.1). Sodua was difficult to access, thereby making traders challenged with cart goods to market facilities and urban centres.

Comparatively, residents in communities connected with engineered roads had easy access to market facilities, whereas communities connected with un-engineered roads had difficulties accessing market facilities. For instance, respondents from communities connected by engineered roads stated that cars and tricycle carry their goods to the market fast and reliably, the market centres are accessible all the time irrespective of the weather conditions and farmers have easy access to farmlands directly to purchase farm produce in bulk and there is easy access to the market centres without any delays or hindrances concerning the transportation of farm produce and cocoa. This is because the improvement of the road networks enhanced easy access to the market centres with its associated positive effects, such as fewer transport costs and less time associated with the transportation of goods, as well as access to reliable transport services.

On the other hand, the inhabitants of communities such as Kyeaboso and Old Edubiase, without market centres, are challenged with both physical and economic access to neighbouring market centres as well as a ready market for produce due to the inaccessibility of the roads during the rainy season, high transport costs associated with the transportation of farm produce and unreliable transport services. For instance, the respondents stated that potholes are a major problem in accessing the market, in addition to the transport cost being expensive due to the poor conditions of the road networks connecting the market centres. These findings are consistent with the findings of Berg et al. (2018), who established that most developing countries in Africa lack access to market centres primarily due to poor transport infrastructure. Similarly, the outcome of studies is consistent with Atuoye et al. (2015) and Danso-Wiredu (2011), who established that most rural areas in Ghana lack access to vital infrastructural facilities such as market centres due to poor rural transport services. Consequently, Hine (2014) stated that the poor road infrastructure confronting rural areas in Ghana comes with a plethora of transport challenges, such as the non-availability, unpredictability, and high transport fares of rural transport services (Hine, 2014).

Impacts of road infrastructure on access to Farm inputs

According to Inoni and Omotor (2009) and Jemal and Genet (2019), access to farm inputs is essential for farmers to support their farming activities, particularly, rural areas. In the view of Adedeji et al. (2014), farming communities located along a good road network have easy access to farm inputs compared to farming communities located along un-engineered road networks. The outcome of the field survey revealed that communities located along the engineered road had easy and fast access to farm inputs to support their farming activities (refer to Table 3.6). This is because they had easy access to farm inputs from suppliers in the community, as well as markets located in the communities, due to the good nature of their road networks. Thus, farmers from farming communities such as Denkyie, Kusa and Ayaase had easy access to farm inputs during the farming season. For instance, a participant stated the following;

"Farmers from Denkyie, Kusa and Ayaase have easy access to farm inputs during the farming season. Our road networks are good, so farmers easily travel to neighbouring communities to purchase farm inputs when the need arises" (Assemblyman of Kusa).

On the other hand, farmers from farming communities located along the un-engineered road networks lack easy access to farm inputs (refer to Table 3.6). The situation is worsened for farmers in communities without market facilities. For instance, farmers

from communities such as Kyeaboso and Old Edubiase without market centres are challenged with both physical and economic access to neighbouring market centres to purchase farm input due to the inaccessibility of the roads during the rainy season, especially. For instance, a participant stated the following;

"Farmers in this community lack easy access to farm inputs during the farming season. Most of us farmers often travel as far as to Fomena, Bekwai or even to Kumasi to purchase farm inputs" (Chief of Edubiase).

Table 3.6: Impacts of road infrastructure on access to Farm produce

Variable	Impact on access to Farm inputs		
Categories of Respondents	Positively	Negatively	Total
Respondents along the engineered Road	75%	25%	100%
Respondents along an un-engineered Road	15%	85%	100%

Sources: Field Survey, 2022

Impacts of road infrastructure on access to social services (Health and Education)

In the development of rural areas, transportation plays a crucial role (Okoko, 2011). It is crucial in putting land into production, marketing agricultural goods and developing industries, as well as in expanding trade, implementing health and education programs and exchanging ideas (Olawole et al., 2010; Inoni and Omotor, 2009). According to Adedeji et al. (2014), the main de facto market force and the development of rural areas is transportation. Additionally, the existence of growth poles or a vibrant economic activity within a particular area within a region can also stimulate the provision of road infrastructure as well as vital infrastructural facilities (Adedeji et al. 2014). They further reiterated that the provisions of road infrastructure stimulate the provision of infrastructural facilities such as schools, electricity and water.

Therefore, it is expected that communities connected by engineered roads are expected to be provided with all the needed social infrastructural facilities. On the reverse, communities without access to improved road networks are expected to lack access to all the essential social infrastructural facilities. However, that is not the case as the outcome of the household survey conducted revealed that communities such as Kusa and Ayaase along engineered road networks are provided with educational facilities that range from pre-school to basic level education. Denkyie, which also has an engineered road, has no school, but has access basic school in Kusa, which is a neighboring community. Because of the good nature of the road, students walk to school without difficulty, whereby no dust or inconvenience is encountered. Thus, the provisions of the engineered roads contributed to and stimulated the provisions of these educational facilities in the communities or made it easy to access schools in neighbouring towns.

On the other hand, communities such as Kyeaboso, Old Edubiase and Sodua that are located along un-engineered road networks do not have public educational facilities that range from pre-school to a basic level (Junior High School). This finding resonates with the findings of Ibrahim (2011) and Sileshi and Tebarek (2017), who stated that rural residents with access to all-weather road networks have been able to access essential social services such as education and health care services due to efficient transportation infrastructure. In the view of Okoko (2011), rural residents with poor road infrastructure have limited access to education facilities and health delivery primarily due to the high cost of transport. Similarly, Asafo-Adjei (2020) argued that only a handful of rural roads are passable during rainy seasons, thereby isolating these communities from the rest of the other settlements (Yeboah, 2015).

In terms of health facilities, residents within the communities, such as Denkyie, Sodua, Kyeaboso and Old Edubiase communities, do not have a CHPS compound but access health care services at Fomena and Bekwai when the need arises. This means that communities along both engineered and un-engineered roads are not provided with all the necessary social infrastructural facilities, like health and educational facilities. It is therefore inferred that the provisions of all-weather road networks do not necessarily stimulate the provisions of social infrastructural facilities but may enhance access to these facilities in neighboring areas.

To test if there is any significant association between engineered roads and the provisions of social infrastructural facilities, a simple linear regression test was conducted. The result of the regression model below shows a positive correlation between engineered road networks and the provision of social infrastructural facilities. The relationship is statistically insignificant ($p>0.05$) (Refer to Table 3.7). This implies that a good road infrastructure necessarily stimulates the provision of social infrastructure in the long run. However, the provision of essential infrastructural facilities is determined by several factors such as the threshold population of the said community, the location, the role of the community and the nature of economic activity ongoing in the community (Moeketsi, 2017; Agbigbe, 2016; Pradhan and Bagchi, 2013).

Table 3.7: Model Summary

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. E	Beta		
(Constants)	1.800	0.424		4.243	.004
Provisions of Social Infrastructural Facilities	0.600	0.278	0.478	1.440	0.9

Dependent Variable: Provisions of Social Infrastructural Facilities

CONCLUSION AND RECOMMENDATIONS

This paper examined how road infrastructure and inclusive rural transformation are connected in the background of developing economies, using the Adansi North District in Ghana as the case study. The research aimed to understand the character of road infrastructural development and its impacts on inclusive rural development, to assess the impacts of the enhanced road networks on agricultural and non-agricultural development on socio-economic development and to evaluate the disparities in access to healthcare services and education along engineered and non-engineered road corridors. The results showed that communities with better road networks enjoyed increased accessibility to important infrastructural facilities such as markets, schools and health care services and had a positive spillover to their core economic development, specifically agricultural production. The endemic underdevelopment of the communities situated on the un-engineered roads corresponds with the theoretical assumptions of the urban bias thesis, which states that resources are systematically transported out of the underdeveloped periphery to the more developed centers, which in turn triggers the continuance of spatial inequalities and provides fewer chances of inclusive growth (Lipton, 1965; Lehmann, 1980a; Ahiakpor, 1985). On the other hand, societies that lacked enhanced road networks faced a big rift in access to basic social amenities, especially markets, educational institutions and medical services. Although traditional wisdom dictates that communities that are better equipped with road infrastructure should be prioritised to receive social infrastructure (Banerjee et al., 2020; Blankespoor et al., 2017; Beyzatlar and Kustepeli, 2011), the research findings are in opposition to this perception, as unimproved and improved road network-linked communities did not equally receive infrastructural facilities such as CHPS compounds. This gap implies that road infrastructure itself does not precondition the inclusive access to social services but rather exists as a complex system of predeterminants such as the population threshold requirements, geographic location, the role of the community in the overall economic system and the character of local economic activity (Berg et al., 2018; Moeketsi, 2017; Agbigbe, 2016; Pradhan and Bagchi, 2013). The simple linear regression analysis established that there was a positive correlation between the engineered road networks and the provision of the social infrastructure, but the correlation did not prove to be statistically significant ($p>0.05$). This indicates that, despite the need to develop road infrastructure, this alone is not sufficient to bring about the actual inclusive rural transformation unless other complementary factors are addressed at the same time, as they must together establish equitable access to basic services and economic opportunities.

Policy Recommendations

The findings of the study imply some important policy implications for infrastructure-based inclusive growth in emerging economies. The Ghana Cocoa Board, in conjunction with the Department of Feeder Roads, ought to focus on the restoration of the degraded road networks in the cocoa-producing regions as part of improving the farm output and access to the market. The Ministry of Local Government and Rural Development should devise an elaborate rural development model that may perceive transportation infrastructure as a driving force of rural change. The Ministry of Roads and Highways also need to develop an integrated national transport policy that focuses on systematic upgrading of the feeder roads by making use of evidence-based planning and equal resource distribution. Strategic investment in rural road infrastructure is a key channel through which spatial inequalities can be minimized and balanced national development ensured.

REFERENCES

1. *Abdulkadir, B. U. (2014). Analysis of the condition of rural road transport in Kwara State, Nigeria. European Scientific Journal, 10(5), 288-307.*
2. *Adarkwa, K. K. (2003). Dusty roads, rickety trotros and survival: Understanding the nexus between road transport investments and poverty reduction in Ghana (Professorial Inaugural Lecture). Kwame Nkrumah University of Science and Technology Kumasi University Printing Press.*
3. *Adarkwa, K. K., & Tamakloe, E. K. (2004). National rural transport policy and strategy document: Volume one, main report. Ministry of Roads and Transport/Department of Feeder Roads.*
4. *Adedeji, O. A., Olafiaji, E. M., Omole, F. K., Olanibi, J. A., & Yusuff, L. (2014). An assessment of the impact of road transport on rural development: A case study of Obokun Local Government Area of Osun State, Nigeria. British Journal of Environmental Sciences, 2(1), 34-48.*
5. *Adeniyi, J. O., Akinrinmade, Y., & Abiodun, A. L. (2018). Analysis of road transport impact on rural development in Nigeria: A study on Akure North Local Government Area, Ondo State. International Journal of New Technology and Research, 4(3), 102-110.*
6. *Adomako, S. V. (1986). Role of feeder roads in rural development [Unpublished B.Sc. (Planning) Special Study]. Department of Planning, Kwame Nkrumah University of Science and Technology.*
7. *Adom-Asamoah, G. (2016). Impact of road investment on the achievement of the millennium goals: The case of selected feeder roads in Ghana [Doctoral dissertation, Kwame Nkrumah University of Science and Technology].*
8. *Afukaar, F., Damsere-Derry, J., Peters, K., & Starkey, P. (2019). Rural transport services indicators: Using a new mixed-methods methodology to inform policy in Ghana. Transportation Research Interdisciplinary Perspectives, 3(1), 1-12.*
9. *Agarwal, S. (2019). Pre-post rural development. International Journal of Socio-Legal Analysis and Rural Development, 2(1), 97-106.*
10. *Agbigbe, S. A. W. (2016). The impact of transportation infrastructure on Nigeria's economic development. Walden University Press.*
11. *Ahiakpor, J. C. W. (1985). The success and failure of dependency theory: The experience of Ghana. International Organization, 39(3), 535-552.*
12. *Ale, A. S. (2013). Rural transportation to food crop production. Journal of Environment, 2(5), 112-117.*
13. *Ali, R., Barra, A. F., Berg, C. N., Damania, R., Nash, J., & Russ, J. (2015). Highway to success or byways to waste. The World Bank.*
14. *Amo, T., & Meirmanov, S. (2014). The epidemiology of road traffic accident (RTA) in Ghana from 2001-2011. Life Science Journal, 11(9), 35-55.*

15. *Andreosso-O'Callaghan, B., & Lenihan, H. (2008). Networking: A question of firm characteristics? The case of the Shannon region in Ireland. Entrepreneurship and Regional Development, 20(6), 561-580.*
16. *Anega, N. (2016). The effect of accessibility and mobility in rural road transport on agricultural efficiency and commercialization of smallholder farmers in Ethiopia. SAGE Publications.*
17. *Angmor, E. (2012). Can traditional markets be improved through transportation services: The case of Asesewa and Agormanya traditional markets, Ghana? International Journal of Academic Research in Business and Social Science, 2(6), 2222-6990.*
18. *Angmor, E. N. (2012). The role of road transportation service in the development of traditional market's: A case of Asesewa and Agormanya traditional markets in the Eastern Region, Ghana [Master's thesis, Kwame Nkrumah University of Science and Technology]. http://www.knust.thesis.com*
19. *Arethun, T., & Bhatta, P. B. (2012). Contribution of rural roads to access to and participation in markets: Theory and results from Northern Ethiopia. Journal of Transportation Technologies, 2(2), 165-174.*
20. *Arnott, R., & Kraus, M. (2003). Principles of transport economics. In R. W. Hall (Ed.), Handbook of transportation science (2nd ed.). Kluwer.*
21. *Asafo-Adjei, C. K. (2020). Accessibility and transport challenges facing rural people living along feeder roads in Ghana. Civil Engineering and Architecture, 8(2), 127-135.*
22. *Asafo-Adjei, C. K., Iyer-Raniga, U., & Aranda-Mena, G. (2020). Accessibility and transport needs of rural people in Ghana: How relevant are appraisal models. Civil Engineering and Architecture, 8(2), 127-135.*
23. *Asogwa, B. C., Ezihe, J. A., & Ater, P. I. (2013). Socio-economic analysis of cassava marketing in Benue State, Nigeria. International Journal of Innovation and Applied Studies, 2(4), 384-391.*
24. *Atkinson, A. B., & Stiglitz, J. E. (1980). Lectures on public economics. McGraw-Hill.*
25. *Atuoye, K. N., Dixon, J., Rishworth, A., Galaa, S. Z., Boamah, S. A., & Luginaah, I. (2015). Can she make it? Transportation barriers to accessing maternal and child health care services in rural Ghana. BMC Health Services Research, 15(1), 333.*
26. *Banerjee, A., Duflo, E., & Qian, N. (2020). On the road: Access to transportation infrastructure and economic growth in China. Journal of Development Economics, 145, 102442.*
27. *Banik, B. K., Chowdhury, M. A. I., Hossain, E., & Mojumdar, B. (2011). Road accident and safety study in Sylhet Region of Bangladesh. Journal of Engineering Science and Technology, 6(4), 493-505.*
28. *Barnhardt, S., Field, E., & Pande, R. (2014). Moving to opportunity or isolation? Network effects of a slum relocation programme in India (Working Paper 2014-11-01). Indian Institute of Management, Research and Publication Department.*
29. *Batuo, M. E. (2015). The role of telecommunications infrastructure in the regional economic growth of Africa. The Journal of Developing Areas, 49(6), 313-330.*
30. *Beans, P. (2015). Feeder roads development in Ethiopia: An analysis of the impact of feeder roads development on creating new employment opportunity in Ethiopia. University of Utrecht Press.*
31. *Bell, E., & Bryman, A. (2007). The ethics of management research: An exploratory content analysis. British Journal of Management, 18(1), 63-77.*
32. *Berg, C. N., Blankespoor, B., & Selod, H. (2018). Roads and rural development in Sub-Saharan Africa. The Journal of Development Studies, 54(12), 1-20.*
33. *Berg, J., & Ihlstrom, J. (2019). The importance of public transport for mobility and everyday activities among rural residents. Social Sciences, 8(2), 58.*
34. *Berglund, K., Gaddefors, J., & Lindgren, M. (2016). Provoking identities: Entrepreneurship and emerging identity positions in rural development. Entrepreneurship and Regional Development, 28(1-2), 76-96.*
35. *Beyzatlar, M. A., & Kustepeli, Y. R. (2011). Infrastructure, economic growth and population density in Turkey. International Journal of Economic Sciences and Applied Research, 4(3), 39-57.*
36. *Bhatta, J. (2004). Theorizing community development. Journal of the Community Development Society, 34(1), 5-34.*
37. *Blankespoor, B., Mesplé-Somps, S., Selod, H., & Spielvogel, G. (2017). Roads and structural transformation in Mali. Journal of African Economies, 22(suppl_2), ii57-ii83.*
38. *Blaxter, L. (2001). How to research. Open University Press.*
39. *Boansi, D. (2013). Competitiveness and determinants of cocoa exports from Ghana. International Journal of Agricultural Policy and Research, 1(10), 236-254.*
40. *Bonsu, D. (2014). Road transport and agriculture: A comparative study of the implications of road access for subsistence agriculture in Northern Ghana [Master's thesis, University of Bergen].*
41. *Boslaugh, S. E. (2012). Secondary data sources. SAGE Publications.*
42. *Brink, H. I. (2006). Fundamentals of research methodology for health care professionals (2nd ed.). Juta Publications.*
43. *Bryceson, D. F., Bradbury, A., & Bradbury, T. (2008). Roads to poverty reduction? Exploring rural roads impact on mobility in Africa and Asia. Development Policy Review, 28(4), 459-482.*
44. *Buragohain, T., & Landge, R. S. (2014). Measuring rural development: A qualitative approach. Journal of Land and Rural Studies, 2(1), 21-42.*
45. *Casaburi, L., Glennerster, R., & Suri, T. (2013). Rural road and intermediated trade: Regression discontinuity evidence from Sierra Leone. https://scholar.harvard.edu/files/lorenzocasaburi/files/casaburi_glennester_suri_roads.pdf*
46. *Chakwizira, J., Nhemachena, C., & Mashiri, M. (2010). Connecting transport, agriculture and rural development: Experiences from Mhlontlo Local Municipality. Journal of Business Economics and Management Studies, 1(8), 55-61.*
47. *Chakwizira, J., Whemachena, C., & Mashiri, M. (2010, August 16-20). Connecting transport, agriculture and rural development: Experiences from Mhlontlo Local Municipality integrated infrastructure atlas [Conference presentation]. 29th South African Transport Conference (SATC 2010), Pretoria, South Africa.*
48. *Chigbu, U. E. (2012). Village renewal as an instrument of rural development: Evidence from Weyarn, Germany. Community Development, 43(2), 209-224.*
49. *Cochran, W. G. (2007). Sampling techniques. John Wiley & Sons.*
50. *Collis, J., & Hussey, R. (2009). Business research. Palgrave Macmillan.*

51. *Cook, J., Huizenga, C., Petts, R., Visser, C., & Yiu, A. (2017). The contribution of rural transport to achieve the sustainable development goals. Journal of Development Economics, 81(1), 1-24.*
52. *Courtney, P., Hill, G., & Roberts, D. (2006). The role of natural heritage in rural development: An analysis of economic linkages in Scotland. Journal of Rural Studies, 22(4), 469-484.*
53. *Damania, R., Barra, A. F., Berg, C. N., Russ, J., Nash, J., & Ali, R. (2017). Agricultural technology choice and transport. American Journal of Agricultural Economics, 99(1), 265-284.*
54. *Danso-Wiredu, E. (2011). Mobility and access for off-road rural farmers in West-Akim District. Ghana Journal of Geography, 3(1), 230-249.*
55. *Dasgupta, P., Morton, J. F., Dodman, D., Karapinar, B., Meza, F., Rivera-Ferre, M. G., Sarr, A. T., & Vincent, K. E. (2014). Rural areas. In Climate change 2014: Impacts, adaptation, and vulnerability (pp. 613-657). Cambridge University Press.*
56. *DeLong, B. (2017). The benefits of free trade: Time to fly my neoliberal freak flag high. Washington Center for Equitable Growth.*
57. *Dercon, S., Gilligan, D. O., Hoddinott, J., & Woldehanna, T. (2009). The impact of agricultural extension and roads on poverty and consumption growth in fifteen Ethiopian villages. American Journal of Agricultural Economics, 91(4), 1007-1021.*
58. *Dibua, J. I. (2006). Modernization and the crisis of development in Africa: The Nigerian experience. Ashgate Publications.*
59. *Dillman, D. A., Smyth, J. D., & Christian, L. M. (2009). Internet, mail, and mixed-mode surveys: The tailored design method. Jossey-Bass.*
60. *Dimitriou, D. J., Mourmouris, J. C., & Sartzetaki, M. F. (2015). Economic impact assessment of mega infrastructure pipeline projects. Applied Economics, 47(40), 4310-4322.*
61. *Doloreux, D., & Dionne, S. (2008). Is regional innovation system development possible in peripheral regions? Some evidence from the case of La Pocatière, Canada. Entrepreneurship and Regional Development, 20(3), 259-283.*
62. *Donkor, C. F., & Owusu, S. (2014). Analysis of cocoa-based agricultural knowledge and information systems in the eastern region of Ghana. Russian Journal of Agricultural and Socio-Economic Sciences, 2(14), 34-43.*
63. *Donnges, C. (2012). Rural transport and local government units: How to improve rural transport for the rural poor? Transport and Communications Bulletin for Asia and the Pacific, 5(71), 19-28.*
64. *Ellis, S., & Hine, J. (1998). The provision of rural transport services (Sub-Saharan Africa Transport Policy Programme Working Paper No. 37). World Bank.*
65. *Emran, M. S., & Shilpi, F. (2012). The extent of the market and stages of agricultural specialization. Canadian Journal of Economics, 45(3), 1125-1153.*
66. *Fox, A., & Bayat, N. (2007). Focus on quantitative methods. Research in Nursing and Health, 18(3), 179-183.*
67. *Freshwater, D. (2015). Vulnerability and resilience: Two dimensions of rurality. Sociologia Ruralis, 55(4), 497-515.*
68. *Gannon, C., & Liu, Z. (1997). Poverty and transport (INU/TWU Series Transport Publication TWU-30). World Bank.*
69. *Ghana Cocoa Board. (2019). Cocobod annual report. Cocoa House.*
70. *Ghana Statistical Service. (2010). 2010 population and housing census district analytical report of the Adansi North District Assembly. Ghana Statistical Service.*
71. *Ghana Statistical Service. (2014). Housing in Ghana. Ghana Statistical Service.*
72. *Ghana Statistical Service. (2019). Ghana living standard survey seven (7). Ghana Statistical Service.*
73. *Gillis, M., Perkins, A., Roemer, D., & Snodgrass, P. (1996). Economics of development (4th ed.). W. W. Norton and Company.*
74. *Gollin, D., & Rogerson, R. (2014). Productivity, transport costs, and subsistence agriculture. Journal of Development Economics, 107, 38-48.*
75. *Government of India. (2012). The implication of terms used in Indian censuses. Office of the Registrar General and Census Commissioner. https://censusindia.gov.in/Data_Products/Library/Indian_perceptive_link/Census_Terms_link/censusterms.html*
76. *Hayes, A. (2022). Systematic sampling. Palgrave Macmillan.*
77. *Hellman, J., Thynell, M., & van Voorst, R. (2018). Future outlook of Jakarta in times of climate change: Jakarta claiming spaces and rights in the city. Journal of Economics, 40(3), 35-70.*
78. *Hickel, J. (2016). Neoliberalism and the end of democracy. Springer Publications.*
79. *Hill, D., & Kumar, R. (2011). Global neoliberalism and education and its consequences. Routledge Publications.*
80. *Hine, J. (2014). Good policies and practices on rural transport in Africa: Planning infrastructure and services (SSATP Working Paper No. 100). Sub-Saharan Africa Transport Policy Programme, The World Bank.*
81. *Hite, A. B. (2004). Natural resource growth poles and frontier urbanization in Latin America. Studies in Comparative International Development, 39(3), 50-75.*
82. *Holmgren, J. A. (2014). Strategy for increased public transport usage: The effects of implementing welfare-maximizing policy. Journal of Transport Economics, 5(48), 221-226.*
83. *Holsti, O. R. (2009). Content analysis for the social sciences and humanities. Addison-Wesley.*
84. *Howe, J. (2010). Socio-economic impact of alienation. Rural Travel and Transport Programme, 24-60.*
85. *Inoni, O., & Omotor, D. (2009). Effect of road infrastructure on agricultural output and income of rural households in Delta State, Nigeria. Agricultura Tropica et Subtropica, 42(2), 90-97.*
86. *International Fund for Agricultural Development. (2010). Rural poverty report 2011: New realities, new challenges: New opportunities for tomorrow's generation. IFAD.*
87. *Isac, N. (2009). Dimension of rural development. Lucrări Ştiinţifice, 1(11), 1-8.*