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Factors Influencing Upgrading Decisions by Actors Along Selected Dairy Chains in Kenya

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Abstract
Dairy production is important in Kenya for human nutrition, income generation, and as a source of direct and indirect employment along its value chain. Despite these benefits, smallholder dairy groups in the country have minimal participation in high value and niche markets for dairy products. In the current study, six value addition groups from two Counties (i.e., Uasin Gishu and Meru) were purposively selected, and simple random sampling employed to pick 274 respondents within the surveyed sites. *These comprised 267* smallholder dairy farmers from five self-help groups, and seven members from *a self-help group operated by disabled persons who collected milk from farmers within Uasin Gishu County and processed it for resale.* Data was collected using structured questionnaires, and analyzed using descriptive statistics and a Probit model. Results show that the decision by smallholder dairy farmers and dairy groups to upgrade and move to higher value dairy chains was significantly influenced by their knowledge of value addition activities and whether they participated in a value addition group. It is, therefore, recommended that for value addition to be promoted and upgraded, small-scale value addition groups need to be facilitated and upgraded in terms of education and training, standardization, registration and management. This will generate more market opportunities for milk produced, and decrease wastage from spoilage within the dairy chains.
Keywords: Dairy chains, Probit model, Smallholder, Value addition, Kenya

1. Introduction

The dairy sub-sector in Kenya is rated as one of the fastest growing in the country's livestock sector. It plays an important role in the national economy and socio-economic development of many rural households. The sub-sector contributes about 14% of Kenya's agricultural gross domestic product and 4% of the gross domestic product (KDB 2014). Milk is valued by many households due to its nutritional contribution, especially to children. The dairy sub-sector also contributes to the livelihood of many Kenyans directly and indirectly through employment along its value chain.

According to KDB (2014), volumes of milk processed in Kenya for the years 2002 to 2010 increased from 144 to 516 million litres per annum, with an average production of 4.1 billion litres per year, implying that only about 15% of the milk is processed. Further, annual per capita milk consumption in the country is estimated at 81-100 litres, which translates to approximately 4 billion litres per annum, showing that there is limited surplus for export (KNBS 2009; Behnke & Muthami 2011).

Increased safety and quality standards, health concerns of consumers and the effects of climate change continue to be major challenges in the dairy sub-sector in Kenya, especially because large quantities of milk are handled by the informal sector, which is unregulated. *Omore et al.* (2011) showed that milk products handled by traders in the country have high bacterial levels. Additionally, production is still very costly and is characterized by very low input use, although this varies according to the degree of commercialization by a farmer. Muriuki (2011) observed that feed represented the largest part of the cost of milk production and, that there were no effective mechanisms to assure farmers of the quality of animal feeds in the market. Other studies indicate that cows are generally underfed, resulting in low milk production per cow (e.g., (KNBS 2009; Behnke & Muthami 2011).

Focusing on agriculture from a value chain perspective has shifted attention from production alone to a whole range of activities, from designing to marketing and consumption. Many policy makers have emphasized the need to develop market-oriented and market-led opportunities along the entire value chain (e.g., UNIDO 2009a & IFAD 2010). Reardon *et al.* (2004) showed that market literacy by producers was key to accessing niche markets like supermarkets, but this remains a challenge for many smallholder dairy groups.

Dairy products from upgraded value chains are pasteurized and packaged before marketing. Consequently,

these products tend to dominate niche markets, which are characterized by stringent safety and quality standards. Conversely, traditional dairy value chains are characterized by low technological capabilities, being labour intensive, and engagement in simple milk processing like boiling and fermentation (Giuliani *et al.* 2005; Makita *et al.* 2011). However, traditional value chains have opportunities to increase volumes of milk marketed with less stringent quality standards (UNIDO 2009b), comprise majority of smallholder farmers and, consequently, offer opportunities for broad-based rural development.

Increasing technological know-how and management abilities, according to UNIDO (2009b), enable effective participation in value chains. Upgrading a value chain means not only acquiring knowledge and technologies, but doing so at a faster pace than other actors in competing value chains in order to have a competitive edge. There is, therefore, need to shift focus and study traditional value chains, and ways of improving processes, products and functions along these chains to provide safe and high quality dairy products. To do this, it is imperative to identify key drivers of upgrading decisions along the dairy chains in terms of specific factors in each selected value chain. The present study, therefore, aimed at contributing to the body of knowledge on value addition by analyzing the factors that influenced upgrading decisions along selected dairy chains in Kenya.

2. Research Methodology

2.1 Description of the Study Sites

The study was conducted in Uasin Gishu and Meru Counties of Kenya. These study sites were chosen based on a baseline survey by the Eastern Africa Agricultural Productivity Project Coordinating Unit, Kenya (EAAPP 2011), which showed that dairy production businesses in these sites had competitive advantage, and with availability of suitable technologies that could be scaled up.

Uasin Gishu County lies in the mid-west of Kenya between longitudes 340 50" east and 350 37" west, and latitudes 00 03" south and 00 55" north, with an area of 3,345.2 km^2. Temperatures in the County range from 7 to 29^oC, with high, reliable and evenly distributed rainfall ranging between 624.9 and 1,560.4mm. January-February and April-May are the driest and wettest months, respectively (Kenya County Guide 2017). The County has a population of about 894,179 people, with a density of 267 people per km^2. It is reported that 50% of the population lives below the poverty line, earning less than USD 1.00 per day (KNBS 2009). The main agricultural activities in the County are maize and wheat growing, and dairy and beef production (Kenya County Guide 2017).

Meru County is located along the eastern side of Mount Kenya about 8.05 km north of the equator and at an altitude of approximately 1,525m above sea level (Kenya County Guide 2017). The County has an area of 6,936.0 km^2, with a population of 1,356,301 people and a density of 195.5 people per km^2 (KNBS 2009). Temperatures range from 16 to 23^oC, and bimodal rainfall ranging between 500 to 2600mm per annum, with long rains occurring from mid-March to May and short rains from October to December (Kenya County Guide 2017). The economy of the County is basically agricultural, with *Khat* being the most commonly grown cash crop in the southern part, both for export and local consumption. The other major cash crops are coffee and tea in some prime areas, especially at the slopes of Mount Kenya. Dairy farming also forms a huge part of the County's economy (KNBS 2009; Kenya County Guide 2017).

2.2 Sampling Procedure

For the selection of the dairy groups, purposive sampling was employed, i.e., smallholder dairy farmers and groups that engaged in value adding activities or who sold unprocessed milk were selected. The dairy groups had to be operating legally, and with good management and well defined future plans. Subsequently, two sub-samples for individual smallholder dairy groups were collected for this study, i.e., one in which the actors were affiliated to value addition groups and the other that they were not. For the affiliated actors, a source list was obtained from the collective action groups from which actors were selected randomly. For the non-affiliated actors, a sampling frame from which simple random sampling was employed was constructed with the assistance of the area agricultural officer. Consequently, data was collected on 274 respondents from six separate dairy groups (three from each County) that performed different value addition processes. These comprised 267 *smallholder dairy farmers from five self-help groups, and seven members from* a self-help group operated by disabled persons who collected milk from farmers within Uasin Gishu and processed it for resale. The factors that influenced decisions by smallholder dairy groups to add value to milk were assessed. The survey sites were proximal to major markets for milk and milk products.

2.3 Analytical Framework

A Probit model as shown in equation 1 below was used to determine the factors influencing the choice of whether to upgrade or not to upgrade the dairy chain:

$$Prob(y_i = 1|X = \int_{-\infty}^{X'\beta} \Phi(t)dt = \Phi(X^i\beta) \quad (1)$$

where y_i is an indicator variable equal to 1 if the value chain actor chooses to upgrade the chain or otherwise, Φ(.) the standard normal distribution function, *βs* the estimated parameters and *Xs* the determinants of the dependent variable, i.e., the choice of adding value to milk. By upgrading milk products and processes like, for example, increasing delivery speed, selling processed milk products, using standardized equipment and adopting measures to increase the quantity of milk sold, the dairy farmer is considered to have added value to milk and milk products as depicted in equation 2 below:

$$Y(0,1) = Log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 \ldots . \beta_n X_n \quad (2)$$

where Y is the probability of a chain actor to add value to milk and milk products, β_0, β_1, β_2, β_3, β_4.... and β_n the parameters to be estimated, X_1 a vector of socio-economic factors, X_2 a vector of institutional factors, X_3 a vector of economic factors, X_4 a vector of resource factors and ε_{ij} an error term that is independently and identically distributed.

The Probit parameter estimate does not show by how much a particular variable increases or decreases the likelihood of choosing to upgrade milk. For this reason, the marginal effects of the independent variables on the probability of a chain actor to choose to add value to milk or to the probability to upgrade are presented. For continuous independent variables, the marginal effect of the Probit model is calculated by multiplying the coefficient estimate (∝) by the standard probability density function given in equation 1 above by holding the other independent variables at their mean values as presented in equation 3 below:

$$\frac{\partial P(Y=1)}{\partial X_i} = \alpha\Phi(\beta_j X_i \quad (3)$$

Conversely, the marginal effects of the dummy independent variables were analyzed by comparing the probabilities that result when the dummy variables take their two different values while holding all other independent variables at their sample mean values (Wooldridge 2002). Finally, the log-likelihood function, which was maximized to obtain the parameter estimates and the corresponding marginal effects for the Probit model, is given in equation 4 below:

$$\ln L(\alpha|Y, X_i) = \sum_{y=1} ln\,\Phi(\beta_j X_i) + \sum_{y=0} \ln(1-\Phi)(\beta_j X_i) \quad (4)$$

The Probit model was then derived using maximum likelihood estimation. The Probit model uses a normal distribution and, mathematically, it involves the use of integrals.

3. Results and Discussions

3.1 Value Addition by Smallholder Dairy Groups

Majority (86%) of the respondents sold their milk unprocessed, i.e., raw before boiling (Table 1). The minimal processing of milk at the farm level could be because of inadequate equipment for value addition. It is, however, important to note that raw milk is highly perishable and is more likely to get contaminated before it reaches the final consumer, which poses greater risk to human health.

Table 1. Types of value addition by smallholder dairy groups in the surveyed sites

Type of value addition***	County		%
	Uasin Gishu	Meru	
Raw	106.00	132.00	86.90
Boiled	13.00	4.00	6.20
Mala (traditionally fermented milk)	5.00	1.00	2.20
Yoghurt	0.00	1.00	0.40
Ghee	1.00	0.00	0.40
Raw and mala	0.00	2.00	0.70
Raw and yoghurt	0.00	1.00	0.40
Boiled, mala and yoghurt	5.00	0.00	1.80
Mala, yoghurt and cheese	3.00	0.00	1.10

None of the respondents in Meru County processed milk into cheese, citing dislike by most buyers. This is consistent with a study undertaken in the central region of Kenya, which showed that only 3% of Kenya's milk is processed into cheese (Mbugua *et al.* 2012). Additionally, traditional value addition was minimally practiced for commercial purposes. The foregoing imply that there were more unexploited opportunities for value addition in the dairy sub-sector in the country.

3.2 Demographic and Socio-economic Characteristics of the Smallholder Dairy Groups

3.3.1 General Characteristics of the Dairy Groups

General demographic and socio-economic characteristics of the six smallholder dairy groups that were surveyed are given in Table 2 below. Each value addition group had been in operation for more than three years. Among

the groups, Thuita SHG, located in Meru South of Meru County, was the oldest in terms of years in operation. Langas SHG in Uasin Gishu County was run by a group of disabled persons who collected milk from farmers within the County and processed it for resale.

The main activities undertaken by the groups were bulking, processing, distribution and marketing of milk and milk products, and supporting each other depending on each group and the group's needs. The main reason for the formation of these groups was to get better prices and market for their milk and milk products, to provide loans to members and to improve the welfare of its members. All the groups had membership and contribution fees from its members.

Table 2. General demographic and socio-economic characteristics of the smallholder dairy groups in the surveyed sites

Variable	County					
	Uasin Gishu			Meru		
	Chepng'oror Cooperative Society	*Langas Disabled* SHG[1]	*Kapkawa Baitany* SHG	*Thuita* SHG	*Muchege Hort* SHG	*Siomburu* SHG
Years group had been in operation	3	4	7	24	9	6
Membership number	56	42	21	150	18	20
Estimated value (Kes)[2]	300,000	58,000	50,000	800,000	800,000	60,000
Other income	X	X	X	X	Sold feed	X
Road type to market	Earth	Earth	Tarmac	Earth	Tarmac	Murram
Owned motorable transport	X	X	X	X	X	X
Distance to market (km)	30	0	3	4	3	3

[1]SHG= Self-help Group [2]Kes = Kenya Shillings X=None/ No

3.2.2 Comparison of Smallholder Dairy Groups That Added Value and Those That Did Not

Demographic and socio-economic characteristics of smallholder dairy groups that added value to milk in comparison to those that did not are presented in Table 3 below. It was evident that smallholder dairy groups that added value to their milk were less educated compared to those that did not. The possible explanation for this is that less educated members of smallholder dairy groups depended on the dairy business entirely for income generation and, therefore, would more likely try to maximize revenue from milk and milk products through value addition.

Table 3. Demographic and socio-economic characteristics of smallholder dairy groups that added value and those that did not in the surveyed sites

Variable	Added value (N=36)	Did not add value (N=238)	Significance level (Pearson χ^2)
Gender of household head			
Female	23.00	88.00	0.001***
Male	13.00	150.00	
Training on value addition			
Yes	21.00	229.00	0.000***
No	15.00	9.00	
Age (years)	39.00	44.00	0.027**
Distance to market (km)	3.60	5.10	0.045**
Education level			
None	2.00	3.00	
Primary	15.00	80.00	
Secondary	132.00	97.00	0.08*
College	4.00	51.00	
University	3.00	7.00	
Experience in dairy business (years)	9.00	14.00	0.004***

The results also indicate that female respondents were more involved in value addition than their male counterparts. Majority of the respondents that added value to their milk did not own motorized transport compared to those who did. Further, the respondents that added value to their milk and milk products were slightly younger relative to those that did not. Those that added value to their milk and milk products were also located closer to the market than those that did not. Additionally, respondents that added value to milk tended to have significantly less experience in dairy business relative those that did not. Besides, most respondents with primary level of education added value to their milk compared to those with secondary education.

3.4 Upgrading Activities of the Smallholder Dairy Groups

Table 4 below presents the willingness of the smallholder dairy groups to upgrade their activities. Five groups out of the six had invested in new machinery and increased the number of dairy products that they supplied to the market in the past few years. This was a sign that the groups were striving towards upgrading dairy processes and products (Trienekens 2011).

Table 4. Upgrading activities by the smallholder dairy groups in the surveyed sites

Upgrading activity	County					
	Uasin Gishu			Meru		
	Chepng'oror Cooperative Society	Langas Disabled SHG	Kapkawa Baitany SHG[1]	Thuita SHG	Muchege Hort SHG	Siomburu SHG
Invested in machinery	X	√	√	√	√	√
Increased products sold	X	√	√	√	√	√
Increased use of technology	X	X	X	X	X	√
Increased delivery speed	√	X	√	X	X	X
Expanded market	√	√	√	X	√	√
Improved milk safety	√	√	√	√	√	√
Prevented milk losses	√	√	√	√	√	√

[1]SHG= Self-help Group √ = Yes X= NO

All the smallholder dairy groups had in the past tried to minimize losses resulting from spoilage of milk and milk products by buying lactometers to measure the purity of the milk, and some of them by pasteurizing the milk. One group had invested in a cooling plant to upgrade their milk quality and quantity because they could subsequently buy evening milk from farmers. Some groups had upgraded their processes through activities like expansion of their market base and by increasing delivery speed to the market. Most of the groups were yet to improve on use of dairy technology.

3.5 Upgrading Decisions on Value Addition by the Smallholder Dairy Groups

Upgrading decisions on activities and services that the smallholder dairy groups undertook *in the surveyed sites* are shown in Table 5 below. Out of the six groups, five had at least a member or staff trained on value addition of milk and milk products, indicating their potential to undertake value addition. The groups were also aware of national and international safety and quality standards on milk and milk products, which was a step towards improvement of the safety and quality of milk and milk products.

Table 5. Upgrading decisions on value addition activities and services by smallholder dairy groups in the surveyed sites

Upgrading activities and services	County					
	Uasin Gishu			Meru		
	Chepng'oror SHG	**Langas Disabled SHG**	**Kapkawa Baitany SHG**	**Thuita SHG**	**Muchege Hort SHG**	**Siomburu SHG**
Value addition training	√	√	√	√	√	X
Training provider	College	College	MoA[1]	NGO[2]	MoA	
Standards awareness	√	√	√	√	√	√
Buying evening milk	X	X	X	√	√	√
Information source	MoA					
Marketing strategy	Pricing	Promotion	Quality	Product	Quality	Quality
Linkages with other institutions	Research	Credit	MoA	Credit	Credit	MoA
Services offered	X	Loans	Training	Training	Loans	Feed and treatment
Availability of external support	X	√	X	√	√	√
Areas in need of support		Training	Credit	Electricity costs	Marketing	Training

[1]MoA=Ministry of Agriculture; [2]NGO= Non-Government Organization √ = Yes X= No

All the groups sampled in Meru County bought evening milk while those in Uasin Gishu County did not,

citing unavailability of evening milk and poor road infrastructure. Results not presented in Table 5 above further show that, inadequate milk processing equipment and milk spoilage were among the main challenges faced by the dairy groups. In marketing, high cost of transportation, competition from milk hawkers and poor milk prices were some of the major constraints.

3.6 Factors Influencing Decisions by Smallholder Dairy Groups to Upgrade Milk Products

Table 6 gives the marginal effects of a Probit analysis of the factors that influenced the decisions by smallholder dairy groups to upgrade milk and milk products. By choosing to add value to milk, the dairy groups were considered to have upgraded their milk products. This implies that, through value addition, the groups sold more dairy products. However, dairy groups that sold only one product to the market, in this case unprocessed milk, were considered not to have upgraded products. In modeling decisions on whether or not to upgrade products using the Probit model, dairy groups that sold their milk in an unprocessed form were given a value of 0 while those that sold milk products to the market in other forms were given a value of 1.

Table 6. Probit model showing factors influencing upgrading decisions by smallholder dairy groups in the surveyed sites

Factors influencing upgrading decisions	Parameters			
	dy/dx	Standard error	Z	P>z
Gender of household head	-0.055	0.030	-1.840	0.066*
Age of household head	0.000	0.001	0.390	0.697
Education level	-0.002	0.008	-0.200	0.839
Experience in dairy business	-0.002	0.001	-1.730	0.084*
Number of cows	0.005	0.003	1.820	0.068
Milk price (Kes)	0.092	0.055	1.680	0.094*
Road network	0.023	0.021	1.090	0.275
Value addition skills	0.245	0.104	2.360	0.018**
Bargaining power	0.020	0.019	1.060	0.288
Daily milk payment	0.061	0.043	1.420	0.156
Group belonging	-0.026	0.026	-0.990	0.32
Husbandry skills	-0.026	0.018	-1.470	0.143
Cut down losses	0.035	0.018	1.910	0.056*
Quality requirements	-0.026	0.020	-1.280	0.199
Delivery time requirements	0.033	0.035	0.940	0.347
Awareness of milk standards	-0.013	0.015	-0.920	0.359
Distance to main road (km)	0.006	0.005	1.25	0.212
Distance to market (km)	-0.004	0.002	-1.570	0.117
Transport ownership	-0.027	0.017	-1.600	0.109

Level of significance, *P<0.01, **P<0.05, *** P<0.1; Prob>χ^2 = 0.0000, Log likelihood = -51.951719, Pseudo R^2 = 0.4539

The P-value for the overall model fit statistic was less than the conventional 0.05, showing evidence that at least one of the independent variables contributed to the prediction of the outcome. The Mcfadden Pseudo R^2 showed that the variables explained at least 45% of the changes in the dependent variable. The gender of the respondent had a negative effect on the decision by smallholder dairy groups to add value to milk (P<0.01). This implies that a male headed household was less likely to upgrade milk products than their female counterparts. This is shown by a negative coefficient and a marginal effect of 0.05.

Further, the findings in the current study show that if a smallholder dairy group had value addition skills, then the likelihood of adding value to milk also increased by up to 24% (P<0.01). This finding agrees with the observations of Giuliani *et al.* (2005) that, appropriateness of knowledge base influenced the capacity and ways in which firms upgraded their products. Further, this finding shows the need to equip smallholder dairy groups with more specific skills on value addition to increase their ability to upgrade milk products marketed and, therefore, get more income.

The findings in the present study also show that smallholder dairy groups who considered milk prices to be favourable were more likely to add value to milk than those who did not (P<0.1). A unit change in the favourability of milk prices would increase the chances of adding value by up to 7% as indicated by the marginal effects. This implies that price had an effect on the smallholder dairy groups' decisions on whether to upgrade milk products or not. Consequently, there is need to improve the prices offered to them in the market to encourage more smallholder dairy groups to add value to their milk.

Experience in dairy business had a negative influence on the decisions by smallholder dairy groups to add value to milk. A unit change in years of operation resulted in a decrease in the probability of adding value to

their milk as indicated by the marginal effects. Years in operation, as a proxy for experience in dairy business, could imply that those smallholder groups who recently ventured into the dairy business were more likely to add value to their milk than those who were more experienced. This could be because smallholder dairy groups that had been in operation for long were more inflexible to embrace change in market demands to add value to their milk. This finding is contrary to that of Sharma *et al.* (2009), that years in operation enhanced skills and ability to meet quality requirements of the modern milk channels, and better utilization of information and lower transaction costs, which impacted on participation.

The findings in the current study also indicate that smallholder dairy groups that had tried to reduce milk losses were more likely to add value relative to those that had not ($P<0.1$). This could be attributed to availability of more disposable income through decreased milk losses, which reduced the need to sell raw milk faster to meet daily cash requirements of the smallholder dairy groups. Awareness of safety and quality standards in milk by smallholder dairy groups and buyers was shown to negatively influence the decision to add value to milk ($P<0.1$). This implies that, by adding value to milk and producing a variety of dairy products, demands like licensing and packaging could force dairy groups to sell their milk raw because of lesser requirements for the latter.

4. Conclusions and Recommendations

The present study found that minimal processing of milk was done by the smallholder dairy groups in the surveyed sites in Kenya, and dairy products like cheese were rare among them. Participation in value addition was positively influenced by specific knowledge the smallholder dairy groups had on value addition. Dairy groups that were not able to preserve milk were also more likely to increase the quantities delivered to the market as unprocessed. Besides, smallholder dairy groups were more likely to add value to their milk if they were given incentives like access to credit for inputs.

Traditional processing, as a form of value addition, was minimally practiced for commercial purposes, which presents opportunities for value addition in the smallholder dairy sub-sector. Traditional methods of value addition are labour intensive, and for them to be used for commercial purposes, requires upgrading in terms of commercialization and marketing. It is, therefore, recommended that technological and innovative capabilities of smallholder dairy groups be enhanced to encourage more value addition in the overall smallholder dairy sub-sector. Additionally, there is need to equip smallholder dairy groups with more skills on value addition to increase their ability to upgrade milk products marketed to get more income. Infrastructure, especially poor roads and lack of electricity in the remote areas, was a major hindrance to value addition, and this needs to be improved to realize much benefit from value addition. It is also recommended that, for value addition to be promoted and upgraded, small-scale value addition groups need to be facilitated and upgraded in terms of education and training, standardization, registration and management. This will create more markets for milk produced and reduce wastage through spoilage within the dairy chains.

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References

Behnke, R., & Muthami, D. (2011), *"The Contribution of Livestock to the Kenyan Economy",* IGAD Livestock Policy Initiative, IGAD LPI Working Paper No. 03-11, Rome, Italy, 62 pp.

EAAPP (2011), "*Value Addition and Marketing of Milk by Smallholder Farmers in Meru and Uasin Gishu Counties",* East African Agricultural Productivity Project, Unpublished Report.

Giuliani, E., Pietrobelli, C., & Rabelloti, R. (2005), "Upgrading in global value chains: lessons from Latin American clusters", *World Development 33,* 549-573.

IFAD (2010), *"Value Chains - Linking Producers to the Markets",* International Fund for Agricultural Development (IFAD), Rome, Italy, pp. 2-6.

KDB (2014), "*Kenya Dairy Board Publications",* Kenya Dairy Board, Nairobi, Kenya, [Online] Available: http://www.kdb.com (24th April 2017).

KNBS (2009), "*Population Statistics",* Kenya National Bureau of Statistics, Government Press, Nairobi, Kenya.

Makita, K., Desissa, F., Teklu, A., Zewde, G., & Grace, D. (2011), "Risk assessment of *Staphylococcal* poisoning due to consumption of informally-marketed milk and home-made yoghurt in Debre Zeit, Ethiopia", *International Journal of Food Microbiology 153, 135-141.*

Mbugua, J.N., Njonge, F.K., Muchemi, K., Waiyaki. N., & Ngaruiya, N.P. (2012), "*Strategic and Value Chain Smallholder Dairy Study in Central Kenya",* Kilimo Trust, Nairobi, Kenya, pp. 6-10.

Muriuki, H.G. (2011), *"Dairy Development in Kenya"*, Food and Agriculture Organization of the United

Nations, Rome, Italy, 41 pp.

Omore, A., Kurwijila, L., Makokha, S., & Rosemirta, B. (2011), "*Market Study Reveals the Need for Appropriate Food Safety Standards and Incentive-Based Approaches for Improved Compliance in ECA Countries," Policy Brief, International Livestock Research Institute, Nairobi, Kenya.*

Reardon, T.A., Berdegué, A.J., Lundy, M., Hernández, R., Pérez, E., & Jano, P. (2004), "*Supermarkets and Rural Livelihoods: A Research Method",* Michigan, USA: Michigan State University, pp. 7-13.

Sharma, V.P., Kumar, K., & Singh, R.V. (2009), *"Determinants of Small-Scale Farmer Inclusion in Emerging Modern Agri-food Markets: A Study of the Dairy Industry in India",* Working Paper No. 2009-02-01, Indian Institute of Management, Ahmedabad, India.

Trienekens, J.H. (2011), "Agricultural value chains in developing countries: a framework for analysis", *International Food and Agribusiness Management Review 14(2),* 68-72.

Uasin Gishu County (2017), *"info@kenyacountyguide.com",* [Online] Available: www.kenyacountyguide.com/uasin-gishu-county/ and www.kenyacountyguide.com/ meru-county/ (24th April 2017).

UNIDO (2009a), "*Agro-Value Chain Analysis and Development: The UNIDO Approach",* United Nations Industrial Development Organization, Vienna, Austria, pp. 13-20.

UNIDO (2009b), "*Value Chain Diagnostics for Industrial Development: Building Blocks for a Holistic and Rapid Analytical Tool",* United Nations Industrial Development Organization, Vienna, Austria, pp. 32-37.

Wooldridge, J.M. (2002), "*Econometric Analysis of Cross Section and Panel Data",* Cambridge: MA: The MIT Press, pp. 525-539.