



Influence of Milk Collection and Milk Utility Form aspects of Value Chain Innovation on the Performance of the Dairy Sector in Moiben Sub- County, Uasin Gishu County, Kenya

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Abstract

Agriculture and especially the dairy sector with improved dairy value chain contribute immensely toward Kenya's vision 2030. The dairy sector currently contributes about 6-8% of Kenya's GDP and over 70% of households in Uasin Gishu County depend on it. Majority of the stakeholders in the County are smallholder dairy farmers who face many challenges, some of which have attracted the attention of the government, donors and NGOs for support. Despite efforts made in improving the dairy sector, there is still low productivity. Value chain innovations seem to have contributed little in alleviating the problem. The issues of concern are milk collection and milk utility form innovations whose influence are unknown. Therefore, this study evaluated the influence of milk collection and utility innovation on performance of the dairy sector in Moiben Sub-County, Kenya. The study was anchored on Porter's Value Chain Theory and Theory of Innovation, and explanatory research design was used. The target population was 22138 dairy stakeholders and a sample of 393 respondents. Simple random sampling technique was used in selecting the respondents. Primary data was collected using questionnaires and interview schedules and analyzed using multiple regression technique with the help of SPSS. The result of milk collection innovation was statistically significant ($t=5.225$, $P=0.000$, $P<.05$). Also, the study found that milk utility form has significant influence ($t=4.598$, $P=0.000$, $P<.05$) on dairy sector performance. The study concluded that milk collection and milk utility form innovations have positive contributions toward performance of dairy sector. The study recommended development of strategic policies to foster creativity in milk collection and milk utility form. The study will benefit dairy farmers, policy makers, researchers and academicians.

Keywords: Dairy sector, Milk collection, Value Chain, performance, milk utility form

INTRODUCTION

Milk production is a very important element of the whole dairy value chain (Torsen, 2011). A value chain is defined as involving all the activities that firms engage in to bring a product to the market, from conception to final use (EU SCAR, 2015). On the other hand, innovation has been defined as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organizations or external relations", (European Commission (EU) Directorate General for Research and Innovation - EC, 2016). The EC Directorate General for Research and Innovation amplifies this definition, stating: "it implies that innovation activities are all scientific, technological, organizational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations". Innovation is often linked to businesses, but the public can innovate too. Livelihoods of many families in Moiben

Sub County and Uasin Gishu County in general depend on dairy sector. Most families own more than one acre piece of land which enables them keep many animals yet productivity is still low compared to areas like Githunguri in Kiambu County which practice zero grazing. Much has been said about value addition along the dairy value and government and donors have invested in the dairy sector value chain in order to improve productivity and create wealth for the local communities.

The investment in dairy value addition has not yielded much of the desired wealth and therefore value chain innovation is seen as the means of survival and drive for the dairy sector and many innovations have been adopted to improve the dairy sector performance. Though many studies have been conducted on various innovations within the dairy value chain, milk collection; milk bulking and milk form utility innovations have hardly been analyzed. It is necessary to critically analyze these innovations in order to establish their influence on the performance of the dairy sector in Moiben Sub-County, Kenya.

In clarifying the confusion between agricultural research and innovation, Devaux, Torero and Horton (2017) explained that “research is concerned with the production of new knowledge, while innovation is concerned with the processes of change in the production and marketing of goods and services, the changes that may or may not be driven by research”. Basing on the World Bank report (2012), innovation in the context of agricultural development is the process by which individuals or organizations master and implement the design and production of goods and services that are new to them, irrespective of whether they are new to their competitors, their country, or the world (World Bank, 2016).

João and Mixon (2016) introduced entrepreneurship to aspects of value chains and innovation and argued that the global economy and market integration have influenced farmer entrepreneurs to be more responsive to shifts in market demand, hence farmer entrepreneurs are now more connected and involved in value chain innovations as they are connected to supply chains, integrated in industry and active in creation of new networks compared to traditional farming communities. Therefore, focusing on certain innovations in the whole dairy chain is essential regarding the performance of the dairy sector.

Globally, the dairy sector is growing due to demand for dairy products fueled by increase in population, urbanization and disposable income with stringent conditions attached to quality, hygiene and transparency in matters such as environmental impact. Developed nations like USA, Canada, UK and the Netherlands have advanced and commercialized their dairy sectors while developing nations like India have high numbers of dairy cattle. In Africa, South Africa has an advanced dairy sector while Kenya has the most advanced dairy sector in East Africa (Delloite, 2017).

The dairy sector in the East African Region is leading in Africa with 68% of milk production. The sector generates economic returns and employment opportunities along the dairy value chain. The milk is consumed locally with minimal exports, for example Uganda Government earned USD 26.4M in the year 2013 from milk exports, (Bingi and Tondel, 2015). Also, on recent developments in the dairy sector in Eastern Africa, towards a regional policy framework for value chain development shows that the dairy sector is crucial for rural development, poverty reduction, food and nutrition security but the potential is still underexploited. There has been strong interest from policymakers and investors and re-structuring of dairy value chains but there are still a number of productions, marketing and trade constraints which hinder development.

However, the regional economic integration is contributing to economic growth and development in the region like the East African Community (EAC), Intergovernmental Authority and Development (IGAD) and Common Market for Eastern and Southern Africa (COMESA) which are establishing common policy and regulatory frameworks for the integration of regional markets (Bingi and Tondel, 2015).

The dairy industry in Kenya forms a significant part of the rural economy in the country and accounts for 14% of agricultural GDP as well as being the primary source of livelihood for many smallholders who account for over 70-80% of the total marketed milk in the country (IFAD, 2006; Kibiego, Lagat & Bebe, 2015). The industry is dominated by small scale farmers who own one to two cows and practice smallholder dairy production systems (KDB, 2009; Wambugu *et al.*, 2012). Dairy producers are classified into three categories: smallholders owning 3-15 lactating cows, medium producers, owning 15-50 cows and large-scale producers, owning 50-500 cows (Rademaker *et al.*, 2016). The estimated value of the Kenyan dairy sector is Kshs 73 billion which accounted for over 70% source of livelihood for 1.8 million smallholder dairy farmers (EADD, 2008).

In Central Kenya, over 2 billion litres of milk is produced valued at over Kes.30 billion, over 70% of which went to more than 600,000 households as source of income and provided means of livelihoods to about 2 million households along the value chain by creating backward and forward linkages, (Wambugu *et al.*, 2012).

Milk production in Kenya is dominated by small scale producers who produce over 95% of the milk with large-scale dairy farming accounting for less than 5% per cent of national milk production (KDB, 2014).

About 45% of all milk produced in the country is locally consumed, the remaining 55% is traded whereby 88% of it traded as raw, (untreated) milk to neighbors and 12% is traded on the formal market (Njenga, 2019). It is valued at over KSh184 billion (US\$2.1 billion) and contributes 6-8 percent of the country's GDP" (USAID-KAVES, 2014). The sector is dynamic and is important economically. It contributes to the lives of many in terms of food and nutrition security and the beneficiaries range from farmers, milk hawkers, processors, and consumers (Wambugu, Kirimi & Opiyo, 2015).

Sessional Paper No. 5 of 2013 on the National Dairy Development Policy, estimated productivity per cow in Kenya at 7-8 litres per day (2,400 per lactation), compared to global productivity per cow of 60 litres per day (18,000 litres per lactation). The Low productivity in Kenya has been attributed to inadequate feeding, inadequate and inefficient breeding services, inefficient dairy research, poor animal husbandry, inadequate extension and advisory services, low quality feeds, environmental, socio-economic/cultural factors, ineffective disease control and veterinary services, poor infrastructure, high cost inputs, lack of access to markets and low incentive (Sessional Paper No.5 of 2013).Although the country appears to be self-sufficient in milk and dairy products, the demand for these products is expected to increase due to population growth, urbanization, increased disposable income, and increased domestic and external trade (Rademaker, Koech, & Van der Lee, 2016).In an effort to address the low productivity trend, Kenya Government requested for support from development partners and practitioners like USAID, SNV, FAO-IFAD, to improve agricultural value chain innovation aimed at increased smallholder farmer production and market access (CGIAR, 2011).

The concept of the value chain was not present in Kenya before 1990 because the government was controlling all sectors of the economy. The challenges of a closed economy in an increasingly liberalized world economy were felt and by 1986, the Government of Kenya published Sessional Paper No. 4 of 1986 (Economic Management for Renewed Growth) setting out the framework for liberalizing the entire economy. Liberalization of the economy that began in the early 1990s gave opportunity for individual and institutional farmer entrepreneurs to engage in dairy production with value addition while the government played regulatory and policy making role as indicated in Policy documents: Dairy Master Plan 1991, Poverty Reduction Strategy Paper (PRSP, 2001) and Economic Recovery Strategy for Wealth and Employment Creation (GoK, 2003). Others were the impact of Structural Adjustment Programmes (Rono, 2002) and the Kenya Poverty Reduction Strategy Paper (IMF, 2001).

After 2002, there was renewed interest in agriculture with many policies being developed such as Strategy for Revitalizing Agriculture, (GoK, 2002) a means of reversing the declining economic growth in the country. In line with Kenya Vision 2030 (GoK, 2007), the Ministry of Agriculture (MOA) developed the Agricultural Sector Development Support Programme (ASDSP), 2010-2020 as a Medium-Term Plan (GoK, 2014). The institutional framework recognized support from other institutions like Ministry of Cooperative Development, Kenya Dairy Board (KDB), the Kenya Bureau of Standards (KEBS), East African Dairy Development Association (EADDA) and National Farmers Information Service (NAFIS) which have played an important role in addressing value addition challenges and provided enabling environments for success to local farmers. Other programs developed as a way of improving productivity include Kenya Agricultural Productivity and Agribusiness Project (KAPAP), National Agriculture & Livestock Extension Program (NALEP) and marketing system and infrastructure (GoK, 2010).

Uasin Gishu County is situated in the Rift Valley region and divided into six administrative units namely: Turbo, Soy, Moiben, Ainabkoi, Kesses and Turbo. It is a cosmopolitan county with dairy farming as one of the key agricultural activities with two major dairy collection and processing players, KCC and Brookside. Other players are small, such as ATM milk dispensers and milk bars spread across the major population centers of Uasin Gishu County. Dairy farming is mixed with large and small-scale farmers who are majority with open grazing and limited zero grazing with milk selling at both informal (farm gate price) market and formal market. The distribution of dairy farmers in the county is shown in table 1 below:

Table 1: Dairy Farmers in Uasin Gishu County

Sub-County	Turbo	Soy	Moiben	Ainabkoi	Kesses	Kapseret	Total
Dairy farmers	13,022	16,509	22,044	34,155	10,970	12,581	109,281

Source: Department of Livestock Uasin Gishu Report, 2017

A report of 2017 from the Ministry of Agriculture, Livestock Development and Fisheries, showed that Uasin Gishu County was one of the leading milk producers in Kenya (MoALF, 2017). It is often referred to as the 'Dairy County', just as it is the 'Breadbasket' of Kenya for its role in cereal production. On average, over 80% of the farm families are engaged in the dairy value chain. In 2016, the dairy sub-sector in Uasin Gishu produced 200.5 million litres of milk, earning producers Kshs. 6.2 million (SDLD, 2017).

The county in 2017 had 109,281 dairy farmers, owning 327,843 dairy cows with production of 196,083,090 litres, hence produced on average of 598 litres per cow. In 2019, the animal population had increased to 342005, producing 208,675,926 litres of milk, production on average was 610 litres per cow (Table 2). Therefore, in five years (2014-2019), an increase of 12 litres has been achieved per cow, hence annually, the increase has been merely 2.4 litres per cow. Moiben Sub County had a total of 22,044 dairy farmers owning 66,133 dairy cows which produced 39,554,186 litres of milk giving a mean of 598 litres per cow in 2014 (UGDLP, 2014).

Table 2: Milk Production

Sub-county	Dairy cattle	Milk (kg)/year
Ainabkoi	106,733	65,220,177
Kapseret	39,305	24,023,227
Kesses	34,280	20,946,965
Moiben	68,888	42,094,433
Soy	52,105	31,524,519
Turbo	40,694	24,866,605
Total	342,005	208,675,926

Source: Uasin Gishu County SDCP Brief (2019)

Milk rejection level is high due to inadequate cooling and storage facilities among other factors (USAID, 2016). Wambugu *et al.* (2015) indicates that this is a major challenge facing farmers. Milk processors and manufactures have put in place quality testing and assurance systems which conform to national and international standards (Wambugu *et al.*, 2012) but the levels of rejection are still high. Therefore, this study evaluated the influence of milk collection and utility innovation on value chain innovation on performance of the dairy sector in Moiben Sub- County, Kenya

Research Questions

The specific research questions were:

- i) To determine the influence of milk collection innovation on performance of the dairy sector in Moiben Sub -County
- ii) To determine the influence of milk utility form on the performance of the dairy sector in Moiben Sub- County
- iii) To evaluate the performance of the dairy sector in Moiben Sub County

Research Hypotheses

This study was guided by the following research hypotheses:

- H₁:** There is a significant influence of milk collection innovation on performance of the dairy sector in Moiben Sub- County
- H₂:** There is a significant influence of milk utility form innovation on the performance of the dairy sector in Moiben Sub- County
- H₃:** There is improved performance of dairy sector in Moiben Sub-County

The findings of the study will benefit policy makers in both the National Government and County Governments, particularly those whose economy is anchored on the dairy industry. It will also benefit the stakeholders in the dairy industry that include Dairy cooperatives and processors which will benefit from enhanced knowledge on value addition, milk traders will gain knowledge on minimization of wastage, milk self-help groups will gain skills on bulking and preservation techniques, Partners and donors in the sector will identify the gaps needed for support and the knowledge created will add to the existing literature and hence help scholars

Theoretical Framework

The study was anchored on two theories namely, Porter's Value Chain Theory (1985) and Schumpeter's Theory of Innovation (1961). Michael Porter's, Value Chain Theory (1985) offers an explanation where competitive advantage arises in a business entity. It tracks the impact made on a product or service by every process from its start to delivery to the final consumer. Products pass through a chain of activities in order, and at each activity the product gains some value. The chain of activities gives the products more added values. Some of the major activities in milk value chain include milk collection, milk transportation and milk utility form (Milk products). The study therefore attempts to evaluate to what extent the Porter's Value Chain Theory is applicable indicating activities that can contribute to dairy sector performance. Based on this theory, it is hoped that solutions could be suggested at an activity level to improve dairy sector performance. Dairy farmers and other stakeholders can be assisted by giving them new alternatives.

Conceptual Framework

Conceptual framework depicts the independent and the dependent variables of the dairy value chain (Fig 1)

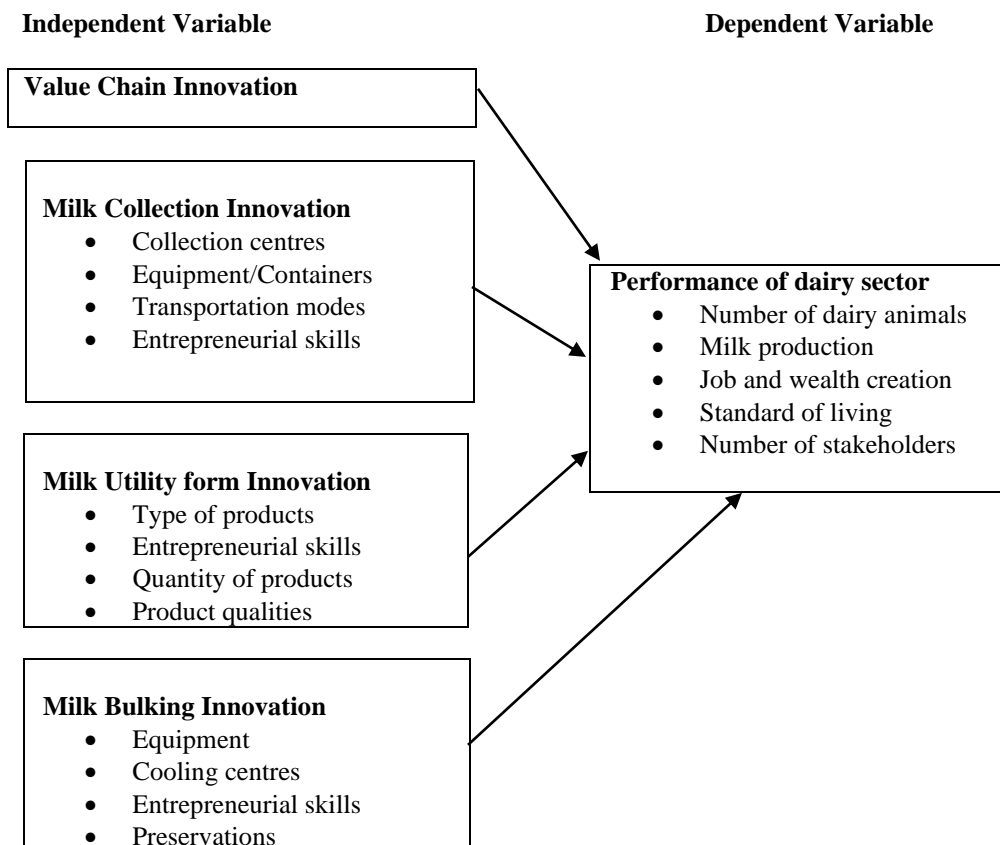


Figure 1: Interrelationships of Independent and Dependent Variables

Source: Researcher, 2020

METHODOLOGY

The study employed explanatory research design. Explanatory research design is also known as causal research design and is conducted in order to identify the extent and nature of cause -and -effect relationships (Zikmund, Babin & Griffin, 2012).

In this research, the target population was 22138 comprising of 22044 smallholder dairy farmers and 94 key stakeholders that include staff of dairy cooperatives and dairy self-help groups, milk traders and artificial inseminators (AI), all in Moiben Sub County, Uasin Gishu. The smallholder dairy farmers and stakeholders are spread throughout the five administrative units (Wards) in Moiben Sub- County (Table 3 & Table 4)

Table 3: Dairy Farmers in Moiben Sub-County per Ward.

Ward/Others	Kimumu	Sergoit	Moiben	Tembelio	Karuna	Total
	6,613	4,409	3,307	5,511	2,204	22044

Source: Department of Livestock Uasin Gishu Report, 2017

Table 4: Key Stakeholders of Dairy Sector in Moiben Sub-County

Stakeholder/Ward	Kimumu	Sergoit	Moiben	Tembelio	Karona	Total
Dairy Co-ops	0	2	4	1	2	9
Milk traders	35	4	5	6	5	55
Dairy Self-Help Groups	0	0	0	1	1	2
A.I Providers	5	4	4	7	8	28
Totals	40	10	13	15	16	94

Source: Department of Livestock Uasin Gishu Report, 2017

The research instruments used in this study was a questionnaire and an interview schedule.

Mugenda & Mugenda (2012), define reliability as consistency and dependability of data collected through repeated use of a scientific instrument or data collection procedure under the same conditions. Data is said to be reliable for decision making when the data collection method and the instruments used to collect that data produce similar results when applied repeatedly over time. Therefore, Cronbach's alpha technique was used and result is shown in table 5. All variables had coefficients of more than 0.70, which is the acceptable level.

Table 5: Reliability Results

Variables	Test 1	Test2	No of items
Milk collection Innovation	.745	.777	6
Milk utility form innovation	.734	.772	6
Dairy sector performance	.799	.724	5

Source: Field data 2020

According to Orodho & Kombo (2002), validity is the degree to which instrument measures what it purports to measure. The researcher focused on content validity, the accuracy with which an instrument measures the variable under study. Content validity was measured through cross checking of research questions and questionnaires. The

improvement on content validity was done by University supervisors, peers and experts.

Using Yamane's (1972) sample size formula at 95% confidence level, $P = 0.05$, the sample size has been computed as shown below: and distribution is indicated in table 3.3.

$$n = \frac{N}{1 + N(e)^2}$$

Where; n = the sample size, N = the population size, e = the acceptance sampling error

$$= 22138 / (1 + 22138 (0.05)^2)$$

$$= 22138 / 56.345 = 392.90 = 393.$$

393 respondents

Table 6: Sample Distribution for Dairy Farmers and Key Stakeholders

Ward	Kimumu	Sergoit	Moiben	Tembelio	Karona	Total
Dairy farmers	6,613	4,409	3,307	5,511	2,204	22,044
Sample	109	73	55	91	36	364
Key stakeholders	36	10	13	15	16	94
Sample	12	3	4	5	5	29

Source: Researcher, 2020

Simple random sampling technique was used to obtain the sample. The sample was drawn from the population of the dairy farmers and key stakeholders from each of the five (5) wards of Moiben.

In this study, two data collection methods were used, that is the questionnaire and interviews to collect primary data. Three hundred and ninety-three (393) questionnaires were distributed to respondents. Two research assistants were hired and trained for this exercise to ensure that questionnaires are delivered in time and accurately filled and then collected. Each respondent filled the questionnaire which was then collected by research assistants. The researcher carried out one-on-one interviews with the key stakeholder respondents.

For secondary data, a review of existing reports and e-materials (Document analysis) was undertaken.

The data was analyzed using multiple regression technique with the help of SPSS.

The multiple regression model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$$

Where:

Y = Performance of dairy sector (Dependent variable)

X₁ = Milk collection innovation

X₂ = Milk form utility innovation

β₀ = the constant in the equation when X₁ - X₄ equals to zero

β₁, β₂, β₃, are the estimated regression coefficients.

ε = Is the error in the observed value or residual term.

RESULTS

Results of Model Assumptions

The results of assumptions of multiple regression model have been analyzed as here below

i) Result of Linearity Test

The linearity assumption of multiple regression was tested and result is shown in figure 2 below.

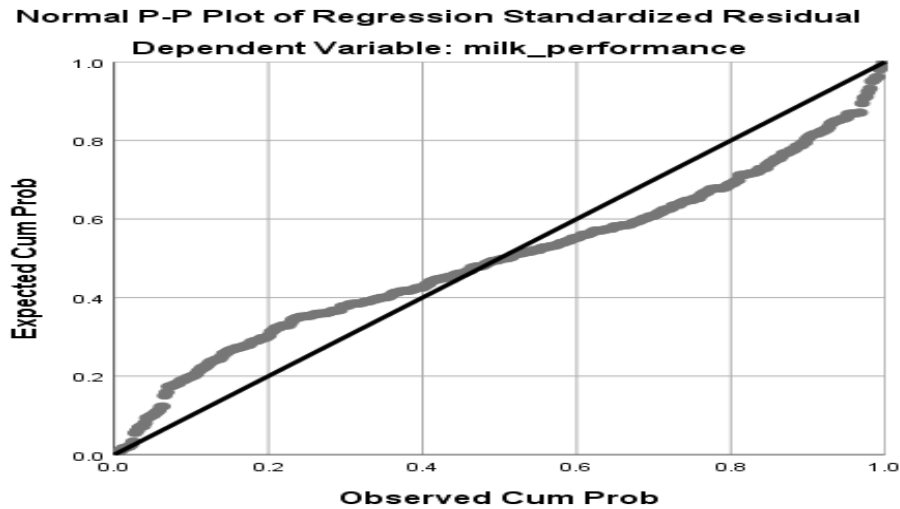


Figure 2: Linearity

The normal plot in the qq plot above shown in Fig 3 is approximately a straight line, therefore the original dataset is close to being normally distributed which indicates a strong linear relationship between independent and dependent variables.

ii) Result of Homoscedasticity Test

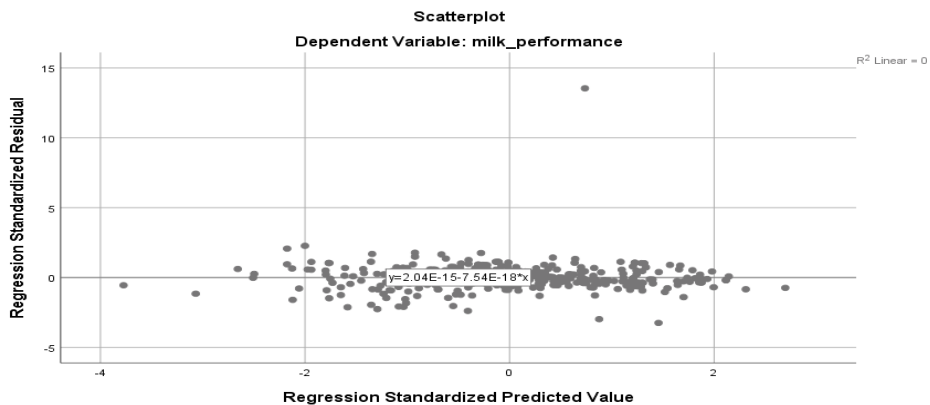


Figure 3: Homoscedasticity

The scatter plot above in Fig 3, shows variance of residuals. There are points equally distributed above and below zero on the X axis and to the left and right of zero on the Y axis. This indicates that homoscedasticity is not a problem.

Result of Multicollinearity

Table 7: Multicollinearity

(Constant)	Tolerance	VIF
Milk_collection_innovation	.648	1.543
Milk_utility_form	.961	1.040

Dependent Variable: Dairy sector performance

From table 7 above, the variable inflation factor (VIF) values for the independent variables milk collection innovation (1.543) and milk utility form innovation (1.040) are all below 5 indicating that there is no multicollinearity problem among independent variables.

Result of Autocolleration

Table 8: Model Summary

The result of Autocolleration of model assumption is shown in table 8 below.

Model	R	R Square	Adjusted Square	R Std. Error of the Estimate	Durbin-Watson
1	.420 ^a	.177	.170	.71393	1.583

a. Predictors: (Constant), milk_collection innovation, milk_utility_form innovation)

b. Dependent Variable: dairy sector performance

To test the existence of autocollinearity, Durbin Watson test technique was used. The model tests correlation between errors and assumes that the error terms are stationary and normally distributed with mean zero. The test statistic can vary between 0 and 4 with 0 value indicating positive autocorellation and 4 values indicating negative autocorellation. From table 8, the value recorded was 1.583 which implies that there was a less autocorrelation.

Dairy Stakeholders in Milk Value Chain

Graph showing Milk Value Chain sectors of the Sampled Dairy stakeholders in Moiben Subcounty

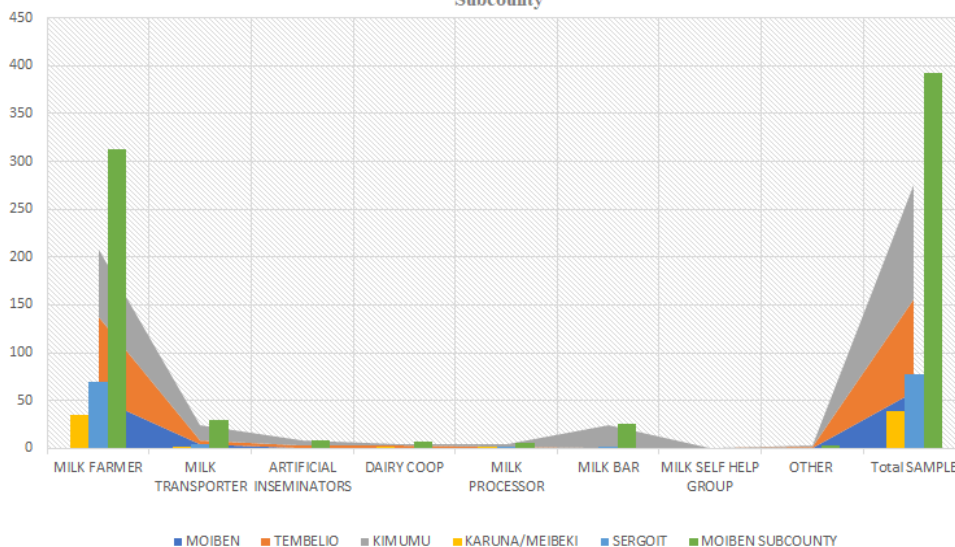


Figure 4: Distribution of Stakeholders Across the Dairy Value Chain in Moiben Sub-County

Milk farmers are the main stakeholders in the milk Value chain with 79.64% of the sampled respondents followed by transporters (0.08%) and Milk bars (0.07%). This signals that the sub-county adoption of innovation remains low (Fig 4.5). Milk self-help groups and dairy cooperatives remain scanty. Milk bars were found to be common in Kimumu because they are convenient for urban population. Thus, it is evident that the dairy sector is mainly at the bottom of the milk value chain in the sub-county.

Milk Products Distribution and Transport in the Sub-County

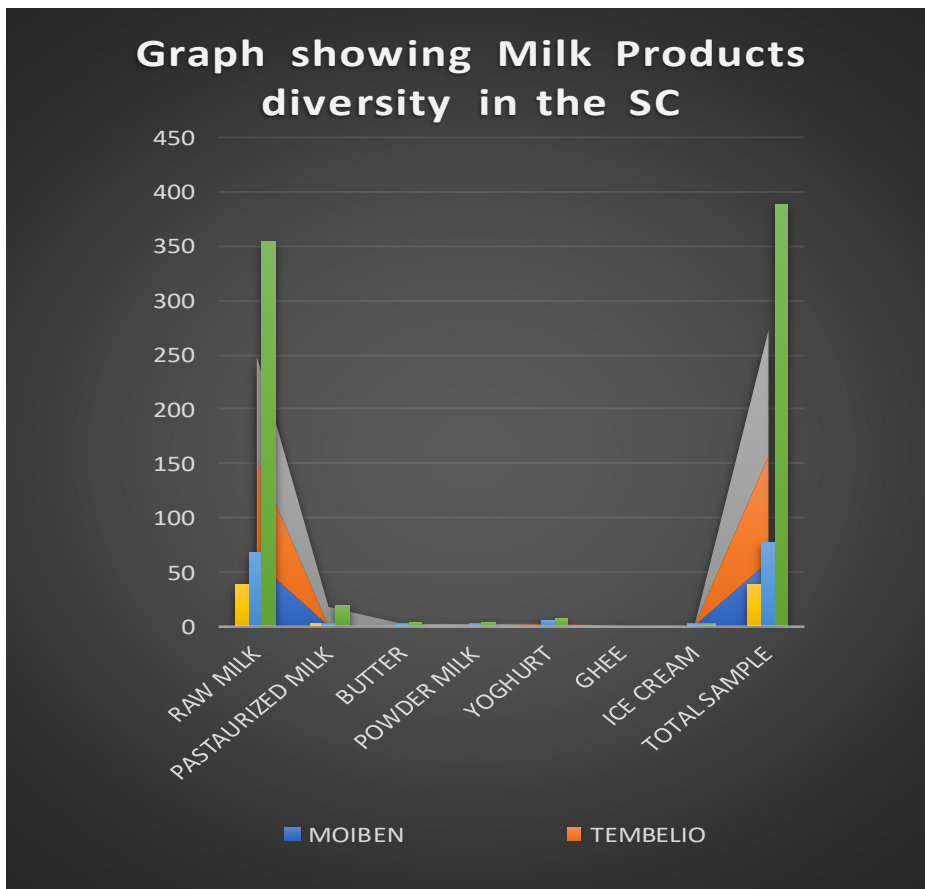


Figure 5: Milk Products Distribution in the Sub-County

Over 90% of the sampled dairy stakeholders were engaged in direct raw milk in the value chain (Fig 5). This means that the level of diversification to other products is less than 10% in the Sub- County. Inadequate processors, storage facilities and other innovative approaches cause the sector to rely primarily on raw milk. Also transport comparison for 2017 and 2020 are indicated in Fig 6 and 7.

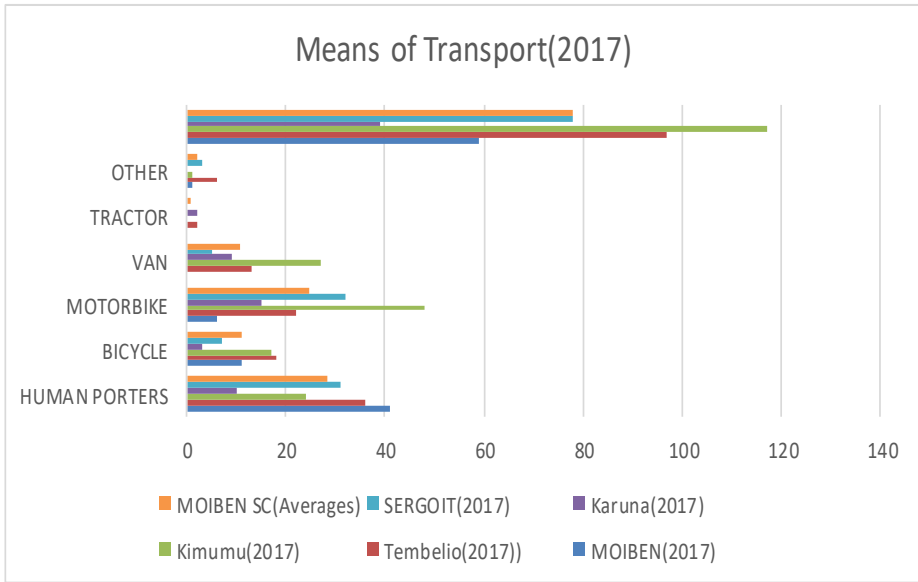


Figure 6. Means of Milk Transportation in 2017

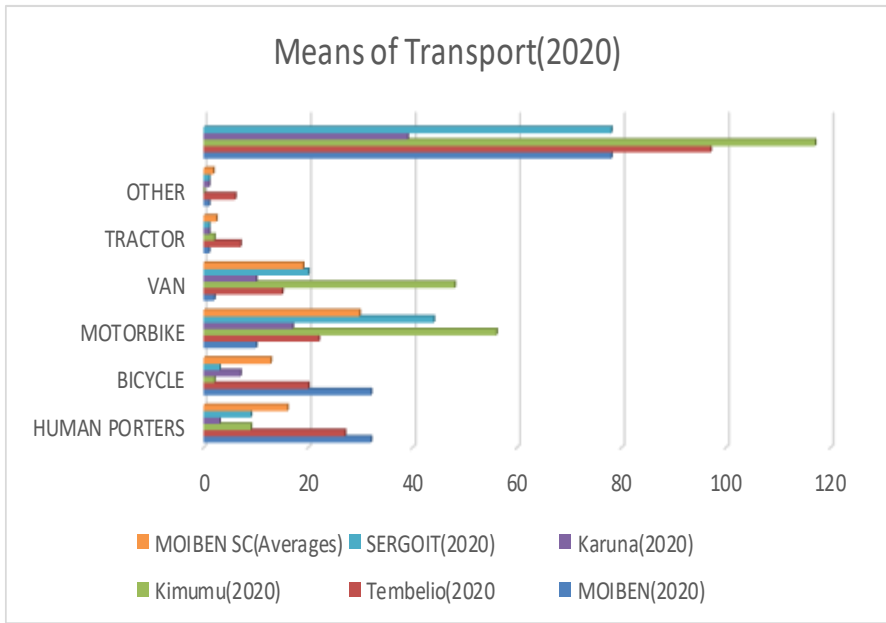


Figure 7: Means of Milk Transportation in 2020

There has been a shift in the means of milk transportation to motorized means from human transporters in the last three years. For example, the mean for human transporters has dropped by 12.4%, bicycles have increased by 1.6%, and Vans have increased by 8.2 %, tractors by 1.6%. Motorbikes increased by 5.2%.

Results of Research Questions

The results obtained as per each research question have been presented in this section

What is the Influence of Milk Collection Innovation on Performance of the Dairy Sector in Moiben Sub-County?

The result is presented in table 9 below.

Table 9: Influence of Milk Collection on Performance of Dairy Sector

STATEMENT	SA	A	U	D	A	TOTAL	MEAN	SD
There are new milk delivery destinations	36	233	48	69	7	393	3.5627	0.94491
There is new mode of milk transport	33	253	65	38	4	393	3.6880	0.79410
There are new and appropriate containers for collecting milk	42	241	47	56	7	393	3.6471	0.19609
There is new way of removing milk impurities	21	180	122	53	17	393	3.3453	0.93148
There is a new way of determining milk quality	29	186	103	69	11	393	3.9990	0.94157
There are often entrepreneurial trainings organized for farmers and stakeholders	46	138	118	58	33	393	3.3171	1.42206
Average								

Source: Field Data, 2020

Key: SA-Strongly Agree, A-Agree, UD-Undecided, D-Disagree, DS-Disagree Strongly

The findings shown in table 9 above, for the new milk delivery destinations, results showed that 36(9.2%) strongly agreed that there are new destinations, 233(59.3%) agreed, 48(12.2%) respondents were undecided, 69(17.6%) disagreed while minority 7(1.8%) disagreed strongly. The mean achieved was 3.647 and 0.19609 standard deviation. The finding on new mode of milk transport, 33(8.4%) strongly agreed that there was a new mode of milk transport, 253(64.4%) agreed, 65(16.5%) were undecided, 38(9.7%) disagreed and 4(1.0%) disagreed strongly. The mean and SD were 3.6880 and 0.79410 respectively.

As for new and appropriate containers for collecting milk, result indicated that 42(10.7%) strongly agreed, 241(61.3%) agreed, 47(11.9%) respondents were undecided, 56(14.2%) disagreed while 7(1.8%) disagreed strongly. The mean achieved was 3.6471 and standard deviation was 0.19609. The results for new way of removing milk impurities showed that 21(5.3%) strongly agreed with the statement, 180(45.8%) agreed, 122(31.0%) were undecided, 53(13.5%) disagreed and 17(4.3%) disagreed strongly with statement. The mean and standard deviation recorded were 3.3453 and 0.93148 respectively. Findings on a new way of determining milk quality revealed that 29(7.4%) strongly agreed that there was a new way, 186(47.3%) agreed, 103(26.2%) were undecided, 69(17.6%) respondents disagreed while 11(2.8%) disagreed strongly with the statement. The mean of 3.9990 and standard deviation of 0.94157 were recorded. Finally, the results as regards to entrepreneurial trainings for farmers and stakeholders indicated that 46(11.7%) strongly agreed to the existed of entrepreneurial trainings, 138(35.1%) agreed, 118(30.0%) were undecided, 58(14.6%) disagreed and

33(8.4%) disagreed strongly. The mean and standard deviation recorded were 3.3171 and 1.42206.

How has Milk Utility Form Innovation Influenced Performance of the Dairy Sector in Moiben Sub- County?

The findings have been shown in in table 10 below.

Table 10: Influence of Milk Utility Form on Performance of the Dairy Sector

STATEMENT	SA	A	U	D	SD	TOTAL	MEAN	SD
There is high level of butter consumption in the area	8	51	42	183	109	393	2.1509	1.03540
There is a lot of yogurt consumption in the location	10	91	54	132	106	393	2.4041	1.18338
There is high level of powder milk consumption in the area	3	20	63	181	126	393	1.9616	0.86887
There is high consumption of other forms of milk in the area	2	25	81	178	107	393	2.1023	0.98957
There is a lot of consumers purchasing ice cream in the location	3	25	43	155	167	393	1.8363	0.91361
Entrepreneurial trainings are often organized in the area	19	144	123	69	38	393	3.1483	1.45655

Source: Field Data, 2020

Key: SA-Strongly Agree, A-Agree, UD-Undecided, D-Disagree, DS-Disagree Strongly

The table 10 above presents the findings on milk utility form. A total of 8(2.0%) strongly agreed and 51(13.0%) agreed that there was high level of butter consumption in the area, 42(10.7%) were undecided, 183(46.6%) disagreed and 109(27.7%) disagreed strongly. The mean of 2.1509 and standard deviation of 1.03540 was recorded. As for a lot of yogurt consumption in the location,10(2.5%) strongly agreed,91(23.2%) agreed,54(13.7%) was undecided, 132(33.6%) disagreed and 106(27.0%) disagreed strongly). The mean and standard deviation achieved were 2.4041 and 1.18335 respectively. Responding to the statement that there was high level of powder milk consumption in the area,3(0.8%) strongly agreed,20(5.1%) agreed,63(16.0%) were undecided,181(46.1%) disagreed and 126(32.1%) disagreed strongly. The mean was 1.9616 and 0.86887 standard deviation.

Results on high consumption of other forms of milk in the area, 3(0.8%) strongly agreed, 25(6.4%) agreed, 81(20.6%) respondents were undecided, 180(45.8%) disagreed and 107(27.2%) disagreed strongly that there was high consumption of other forms of milk. The mean and standard deviation achieved were 1.8363 and 0.91361 respectively. A total of 3(0.8%) and 25(6.4%) strongly agreed and agreed respectively that there was a lot of consumers purchasing ice cream in the location, 43(10.9%) were undecided, 155(39.4%) disagreed and 167(42.5%) disagreed strongly. The recorded mean was 1.8363 and 0.91361 standard deviation. Also, the finding showed that 19(4.8%) and 144(36.6%) strongly agreed and agreed respectively that entrepreneurial

trainings are often organized in the area, 123(31.3%) were undecided, 69(17.6%) disagreed and 38(9.7%) disagreed strongly of entrepreneurial trainings being organized in the area. The mean of 3.3171 and standard deviation of 1.42206 were recorded in the study.

Multiple Regression Analysis

A multiple regression analysis of the variables under this study have been computed to assess the relationship between independent and dependent variables of the study. The results are presented in table 11 and 12.

Table 11: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.817 ^a	0.767	0.762	0.51814

Predictors (Constant): Milk collection innovation and milk utility form innovation

A value of 0.817(R=.817) in this study indicates a good level of prediction and the value of 0.767(R²=.767) shows that 76.7% of variability in Performance of Dairy Sector can be explained by independent variables.

Table 12: Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	1.937	0.214		9.040	0.000
Milk collection innovation	0.350	0.067	0.299	5.225	0.000
Milk utility form innovation	0.237	0.052	0.216	4.598	0.000

a. Dependent Variable: Performance of Dairy Sector

The general model equation (Table 12) to predict dairy sector from milk collection innovation, and milk utility form innovation, is given below:

$$Y=1.937+0.350X_1+0.237X_2-----1$$

Hypothesis H₁: There is a Significant Influence of Milk Collection Innovation on Performance of the Dairy Sector in Moiben Sub-County

The findings as shown in table 12 show that milk collection innovation has a significant influence on performance of the dairy sector in Moiben Sub- County (t=5.225, P=0.000,P<-05).Therefore the effect is statistically significantly different. An increase in one unit of milk collection innovation can cause an increase in dairy sector performance by 0.350 units.

Hypothesis H₂: There is a Significant Influence of Milk Utility Form Innovation on the Performance of the Dairy Sector in Moiben Sub- County

The result indicated in table 12, show that milk utility innovation has a significant influence on performance of the dairy sector in Moiben Sub- County (t=4.598 P=0.000, P<-05). Therefore, the effect is statistically significantly different. An increase in one unit of milk utility form innovation affects dairy sector performance by 0.237 units.

DISCUSSION

The Influence of Milk Collection Innovation on Performance of the Dairy Sector in Moiben Sub –County

The study found that there are new milk delivery destinations (68.9%) implying markets for milk has been diversified. Also new model of transport (72.6%) has been developed which means raw milk can be delivered to collection centres to avoid unnecessary delays. New containers and appropriate for milk collection (71.8%) and new way of removing impurities (51.4%) have been implemented implying quality of milk will not be compromised. Equally new way of determining milk quality (54.5%) had been innovated meaning easy and faster way of assessing milk quality. Finally, entrepreneurial training is organized for farmers and stakeholder which means entrepreneurial skills are often acquired. The result of hypothesis was statistically significant ($t=5.225$, $p=0.000$, $P<.05$) which confirmed the hypothesis. An increase in one unit of milk collection innovation increases dairy performance by 0.350 implies that innovations should be encouraged. The result is in agreement with Debele (2012) who reported that training is essential for management and use of modern value –added technologies. Also, the study found that new ways of removing impurities have been implemented. This result agrees with the finding of Ndungu (2016), who reported that milk impurities were above KEBS standard and should be managed effectively and results of milk quality along dairy farming systems and associated value chains in Kenya by SN Nyokabi (2021)

The Influence of Milk Utility Form Innovation on Performance of the Dairy Sector in Moiben Sub–County

The study found that there was high level of butter consumption (15%), increase in Yogurt consumption (25.5%), slight increase in powder milk consumption (5.9%) and other forms of milk (6.9%). This means that the demand for milk utility forms is on the increase creating business opportunities for both dairy farmers and dairy farmers respective. Also, the purchase of ice cream is on the increase, implying that the demand is also growing. The result showed that entrepreneurial training is often organized (41.5%) meaning that both stakeholders and dairy farmers are continually acquiring current skills to manage dairy sector better. Also, the study found that milk utility form has significant influence on dairy sector performance ($t=4.598$, $P=0.000$, $P<.05$), and an increase in one unit of milk utility form affect dairy sector performance by 0.237. This implies that performance of dairy sector depends significantly on conversion of raw milk to other forms.

The finding is in agreement with Fuller et al. (2004) who reported that the consumption of dairy products; Yogurt and Ice cream were higher in Urban China. The finding supports the result of Sun et al. (2005), who reported that in Wisconsin State in America, 90% milk produced is used in the manufacturing of Cheese. Further the results are supported by Jonathan (2012) who reported that fluid milk consumption had declined and Yogurt and Cheese increased.

CONCLUSION

From the findings of the study, it can be concluded that new innovations for milk collection have been developed and implemented; also, milk collection innovation has a positive contribution towards performance of dairy sector in Moiben Sub-County.

The study concluded that the consumption of milk by-products/utility forms have increased and entrepreneurial trainings are conducted. Further, it can be concluded that milk utility innovation has positive contribution in the performance of dairy sector in Moiben Sub- County.

RECOMMENDATIONS

The study made the following recommendations:

- i. There is need to establish more milk collection centres and be improved and equipped with adequate tools and equipment in order to make them entrepreneurial training centres. This will make them run like collection enterprises which are attractive to the youth and those interested in running enterprises along the dairy value chain.
- ii. There is need by policy makers and those charged with development of infrastructure to establish a good transport system which will make it easy to transport dairy products to the market easily and avoid wastages. There is also a need to develop a robust subsidy program for the dairy stakeholders in the Sub County. These two programs will assist in reducing cost of dairy ventures and increase earnings to dairy farmers and other dairy stakeholders.
- iii. Every Ward should establish dairy Saccos and encourage dairy farmers and other stakeholders to be members and make pulling resources together easy. This will also encourage saving culture among farmers and stakeholders and ultimately sacco members will access cheap credit facilities to improve their dairy undertakings.
- iv. There is need to establish and publish incentives along the dairy value chain especially for dairy farmers and other stakeholders handling milk with high hygiene that meet KEBS standards. This will encourage them to go extra mile in their dairy business because they will be rewarded for quality milk deliveries.
- v. There is need to encourage establishment of milk processing factories that engage in manufacturing of milk by-products. The Moiben Sub-County leadership should be proactive in looking for investors and give them necessary assistance to establish, Yogurt, butter, Cheese, Mursik/mala factories in the area which will pay high price for milk deliveries and attract individuals to engage in dairy farming.
- vi. Concerted effort should be directed to the youth and dairy farmers and other stakeholders along the dairy value chain in entrepreneurial training on use of various types of milk utility forms. This will create entrepreneurs along the dairy value chain which will eventually convert dairy sector into flourishing business enterprise.
- vii. There is need to establish many milk bulking centres along the dairy value chain in the Sub County. The growth of these bulking centres can be converted into bulking enterprises to take advantage of economies of scale and make dairy sector profitable
- viii. It is recommended that those supporting the development and growth of the dairy sector should invest in supporting bulking enterprise financially in order to be effective in supporting the dairy farmers. The bulking enterprises will be

able to pay for deliveries upfront and attract more deliveries in order to be viable and enjoy economies of scale.

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