International Journal of Academic Research and Development
ISSN: 2455-4197; Impact Factor: RJIF 5.22
Received: 21-02-2019; Accepted: 23-03-2019
www.academicjournal.in
Volume 4; Issue 3; May 2019; Page No. 67-72

Effect of road infrastructure development on household well-being among small holder farmers in Butere sub-county

Peter Makonere Wesala[1], Dr. Julius Miroga[2], Bonface Imbali Mudi[3]
[1] Post-Graduate Student, Jomo Kenyatta University of Agriculture and Technology, Kenya
[2] Lecturer, Jomo Kenyatta University of Agriculture and Technology, Kenya
[3] Doctoral Student, Jomo Kenyatta University of Agriculture and Technology, Kenya

Abstract
The Kenyan government committed itself in the first Medium Term Plan 2008-2012 of Vision 2030, to improve and modernize Kenya's infrastructure to world-class in order for the country to achieve middle-income status and enhance welfare of her citizens. In Kenya, the number of poor people increased substantially over the ten-year period 1999-2009. Given this scenario, an explanation of this requires studying the influence of economic infrastructure development on household well-being among small holder farmers in Butere Sub-county. The specific objective of the study was to investigate the influence of road infrastructure on household well-being among small holder farmers in Butere Sub-county. The study adopted descriptive research design, which ensured ease in understanding the insight about the problem under study. Primary data from a sample of smallholder farmers within Butere Sub-county making a total of 2,183 formed the target population. A sample size of 339 respondents was used to represent the target population. A self-administered questionnaire was used for data collection since this can be send to a large number of people. The collected data was analysed using inferential as well as descriptive statistics. The study findings showed a significant relationship between road infrastructure and household well-being of smallholder farmers in Butere Sub-county. The study recommended that the Kenyan government need to ensure dedicated institutions and enabling policy and regulatory frameworks to make sure relevant institutions such as Kenya Rural Roads Authority is strengthened, with a clear mandate, authority and resources to fulfil the mandate, and accountability for achieving that mandate.

Keywords: road infrastructure development, household well-being, smallholder farmers, poverty reduction

1. Introduction

1.1 Background to the Study

Rural economic development is mainly dependent upon the development of basic infrastructure facilities mainly because it has many positive outcomes such as household well-being, productivity enhancement, improvement in quality of life, mobility and accessibility, agricultural development and rural connectivity (Siddaram, 2014) [36]. The spill-over effects generated by economic infrastructure development are highly productive for the economy, could serve as a true engine of growth and by extension poverty reduction (Nilotpal, 2013) [22]. As an essential part of a supportive environment for investment and livelihood, adequate infrastructure promotes economic growth, reduces poverty, and improves delivery of health and other services (World Bank, 2014; Wantchekon, 2014) [41, 39]. According to Stewart (2010), economic infrastructure includes energy, water, transport, and digital communications which are essential ingredients for the success of a modern economy, poverty reduction and household well-being. Economic infrastructure is critical for economic growth and poverty reduction, giving its pivotal role in improving competitiveness; facilitating both domestic and international trade, and integration of continent to the global economy (Osundina, Ebere & Osundina, 2014).

Globally, thirteen of the top twenty states as ranked by infrastructure quality are in Western Europe where absolute levels of poverty are considered lowest in the world (Schwab, 2012) [35]. The United States Department of Transportation estimated that every billion dollars invested in federal highway and transit schemes would support 13,000 jobs for one year, including direct jobs created by the project itself and indirect jobs created by spending on materials hence improving income levels of her citizens (Federal Highway Administration, 2014) [9]. A well-performing transportation network keeps jobs in America, allows businesses to expand, and lowers prices on household goods to American families (National Economic Council, 2014) [21].

In sub-Saharan Africa, the poor live in communities that lack good health care systems, deplorable road networks, lack improved water and sanitation facilities and a host of other facilities (Akanchalabey, 2015) [4]. The lack of modern infrastructure is an impediment to Africa's economic development and a major constraint on poverty reduction (United Nations Human Settlements Program, 2011) [38]. The dismal transport infrastructure picture in Africa is sadly painted in Table 1.1 which presents the continent‘s endowment relative to other regions of the world.

Table 1.1: Africa's Transport Endowment Relative to other Regions

	Sub-saharan Africa	South Asia	East Asia & Pacific	Europe & Central Asia	Latin America & Caribbean	Middle East & North Africa
Population (2007)	561	312	800	1,522	1'912	446
GNP per capita (2007)	952	880	2,180	-	5,540	-
Paved roads (% of Total - 2006)	11.9	56.9	11.4	-	22	81.0

***Source*:** World Bank (2009).

Kenya's Vision 2030 aspires for a country firmly interconnected through a network of roads, railways, ports, airports, water and sanitation facilities and telecommunications (Republic of Kenya, 2007). According to the document, to ensure that the main projects under the economic pillar are implemented in order to reduce poverty levels, investment in the nation's infrastructure will be given the highest priority (Republic of Kenya, 2007). The Medium-Term Plan targeted increased investments in the road network, water and sanitation services, rail, sea and air transport and energy supply services. According to this plan, the government also committed to attaining the target of reducing the number of Kenyans currently living below the poverty line, from 46 percent to 28 percent (Republic of Kenya, 2008). Although Kenya's infrastructure indicators look relatively good when compared with other low-income countries in Africa, they are far below the levels found in Africa's middle-income countries (Mohammed, 2015).

1.2 Statement of the Problem

The Kenyan government committed itself in the first Medium Term Plan 2008-2012 of Vision 2030, to improve and modernize Kenya's infrastructure to world-class in order for the country to achieve middle-income status (Republic of Kenya, 2008b). The government of Kenya also devoted herself to attaining the target of reducing the number of Kenyans currently living below the poverty line, from 46 percent to 28 percent. According to this plan, average annual incomes would be raised from an estimated USD 650 in 2006 to USD 992 by 2012 (Republic of Kenya, 2008b). Despite the effort and interventions by the Kenya government, poverty rates have continuously remained high (SID, 2013). In Kenya, the number of poor people increased substantially over the ten-year period 1999-2009 (Republic of Kenya, 2009a). In the Second Medium Term Plan of the Kenya Vision 2030, poverty was considered a threat to human life in spite of the policy initiatives used (Republic of Kenya, 2013).

Some of the studies that have been conducted have explored policy initiatives on household well-being; political economy of poverty reduction; poverty reduction approaches, changes in incomes and poverty among others (Cuangara & Hanlon, 2011; Nyamboga, Nyamweya, Sisia & Gongera, 2014; Ranguma, 2014; Wambua 2013). Despite these studies and their recommendations, poverty remains a challenge, indicating that there is still more that needs to be done. There is limited research linking transportation to household well-being in Butere Sub-county. This study seeks to fill this knowledge gap.

1.3 Objective of the Study

The objective of this study was to investigate the effect of road infrastructure development on household well-being among small holder farmers in Butere Sub-county.

1.4 Research Hypothesis

The null hypothesis of this study was that road development has no effect on household well-being of smallholder farmers in Butere Sub-county.

2. The capabilities approach

Capabilities Approach has been described by Robeyns (2005) as a broad normative framework for the evaluation and assessment of individual well-being and social arrangements, the design of policies, and proposals about social change in society. Well-being is best understood in terms of capabilities; that is, a person's ability to do and to be the things he/she has reasons to value (Sen, 2000). Therefore, the higher the level of a person's capabilities, the higher is the level of his/her well-being. The capabilities approach can be used to evaluate several aspects of people's well-being, such as inequality, poverty, the well-being of an individual or the average well-being of the members of a group. It can also be used as an alternative evaluative tool for social cost–benefit analysis, or as a framework within which to design and evaluate policies, ranging from welfare state design in affluent societies, to development policies by governments and non-governmental organizations in developing countries (Robeyns, 2005).

The capability approach has a key analytical distinction between the means and the ends of well-being and development, with the ends having intrinsic importance while means are instrumental to reach the goal of increased well-being, justice and development. However, in real situations these distinctions are often not clear, since some ends are simultaneously also means to other ends (Robeyns, 2005). It views goods and services as means to a certain quality of life (Anand & Sen, 2000; Sen, 2000). It also recognizes the influence of social and environmental conditions and conceives capabilities as the solution for evaluating quality of life for human beings (Voget-Kleschin, 2013). Capabilities can be enhanced through a number of interventions including enhancing peoples' choices and involving people in the development of poverty reduction strategies. Since poverty can be understood in the widest sense as a very low level of well-being, it can also be seen as the failure to achieve certain basic needs (Osmani, 2005).

Ibrahim (2006) has emphasized the intrinsic and instrumental importance of social structures; the significance of collective freedoms and collective agency, and the roles of collective action, institutions and social capital in generating new collective capabilities as opposed to individual capabilities. He recognized the fact that development is perceived as the process of expanding people's capabilities to help them achieve the lives they value. This process of capability expansion is highly dependent on the social, economic and political contexts in which these individuals live, and in many developing countries the use and exercise of human capabilities usually

takes place in a collective setting.

3. Review of Literature

Evidence on the impact of road infrastructure on poverty levels can be traced to the studies about the impact of railroads on economic growth in the US in the 19th century (Fogel, 1964; Fishlow, 1965). In his papers, Fogel (1964) used quantitative analysis to measure what would have been the impact of railroads and compared this transportation with river boats. Some studies have found that roads and highways are beneficial to suburbanization, skill premium, industrial earnings, GDP and household income (Michaels, 2008). Around 20 percent of World Bank lending has, in recent years, been devoted to transportation infrastructure projects which represents a larger share than that of the resources allocated to health, education and social services combined (World Bank, 2007). One of the main economic justifications for road construction is that road infrastructure is said to be a determining factor of growth and poverty reduction (Burgess, Jedwab, Miguel & Morjaria, 2010).

Rural roads have shown to be more efficient to reduce poverty in less developed countries (Aggarwal, 2014). Aggarwal (2014) found that in India, rural roads changed the consumption of the poor by replacing their diet with more and better grains. Moreover, farmers increased their agricultural productivity because they were more likely to adopt hybrid seeds and fertilizers. When road transport steps up, government charge toll tax to earn revenue, and a part of it contributes to gross domestic capital formation of the country (Pradhan & Bagchi 2013).

In a similar study on infrastructure and economic growth in Egypt, Loayza and Odawara (2010), avers that road infrastructure promotes market integration by improving connectivity and reducing transportation time, which in turn reduces the costs of production, and leads to price convergence and poverty reduction. The study reveals that on the demand side, infrastructure increases the effective demand by stimulating employment during and after the construction of infrastructure. Most of the studies on evaluation of transportation infrastructure have analyzed the effects of roads through the use of market channel (OECD, 2006).

A study by Worku (2011) analysed the impact of roads sector development on economic growth in Ethiopia. The study used time series data on the country's road network and GDP growth over the period 1971-2009. The author uses total road network per worker and he also tests the significance of paved and gravel roads independently. Results from a two-step Generalized Method of Moments (GMM) estimator show that paved roads have positive and significant impact on economic growth while gravel roads do not. Although he finds a positive impact of road on overall GDP, it does not show the variation in road access in different parts of the country and how this might affect economic performance at lower levels of administrative units. The total length of paved roads per 10,000 inhabitants in Kenya is 2.19km, which is less than the East African Community member countries' average of 2.53km (African Development Bank, 2014). It would be interesting to find out, as we try to do in this study, whether development of road infrastructure has contributed to improved household well-being levels in Kenya.

Akinlabi *et al.* (2011) examined economic infrastructure as an approach to poverty alleviation and economic growth in Nigeria. They adopted Vector Autoregressive (VAR) framework. They equally used real per capita expenditure on economic service and real per capita income on social and economic services as proxy to infrastructure. They used level of fiscal deficit to proxy quality of governance with the assumption that in any economy where level of economic infrastructure leads to poverty alleviation, the quality of governance must be a contributing factor. They found out that; economic infrastructure granger causes poverty alleviation directly through economic growth, fiscal deficit does not granger-cause poverty alleviation and they concluded that, continuous increase in economic infrastructure would alleviate poverty in Nigeria.

In a recent study on the nexus between infrastructure investment and economic growth in the Mexican urban areas, German and Barajas (2014) found that rural areas in Mexico with more infrastructure had higher rates of growth and poverty reduction. In the long run, when the infrastructure was insufficient or inadequate, the returns of transportation infrastructure were lower and represented a restriction to economic growth. Canning and Pedroni (2008) conducted Granger causality test between investments in three types of economic infrastructure i.e., kilometers of paved road, kilowatts of electricity generating capacity, and number of telephones based on data from a panel of 67 countries for the period 1960-1990. They found strong evidence in favor of causality running in both directions between each of the three infrastructure variables and GDP among a significant number of the countries investigated.

Mudi, Sakwa and Mukulu (2019) investigated income level effect of rural electrification on the household well-being in Kenya. Pearson correlation analysis showed that there was a general moderate positive relationship between income level effects of rural electrification and household well-being of proprietors of micro and small enterprises. Combined multiple regression analysis revealed that there was a significant positive relationship between income level effect and household well-being of proprietors of micro and small enterprises. It was concluded that income level effects have an influence on household well-being of proprietors of micro and small enterprises in Kenya.

In a similar study, Mudi, Waswa and Nabwayo (2018) evaluated access to credit influence on subjective well-being of women employees in the county government of Kakamega. The study embraced descriptive survey design. Data was analyzed using inferential and descriptive statistics. The study applied chi-square technique to evaluate access to credit influence on subjective well-being among women employees in the County Government of Kakamega. The study findings showed a significant relationship between access to credit and subjective well-being.

4. Research Design

Kothari and Garg (2014) [14] defines research design as the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. Descriptive research design was used in this study. According to Creswell (2003) [8], descriptive research designs are used to allow researchers to gather information, summarize, present data, and interpret it for the purpose of clarification. This design is appropriate for this study since Zikmund (2003) note that descriptive research design is intended to produce statistical information about the aspects of the research issue (in this case

household well-being among smallholder farmers) that may interest policy makers.

4.1 Target Population

Population refers to all the items under consideration in any field of inquiry (Kothari & Garg, 2014) [14]. A study population is a group of individuals taken from the general population who share a common characteristic (Sekara & Bougie, 2010). The target population for this study included 2,183 smallholder farmers in Butere Sub-county registered with the National Cereals and Produce Board of Kenya in March 2017. The choice of Butere Sub-county was motivated by the fact that Kakamega County where Butere Sub-county is found, was ranked top on the Contribution to National Poverty and County Ranking (Republic of Kenya, 2014) [33].

4.2 Sampling Frame

A sampling frame consists of a list of items from which the sample is to be drawn (Kothari & Garg, 2014) [14]. The sampling frame of this study consisted of 2,183 smallholder farmers in the five Wards of Butere Sub-county as shown in Table 3.2.

Table 3.2: Population Sampling Frame

	Sub-county	Population	Sample pop.	% of pop.
1	Shianda Marenyo	457	71	20.9
2	Marama South	282	44	13.0
3	Marama North	486	75	22.1
5	Marama West	515	80	23.6
6	Marama Central	443	69	20.4
7	Total	2,183	339	100

4.3 Sample and sampling technique

Sampling technique is the process of selecting respondents that constitute a sample (Kothari & Garg, 2014). In deriving the sample from the sample frame, Yamane (1967) statistical formula was employed since the target population (2,183) is less than 10,000.

$$N = N/ (1+N (e)^2)$$

Where; N: Sample size
N: Population under study
E: Margin error (0.05)
1: Constant

A margin error of 0.05 was used to compute the sample size, which according to Yamane (1967) gives the largest sample size at a given confidence level. Substituting the margin error of 0.05 and the target population of 2,183 in the formula above gives a sample size of 339. This study therefore used a sample population of 339 respondents for data collection which is equivalent to 15.6 percent of the target population. This sample size was considered sufficient since Mugenda and Mugenda (2003) proposes that a sample of 10 percent of population is considered the minimum for a descriptive research.

5. Findings and Discussion

5.1 Results of Diagnostic Tests

5.1.1 Reliability Test Results

Table 4.1: Internal Consistency: Cronbach's Alpha Results for the Questionnaire

Scale	No. Items	Cronbach's alpha	Conclusion (Reliable/Unreliable)
Road Development	10	.855	Reliable
Household Well-Being	8	.865	Reliable

***Source*:** Author (2018)

Table 4.1 which shows the Cronbach's alpha for all the subscales reveals that the instruments had adequate reliability for the study. Deleting any of the items would not cause improvement in the internal consistency. All the subscales had Cronbach's alpha of greater than 0.7, which is adequate.

5.1.2 Correlation Analysis for Road Development and Household Well-being

To investigate whether there was any statistical significant effect of road development on household well-being of smallholder farmers in Butere Sub-county, the null hypothesis that *"road development has no effect on household well-being of smallholder farmers in Butere Sub-county."* was tested. The correlation analysis result is shown in SPSS output, as indicated in Table 4.2.

Table 4.2: Relationship between Road development and Household Well-being

		Household Well-being
Road development	Pearson Correlation	.592**
	Sig. (2-tailed)	.000
	N	280

**. Correlation is significant at the 0.01 level (2-tailed).

It is evident that there was a moderate positive (r=.592, n=280, p<.05) correlation between road development and household well-being of smallholder farmers. The relationship was statistically significant; therefore, the hypothesis that, *"road development has no effect on household well-being of smallholder farmers"* was rejected. It was therefore concluded that there is statistical significant relationship between road development and household well-being of smallholder farmers, with increase in road development causing an improvement in household well-being of smallholder farmers and vice-versa.

5.1.3 Regression Analysis of Road Development and Household Well-being

To estimate the level of influence of road development on household well-being of smallholder farmers, a coefficient of determination (R Square) was computed. This was done using regression analysis and the results are tabulated in Table 4.3.

Table 4.3: Model Summary for Regression Analysis of Influence of Road Development on Household Well-being

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.537[a]	.423	.331	.46088

a. Predictors: (Constant), Road development

The model shows that road development accounted for 42.3% (R^2 = .423) of the variation in household well-being of smallholder farmers, which was a fairly large effect. However, to determine whether road development was a significant predictor of household well-being of smallholder farmers, Analysis of Variance (ANOVA) was computed as shown in Table 4.4.

Table 4.4: Anova –Influence of Road development on Household Well-being

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	31.180	1	32.180	151.499	.000[b]
	Residual	59.785	279	.216		
	Total	90.964	280			

a. Dependent Variable: Household Well-being
b. Predictors: 7 (Constant), Road development

From Table 4.4, it can be seen that road development was a significant predictor of household well-being of small holder farmers [F (1,279) = 151.499, p < .05)]. This implies that road development was a significant predictor of household well-being of smallholder farmers.

6. Findings

Respondents agreed that road development had contributed to suburbanization in rural areas that had enhanced market for farm produce. Correlation results revealed that there was a moderate positive correlation between road development and household well-being of smallholder farmers. Analysis of Variance exposed that road development was a significant predictor of household well-being of small holder farmers. This resonates with findings by Aggarwal (2014) that rural roads have shown to be more efficient to reduce poverty in less developed countries. The study also echoes the findings by German and Barajas (2014) that rural areas with more infrastructure had higher rates of growth and poverty reduction.

7. Conclusion

The first objective of the study was to investigate the effect of road infrastructure development on household well-being among small holder farmers in Butere Sub-county. The findings presented show that there is a positive significant relationship shown by a coefficient of .423 (p-value=0.01). This shows that road infrastructure development lead to a 42.3% increase in household well-being among small holder farmers in Butere Sub-county. The regression revealed that road infrastructure development was a significant predictor of household well-being among small holder farmers in Butere Sub-county.

8. Recommendations

The study is a justification of the fact that the role of road development on smallholder farmers in Kenya cannot be underestimated and has contributed to improved household well-being. Based on the findings of this study and the conclusions that have been drawn, both policy and management recommendations are made. The Kenyan government should ensure dedicated institutions and enabling policy and regulatory frameworks to make sure relevant institutions such as Kenya Rural Roads Authority are strengthened, with a clear mandate, authority and resources to fulfil the mandate, and accountability for achieving that mandate.

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