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The Infrastructural Development and Commercialization of Smallholder Dairy Farming in Uasin Gishu County, Kenya

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Abstract: Inadequate transportation infrastructure raises search and monitoring costs. The degree of the farmers particularly the smallholder farmers participation in the markets is usually affected by the state of infrastructure. The smallholder dairy producers in Uasin Gishu County, in the commercialization process are as follows: 70% subsistence, 20% semi-commercialized and 10% commercialized. This indicates that smallholder dairy producers are mainly subsistence-oriented with commercial orientation being uncommon. Therefore, commercialization of smallholder dairy farming is still low despite the concern given by the Government and other development partners in transforming the prevalent subsistence smallholder dairy farming to competitive, commercial and sustainable dairy industry that will lead to economic growth, poverty alleviation, wealth and employment creation. This may be influenced by infrastructural development in the study area. The objective of this paper therefore was to assess the influence of infrastructural development on commercialization of smallholder dairy farming. The paper utilized descriptive research design in which a sample size of 384 respondents was selected using stratified random sampling technique. Primary data was collected using structured questionnaires, focused group discussions, and key informants. Data was analyzed using descriptive statistics (mean and standard deviation) and inferential statistics (Pearson product-moment correlation coefficient; Spearman's rank correlation coefficient and multiple regressions) with Household Commercialization Index (HCI) being the dependent variable. The results of the study revealed that infrastructural development have significant influence on commercialization of smallholder dairy farming. In view of the results, it is recommended that the County Government of Uasin Gishu in consultation with policy makers; planners; smallholder dairy producers and other players in dairy farming should formulate policies, strategies, projects and programs that address the influence of infrastructural development issues for increased level of dairy commercialization and hence sustainable rural development.

Keywords: Infrastructural Development, Smallholder Dairy Producers, Commercialization of Smallholder Dairy Farming, Uasin Gishu County

1. Introduction

Infrastructural obstacles such as poor state of roads as well as inadequate road networks obviously hinder marketing efficiency. Furthermore, inadequate transportation infrastructure raises search and monitoring costs [33]. Majority of the population in Africa lives in the rural areas and Over 75% are smallholder producers primarily depending on agriculture for their livelihoods ([27]). The degree of these farmers participation in the markets may be affected by the state of infrastructure [30]. The total milk production and marketed by smallholder dairy producers constitute about 80% and 70% respectively ([9, 12]). Moreover, dairy industry contributes 4% to the total Gross Domestic Product (GDP) and 14% of agricultural GDP ([9, 12]). This huge economic value of the dairy sub-sector should be tapped to contribute to the national development goals through transformation into globally competitive dairy

value chain that provides alternatives out poverty ([5, 9, 10, 12]). Commercialization of smallholder dairy farming usually takes a long transformation process from subsistence to semi-commercial and then to fully commercialized dairy farming [2, 9, 19, 30]. The dairy development in Kenya and in Uasin Gishu County in particular is characterized by smallholder dairy farming in which smallholder dairy producers are mainly subsistence-oriented with commercial smallholder dairy orientation being uncommon. This is depicted in the commercialization scale as shown below: 70% subsistence, 20% semi-commercialized and 10% commercialized ([9, 11, 12]). This indicates that the commercialization of smallholder dairy farming is low and variable. It is therefore important to assess the factors influencing this pattern of commercialization of smallholder dairy development in Uasin Gishu County. The objective of this paper was therefore to assess the influence of infrastructural development on commercialization of smallholder dairy farming in Uasin Gishu County, Kenya.

2. Methodology

This section looks at the study area, research design and data analysis methods.

2.1. Area of Study

Uasin Gishu County is one of the 47 Counties of Kenya with a total area of 3,327.8 Km^2 and human population of 448,994. It strides between longitude 34°50′ and 35°37′ east and 0°03′ and 0°55′ north. The County is divided into six Sub-Counties namely: Soy; Turbo; Kapsaret; Kesses; Ainabkoi and Moiben ([11]). Dairy enterprise in the County is the most important livestock investment with annual net sales of approximately Ksh. 1.9 billion and has been identified as having the highest potential to contribute greatly to employment-led economic recovery ([13]). It has the three (3) categories of smallholder dairy producers namely: subsistence (70%), semi-commercialized (20%) and commercialized (10%) smallholder dairy producers ([11]).

2.2. Research Design and Method of Data Analysis

This paper used descriptive research design in which a sample size of 384 respondents was determined and stratified random sampling technique was used to select these respondents within the strata of Sub-Counties. The methods of data analysis included descriptive statistics (mean and standard deviation), inferential statistics (Pearson product-moment correlation coefficient; Spearman's rank correlation (rho) coefficient and multiple regressions) and Household Commercialization Index (HCI). These methods of data analysis are depicted by formulas below:

$$\text{Mean } \bar{x} = \frac{\sum x_1}{n} \quad (1)$$

$$\text{Standard deviation } \sigma = \sqrt{\frac{\sum_1 (x_1 - \mu)^2}{n}} \quad (2)$$

$$\text{Pearson Correlation } r = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\left(\sum x^2 - \frac{(\sum x)^2}{N}\right)\left(\sum y^2 - \frac{(\sum y)^2}{N}\right)}} \quad (3)$$

$$\text{Spearman's rho } r_S = 1 - \frac{6(\sum d^2)}{n(n^2-1)} \quad (4)$$

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \ldots + \beta nXn + \varepsilon. \quad (5)$$

Where: Y = Average HCI (Dependent variable).

Xi-n = Infrastructural development (Independent variables)

β0= Constant or Point of intercept on Y axis

β1-n = Regression coefficients.

ε= Residual term or the error

$$HCI = \left[\frac{\text{Gross value of milk sales per household per month}}{\text{Gross value of total milk production per household per month}}\right] x100 \quad (6)$$

The Household Commercialization Index (HCI) ranges from zero to 100%. A value of zero signifies a totally subsistence oriented producer. The closer the index is to 100%, the higher the level of commercialization ([26; 29]). This paper used dairy milk production and dairy milk sales in measuring average HCI of the households of the respondents. [8; 19; 26; 35] has established scale of commercialization (HCI) as:0% - 30%: subsistence oriented producers; 31% - 65%:Semi-commercialized producers; 66% - 100%: Commercialized producers.

3. Results and Discussions

3.1. Descriptive Results for Infrastructural Development

This section deals with the descriptive results of the various infrastructural developments (tables 1-5; figures 1-5 below):

According to access to type of road, the proportions of respondents were as follows: 3.9% of respondents had access to tarmac roads whereas 64.8% accessed earth roads and 31.3% used murram roads (Table 1; figure 1).

Among the respondents, 35.2% of them were accessible to passable roads in all seasons meaning that most of the respondents (64.8%) therefore have challenges in transporting their produce to the markets and obtaining farm inputs from markets easily during the rainy seasons.

Table 1. *Access to good type of road.*

Access to good type of road:	Frequency	Valid Percent	Cumulative Percent
tarmac	15	3.9	3.9
earth road	249	64.8	68.7
murram	120	31.3	
Total	384	100	100

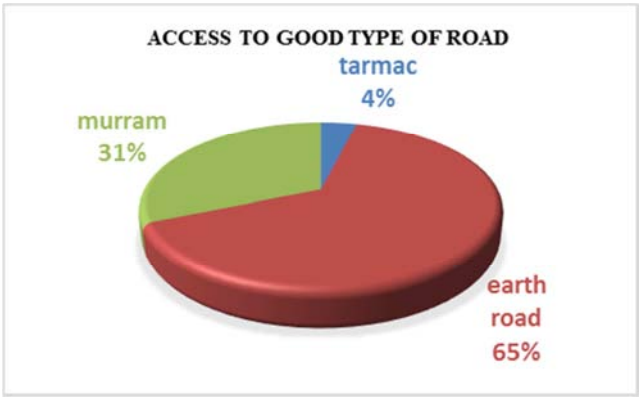

Figure 1. *Access to good type of road.*

This result implies that most of the respondents used earth roads when accessing markets for their products and inputs.

In the case of access to good road network, the results indicate that 36.7% of respondents had access to good road network whereas 63.3% had no access to good road network (table 2; figure 2).

Table 2. *Access to good road network.*

Access to good road network:	Frequency	Valid Percent	Cumulative Percent
Yes	141	36.7	24.7
No	243	63.3	100
Total	384	100	

Figure 2. *Access to good road.*

This results show that most of the respondents had no access to good road network in their areas hence affecting access to markets for their products and inputs.

The proportions of respondents as per their distance to markets indicate that: 23.2% of respondents were 4km away from the market; 20.1% were between 5km and 9km away;11.7% were between 10km and 14km away;15.9% were between 15km and 20 km away while 29.1% were over 20kmaway from the market and 43.3% of the respondents were less than 10 km away from the markets whereas 56.7% were more than 10km away from the markets (table 3; figure 3 below).

Table 3. *Distance to market (Km).*

Distance to market(Km):	Frequency	Valid Percent	Cumulative Percent
1.00–4.00	89	23.2	23.2
5.00–9.00	77	20.1	43.3
10.00–14.00	45	11.7	55
15.00–20.00	61	15.9	70.9
Above 20km	112	29.1	100
Total	384	100	

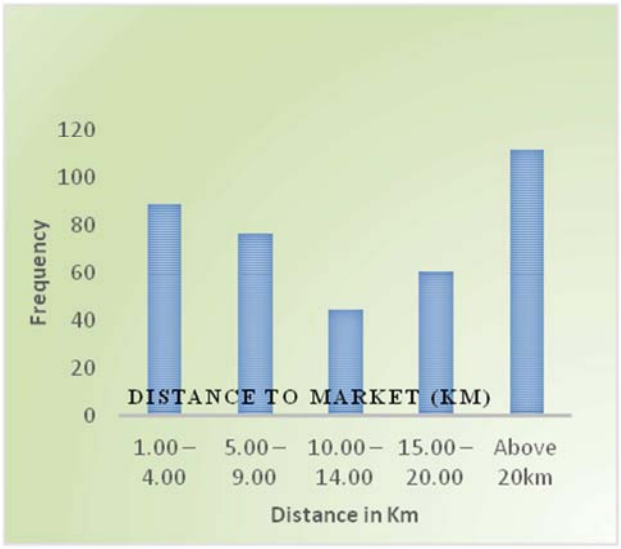

Figure 3. *Distance to market (Km).*

This result indicates that most of the respondents were far away from the markets hence negatively affecting access to markets for their products and inputs.

In the case of accessibility to electricity, the results indicate that 36.2% of respondents were accessible to electricity whereas 63.8% were not accessible to electricity (table 4; figure 4 below):

Table 4. *Availability of electricity.*

Availability of electricity:	Frequency	Valid Percent	Cumulative Percent
Yes	139	36.2	74
No	245	63.8	100
Total	384	100	

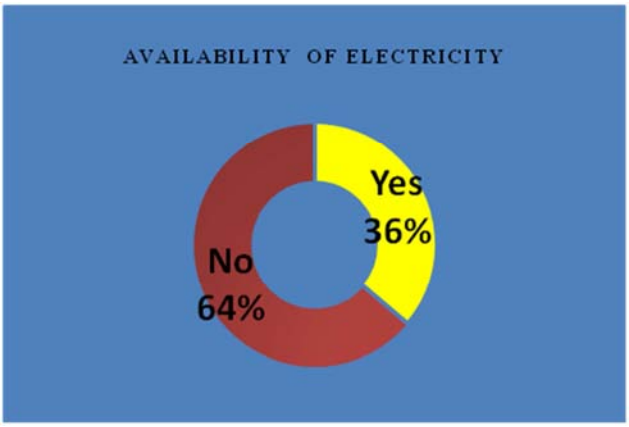

Figure 4. *Availability of electricity.*

This result shows that most of the respondents were not accessible to electricity hence affecting access to markets because they were not able to preserve their milk and even do value addition for increased incomes.

According to access to market information, 34.9% of respondents were accessible to market information whereas 65.1% were not (table 5; figure 5 below):

Table 5. *Access to market information.*

Access to market information:	Frequency	Valid Percent	Cumulative Percent
yes	134	34.9	34.9
no	250	65.1	100
Total	384	100	

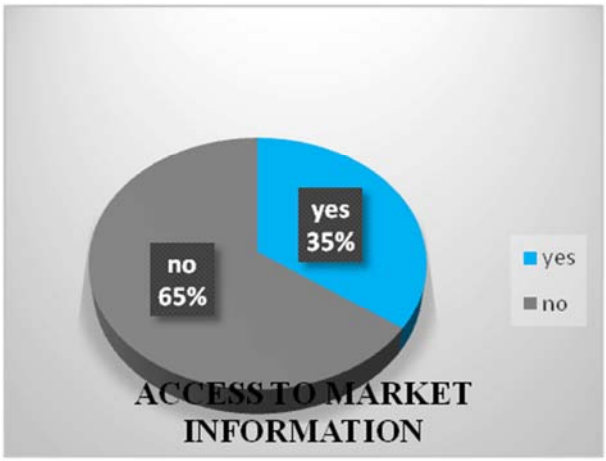

Figure 5. *Access to market information.*

This meant that most of the respondents were not able to access market information hence not able to access market for their produce

3.2. Inferential Results

The correlation and regression analysis were used to assess the relationship between infrastructural development and commercialization of smallholder dairy farming. The results from the correlations, regression and HCI analyses are shown in tables 6-11; figures 7-11 Below:

3.2.1. Correlation Results

The correlation results in table 6 below include Pearson and Spearman's rho correlation coefficients:

According to the type of road accessible by the respondents, results of Pearson correlation coefficient of 0.780 and Spearman's rho of 0.689 shows that there is a positive relationship between type of road and the average Household Commercialization Index with the coefficients being highly significant at 1%.

In the case of good road network accessible to the respondents, Pearson correlation coefficient of 0.768 and Spearman's rho of 0.774 shows that there is a positive relationship between good road network and the average Household Commercialization Index. The coefficients are highly significant at 1%. According to the results, Pearson correlation coefficient of -0.854 and Spearman's rho of -0.773, indicate that there is negative relationship between distance to market and the average Household Commercialization Index. The coefficients are highly significant at 1%.

The Pearson correlation coefficient of 0.790 and Spearman's rho of 0.850 shows that there is a positive relationship between availability of electricity and the average Household Commercialization Index. The coefficients are highly significant at 1%. The results of Pearson correlation coefficient of 0.974 and Spearman's rho of 0.899 show that there is a positive relationship between respondents' access to market information and the average Household Commercialization Index with the coefficients being highly significant at 1%.

Table 6. *Correlation Results for Infrastructural Development*

No.	Independent Variable	Correlation Model	
		Pearson Correlation	Spearman's rho
1	Type of road used	.780**	.689**
2	Road network	.768**	.774**
3	Distance to market (Kms)	-.854**	-.773**
4	Availability of electricity	.790**	.850**
5	Access to market information	.974**	.899**

Key to Table 6:**Correlation is significant at the 0.01 level (2-tailed).*Correlation is significant at the 0.05 level (2-tailed).Sample size, N = 384.Correlation between each variable and itself = 1.00.

The correlation coefficients above indicate that the average Household Commercialization Index of the respondents is significantly correlated with the infrastructural development (independent variables).

3.2.2. Regression Results

The regression coefficients are presented in the formula below:

$$LnY_i = .285 + .128X_{1i} + .108X_{2i} + .-190X_{3i} + .128X_{4i} + .210X_{5i} + \varepsilon$$

$$(.076)(.112)(.227)(.076)(.134)$$

The results indicate that type of road has a standardized coefficient of 0.128, implying that good type of roads accessible by the respondents is positively associated with average Household Commercialization Index and, coefficient is highly significant at 1%. A unit (one percent) changes in the good type of road increased the average household commercialization index by 0.128 (12.8%). The results show that good road network has a standardized coefficient of 0.108, meaning that good road network accessible by the respondents is positively associated with average Household Commercialization Index and, coefficient is highly significant at 1%.A unit (One percent) increases in good road network causes an increase of the HCI by 0.108 (10.8%). The findings show that distance to market has a standardized coefficient of -0.190, implying that distance to the market is negatively associated with average Household Commercialization Index and, coefficient is highly

significant at 1%. Any unit (one percent) increases in distance to market reduces HCI by 0.190 (19%).

Based on the study results, availability of electricity has a standardized coefficient of 0.128, meaning that accessible to electricity by the respondents is positively associated with average Household Commercialization Index and, coefficient is highly significant at 1%.Any unit (one percent) increases in the availability of electricity, increases the HCI by 0.128 (12.8%). The results also indicate that access to market information has a standardized coefficient of 0.210; meaning that accessibility to market information by respondents is positively associated with average Household Commercialization Index and, coefficient is highly significant at 1%. A unit (one percent) increase of access to market information causes an increase of HCI by 0.210 (21%).

The regression coefficients show that these independent variables (infrastructural development) influence the average Household Commercialization Index at various levels. The R Square statistic (0.704) is generally interpreted to mean that the ten independent variables (Infrastructural development) in the regression model account for 70.4 percent of the total variation in the given HCI."The regression model "fits" the data better than another regression model if its adjusted R-square statistic is higher hence the data shows positive significance in relation to the study.

3.2.3. Infrastructural Development and HCI Results

The determined HCI of the respondents are as indicated in tables 7-11; figures 7-11 below:

(i). Type of Roads

The HCI results also indicate that 3.9% of the respondents were accessible to tarmac roads and had higher commercialization index of 71%, whereas 64.8% of the respondents were accessible to earth roads and had lower commercialization index of 25%.

Table 7. *Access to good type of road.*

Access to good type of road:	Frequency	Valid Percent	Average Household Commercialization Index
Tarmac	15	3.9	71
earth road	249	64.8	25
Murram	120	31.3	30
Total	384	100	42

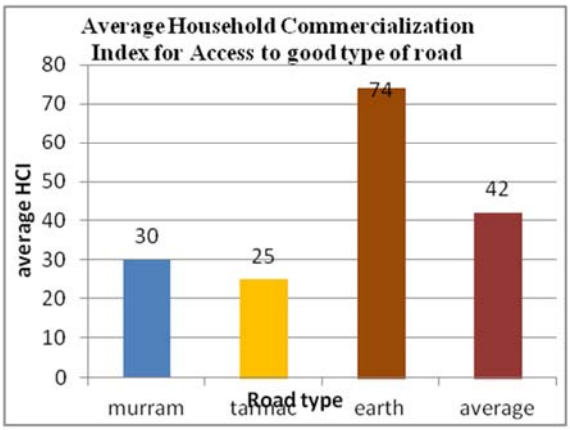

Figure 7. *Access to good type of road.*

The results therefore mean that Poor state of roads as well as inadequate road networks obviously hinders marketing efficiency hence low level of HCI. Earth roads usually become impassable during rainy seasons hence outputs not easily reach the markets. The low levels of HCI are mainly due to milk not reaching the markets and inputs not obtained easily from markets leading to low milk sales, high input costs and high transport costs. Low prices are disincentive to market participation and hence lowering household commercialization index. Inadequate transportation infrastructure raises search and monitoring costs. There are high post-harvest losses in poorly developed market infrastructure. In villages with bad market access due to poor roads, many producers incur high perishability and transportation costs. The lack of roads or presence of seasonally impassable or poor maintained roads influences market access. This is mainly because the respondents' incomes from the sales of the product reduced with the increase of cost of transport of either produce or inputs. High transport costs, arising from lack of well-maintained roads, long distances and lack of affordable, appropriate transport create large physical constraints on market access by rural poor communities.

The finding is consistent to the findings of [33] in South Africa that infrastructural obstacles such as poor state of roads as well as inadequate road networks obviously hinder marketing efficiency. They also reported that remote locations of farms coupled with poor road infrastructure results in high transport costs and in cases where buyers provide transport, this further reduces the price that buyers are prepared to pay the dairy producers.

According to [30] dairy producers in villages with bad market access in Kiambu experience delayed milk collection and delayed payments. The gradual shift to more profitable enterprises (tomatoes, dairy and kales) in peri-urban villages could be due to the influence of better transport infrastructure, efficient information systems and higher degree of interaction in modern market outlets. According to [17], producers who live next to better roads and have more frequent direct contact with the market are willing to produce more systematically for the market, while those with poor market access are forced to produce for domestic consumption. In the highland maize belt of Kenya and Tanzania, chronic poverty is not strongly linked to farm size but is concentrated among food crop producers in remote areas with poor road access [16]. According [16], one study in Tanzania has estimated that households within 100 metres of a gravel road, passable 12 months a year with a bus service earn about one third more per capita than the average. In Africa villages with better physical infrastructure have fertilizer 14% lower, wages 12% higher and crop production 32% higher villages with poor infrastructure. In 1995, Uganda successfully negotiated for a World Bank loan to build new roads rather than new primary schools, arguing that new roads would immediately raise national income and alleviate poverty in the short term. In 1996, the construction of a road from a village to the market Centre in Nigeria

provided the impetus to increased production. In Sargodha district, Pakistan, unemployment decreased when new road created opportunities for drivers, conductors, mechanics, filling stations, shops, tea-stalls near bus stops and other services for travellers. In Sri Lanka, feeder roads in Kegalle had a positive impact on rural development. Construction and maintenance of rural roads can have important effects on incomes and livelihoods of the rural poor. [27] found out in Juncal, Ecuador that farmers without roads do not have a way out. These findings further support the study finding. According to Smallholder Dairy Commercialization Programme (SDCP), [14], milk losses as a result of poor infrastructure were as high as 2,686,847 litres worth KES 53,736,940.00 per year hence supporting the study findings. The result also conforms to those of [18; 34].

(ii). Road Network

The results of HCI show that 36.7% of the respondents were accessible to good road network and had higher commercialization index of 59%, whereas 63.3% of the respondents were not and had lower commercialization index of 28% (table 8; figure 8 below):

Table 8. *Access to good road network.*

Access to good road network:	Frequency	Valid Percent	Average Household Commercialization Index
Yes	141	36.7	59
No	243	63.3	28
Total	384	100	43.5

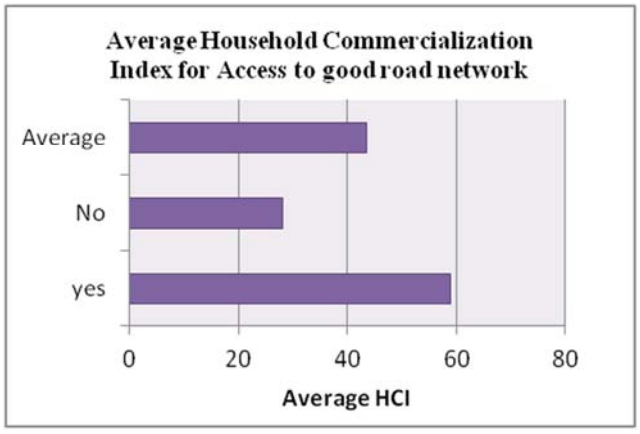

Figure 8. *Access to good road network.*

This is because the dairy products can easily reach the market at low cost mainly via an alternative road hence higher HCI. The poor state of the rural network impedes the physical movements of goods and thereby the integration of rural markets. Many rural roads are impassable, except by tractors, during rainy seasons. There is no economic prosperity on the areas that can be achieved if roads continued to be in dilapidated state and no dense networks of roads.

The study result is consistent with the findings of [33].in South Africa that inadequate and dilapidated state of the rural network impedes the physical movements of goods and thereby the integration of rural markets. Chinese farmers living in rural areas close to cities with dense transport networks have higher incomes than those in remote locations. The finding is also supported by the finding of [30].that in Kiambu, the degree of farmer participation in the markets for all commodities is higher in the villages with well-maintained roads compared to the villages that have bad market access due to bad road network. The finding is also in conformity to those of [16; 34].

(iii). Distance to Markets

According to the HCI results, 23.2% of the respondents were 1-4km away from the market and had higher commercialization index of 66%, whereas 29.1% of the respondents were over 20km away from the market and had lower commercialization index of 22% (table 9; figure 9 below):

Table 9. *Distance to market (Km).*

Distance to market(Km):	Frequency	Valid Percent	Average Household Commercialization Index
1.00–4.00	89	23.2	66
5.00–9.00	77	20.1	49
10.00–14.00	45	11.7	29
15.00–20.00	61	15.9	28
Above 20km	112	29.1	22
Total	384	100	38.8

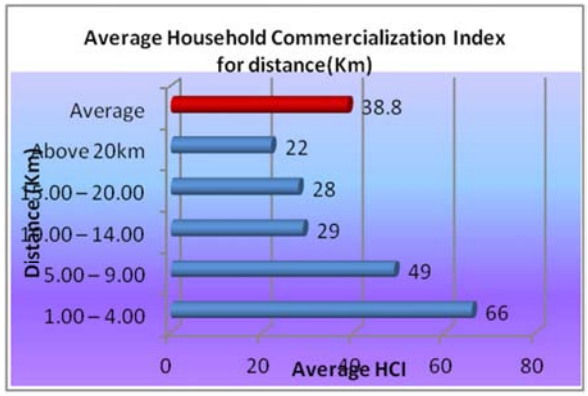

Figure 9. *Distance to market (Km).*

This implies that respondents who are nearer markets have higher HCI because they can get their outputs and inputs to and from markets at low cost and faster. It also means that the greater the distance to the market, the less likely the respondents' orientation towards commercialization. Furthermore, respondents further away from market places have lower market participation and thus market orientation. The farther away a household is from the market, the more difficult and costly it would be to get involved. Thus, the greater distance to the market increases transaction costs.

The study finding is in conformity to that of [33] in South Africa that distance to market is considered as proxy for transaction costs and it negatively affects market participation and HCI. The result is also supported by findings of [30] that Kiambu District, which is closer to the main urban centre, Nairobi has a higher degree of commercialization than the far-flung Kisii District for the milk and kales investigated. The finding of this study is also

comparable with the result of [1] in Abia State, Nigeria that revealed that distance to market was seen to be significant at one percent probability level but with a negative sign. This result is also in line with previous studies like those of [26; 31; 34]. The finding is also supported by the finding of [16] that perishable nature of much agricultural produce from the rural poor in Ecuador, especially women, combined with lack of storage facilities and long distances to markets influence market access. The use of commercial inputs in India like fertilizers and pesticides generally decreases with distance to market. The result is also supported by the findings of [2; 17; 20; 23; 25] that increase in access to inputs increases productivity hence increased in market access and commercialization.

(iv). Availability of Electricity

The results of HCI indicate that 36.2% of the respondents were accessible to electricity and had higher commercialization index of 35%, whereas 63.8% of the respondents were not and had lower commercialization index of 20% (table 10; figure 10 below):

Table 10. *Availability of electricity.*

Availability of electricity:	Frequency	Valid Percent	Average Household commercialization Index
Yes	139	36.2	35
No	245	63.8	20
Total	384	100	27.5

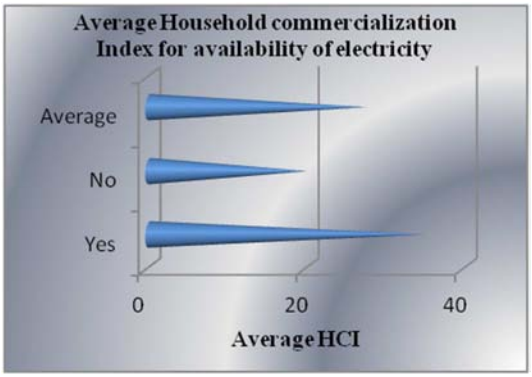

Figure 10. *Availability of electricity.*

This is because the respondents were able to preserve and do value addition to their produce hence able to access market for increased HCI. It is envisaged that household with electricity can conveniently undertake basic-post harvest activities such as refrigeration of farm output like milk and access markets with higher quantities of produce.

According to [30], villages in Kiambu with well-maintained roads and good access to electricity had higher marketed outputs of milk than areas that lack these characteristics. Market access was influenced largely by the state of the roads and the proportion of households with electricity in their homes.According to [4; 9; 10; 16; 17], value addition due to availability of electricity reduces perishability and increase in value of the product thus increased in commercialization levels.The findings of [1; 26; 29] also support the study finding that improved access to electricity is associated with access to credit that increases capital base which increases productivity and commercialization levels.

(v). Access to Market Information

The 34.9% of the respondents were accessible to market information and had higher commercialization index of 69%, and 65.1% of the respondents were not and had lower commercialization index of 26% as indicated in the HCI findings (table 11; figure 11 below):

Table 11. *Access to market information.*

Access to market information:	Frequency	Valid Percent	Average Household Commercialization Index
yes	134	34.9	69
no	250	65.1	26
Total	384	100	47.5

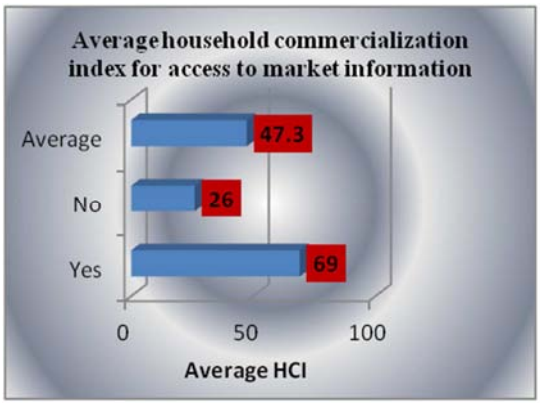

Figure 11. *Access to market information.*

This is because the respondents who were accessible to market information were able to access a wide range of markets for the produce realizing increased income hence increased commercialization level. The more information the household has on marketing, the less transaction costs will be thus increasing market participation.

Smallholder dairy producers are often not aware of prices and market opportunities for their product and find it difficult to participate in alternative markets. Proximity to towns/cities is also proxy for access to information. Markets removed from major cities/towns are not well integrated in these markets, competition is often highly imperfect. Finding a buyer in these markets is often a problem. Lack of reliable information also hampers commercialization in areas with bad market access. The gradual shift to more profitable enterprises (dairy) in peri-urban areas could be due to the influence of better transport infrastructure, efficient information systems and higher degree of interaction in modern market outlets. The farmer's membership to associations' increases commercialization because membership of associations and groups possess the potentials of increased access to information important to production and marketing decisions. It is through networks that information and other resources can be transmitted, and the existence of trust facilitates co-operative behavior based around these networks.

The likelihood of commercialization increases with the

producers' ability to speak/understand English because inability to speak/understand English prevents a resource poor smallholder dairy producer from successfully engaging in trade, especially outside his/her settlement. Lower levels of literacy; generally make producers to have less access to land and credit hence low productivity and lower commercialization level. Such producers would face high transaction costs in both factor and product markets outside their own area.

The result conforms to the finding of [33] in South Africa that marketing efficiency is hindered not only by infrastructural factors but also by informational bottlenecks which increases transaction costs by raising search, screening and bargaining costs. A guaranteed market or contract farming is one of the institutional arrangements that can promote market access to emerging producers. Guaranteed markets impact positively on the HCI due to marginal cost associated with searching for the potential buyer.

[22] argues that proximity to towns reflects how far producers have to travel to reach sources of information. Such information sources are located in nearest towns where there are offices and markets. The finding also conforms to [30] observation that remoteness restricts access to information about new technologies and changing prices, leaving the rural poor unable to respond to changes in market incentives.

The findings on higher output sold from Kiambu than Kisii conform to [15] observation that remoteness restricts access to information about new technologies and changing prices, leaving the rural poor unable to respond to changes in market incentives. [32] found that facilitating market information provision via improved telecommunications is critical for increased market access. According to [16], the rural poor are constrained by lack of information about markets, lack of business and negotiating experience, and lack of a collective organization which can give them the power to bargain favourably. New information throughout the entire commercialization process may trigger key marketing strategy changes, or improvisation, in order to address the changing environment [21]. According to [16], market access problems can affect areas (due to remoteness or lack of infrastructure) and groups, such as the illiterate or poorly educated, minority ethnic groups or those not speaking the official national language, and women. In large parts of Latin America, indigenous people are concentrated in rural areas, and have higher incidences of poverty, lower levels of literacy and generally less access to land and credit. In other regions, remoteness combines with ethnic and language barriers do restrict market access, especially to labour markets.

The result also conforms to those of [3; 4; 6; 7; 17; 25; 26].

The findings show that Infrastructural Development influence commercialization of smallholder dairy farming. The HCI results for the infrastructural development range from 27.5% (subsistence) to 47.5% (semi-commercialized). This means most of the respondents are not commercialized due to influence of infrastructural development. Hence there is need to address the influence of infrastructural development on commercialization of smallholder dairy farming in order to realize sustainable development.

4. Conclusion and Recommendations

The study findings have shown that the infrastructural development has highly significant influence on commercialization of smallholder dairy farming. Based on the above results, it is recommended that the that the County Government of Uasin Gishu in consultation with policy makers; planners; smallholder dairy producers and other players in the dairy farming should formulate policies, and plan projects and programs that empasize more investments in rural infrastructural and market development for improvement of commercialization. Furthermore, in the implementation of the formulated policies and the planned programs and projects, transparency and accountability mechanisms should be placed at the centre of the implementation regulatory and legal frameworks.

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