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MARKETING FRAMEWORK IN THE DAIRY VALUE CHAIN FOR FOOD SECURITY AND SUSTAINABLE DEVELOPMENT IN BUNGOMA COUNTY, KENYA

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ABSTRACT: *This paper brings into context the effect of the marketing strategies on the dairy value chain returns and food security in Bungoma County. It highlights marketing strategies and processing activities along the dairy value chain. Much focus is on how marketing of dairy products is done, factors influencing marketing, marketing constraints, household food availability, strategies used by households to cope with food shortages and approaches to making dairy processing sector more attractive to domestic and international investors. Finally, it highlights the strategies and resources devoted to marketing, and the existing linkages between the producers, marketers, processors, and consumers.*

KEYWORDS: Marketing Strategy, Dairy Value Chain Returns, Food Security, Dairy Marketing Framework

INTRODUCTION

Background of the Study

Food security is a situation in which all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active healthy life (FAO, 2007; IFPRI, 2012). It is affected by a complexity of factors including unstable social and political environments that preclude sustainable economic growth; wars and civil strives; macroeconomic imbalances in trade; natural resource constraints; poor human resource base; gender inequality, inadequate education; poor health; and natural disasters like floods and pest infestations and absence of good governance. All these factors contribute to either insufficient national food availability or access to food by households and individuals (FAO, 2011, 2012; IFPRI, 2012).

Dairy farming as an important part of the global food system plays a vital role in sustainable rural development. The United Nations has identified dairy sector as one of the drivers in achieving sustainable development goals. According to Bellamy and Bogdan (2016) dairy marketing strategies aim at achieving economic and social dimensions of sustainable development goals. Economic dimension is realised by strengthening dairy farmers economically through efficient and effective market development strategies that make them more attractive for investment, creating and preserving local employment. Social dimension is addressed through professional and gender empowerment, access to local milk, dairy and workforce development. This relates to food security (objective of SDG2) by increasing the production volume, quality and contributing to dairy farmers' income plus nutritional needs of different age and social groups.

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Unlike western countries, dairy farming in developing countries is dominated by smallholders where marketing remains grossly primitive. The efforts in value chain development attempt to link smallholders to markets by shifting traditional farming strategies toward increased production for the market; providing market information; organizing farmers into groups, associations, or cooperatives; and by coordinating contract farming and out-grower schemes (Njuki *et al*., 2011). The promotion of value-chain development for smallholders is, however, accompanied by concerns that the benefits of market-oriented production are more likely to be captured by the rich; increased access to new market opportunities is likely to displace local farmers and further that value chain projects will create a privileged group of farmers with exclusive access to new technologies or marketing channels (Njuki *et al*., 2011).

Kenya is considered amongst the highest consumers of dairy products in Africa slightly behind Egypt and South Africa (Lokuruka, 2016), implying that smallholder dairy farmers almost always have the capacity to respond quickly to meet market demand for milk productivity simply by improving feeding of locally available crop by-products if they are able to access capital. Here smallholders contribute to ensuring regional food security, stimulating economic development through creating jobs thereby achieving sustainable development goals.

The dairy products marketing frameworks differ in terms of economy, region, and country and are critical in the dairy sector by comprising large numbers of small holdings with most undifferentiated products and farming enterprises isolated from the final consumer (Ritson, 1997). Majority developed countries have shorter marketing frameworks which increase producer earnings while relieving consumers extra cash. However, in developing economies, the marketing plan is long consisting of various intermediaries which reduces producer earnings and increase the cost of acquiring dairy products. Therefore, the objective of this paper is to investigate the role of marketing framework in the dairy value chain for food security and sustainable development in Bungoma County, Kenya.

LITERATURE AND THEORETICAL REVIEW

Literature Review

Dairy marketing truly came into the public's consciousness with the introduction of the "Got Milk" campaign in 1993. The basic dairy product became associated with a memorable and catchy slogan that helped drive sales. There are many other strategies, though, to mark all types of dairy products. These include promotion of nutritional value, appeal to the organic market, and use of social media networks and development of new dairy products (Imam *et al*., 2011). According to American Marketing Association (2010), marketing is "the process of planning and executing the conception, pricing, promotion, and distribution of ideas, goods, and services to create exchanges that satisfy individual and organizational objectives." Marketers use an assortment of strategies to guide how, when, and where product information is presented to consumers. Their goal is to convince consumers to buy a particular brand or product. Successful marketing strategies create a desire for a product. A marketer, therefore, needs to understand consumer likes and dislikes. In addition, marketers must know what information will convince consumers to buy their product, and whom consumers perceive as a credible source of information.

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Livestock products have highly distributed production systems located far from consumer markets and they are highly perishable. Thus, they require more efficient marketing and processing system along their entire value chain-from production to consumption-to realize their higher value. Marketing and processing activities are even more critical in Africa since most livestock producers are small, resource poor, and often unable to establish their own linkages with markets, processors, and consumers. Even after decades of planned economic development, marketing of livestock and livestock products remains largely unorganized, traditional, and fragmented, with a few exceptions.

The studies have inferred that the marketing cost is lower for toned milk, standardized milk, full cream milk and skimmed milk product (SMP) for private dairy plant and only of butter and ghee for the co-operative dairy plant(Babua and Vermab, 2010). The marketing margins have been found higher for the private plant in toned milk, standardized milk and butter and in full cream milk, ghee and SMP for the co-operative plant, indicating their respective profitability. The products which could earn higher value after passing through the value chain are milk peda, khoa and SMP in the cooperative plant and ice cream, Mysorepa and ghee in the private plant (Babua and Vermab, 2010). A small market research study on the potential of yogurt production was implemented in Nyandira and met with positive feedback, motivating Twawose to start production (Krogh, 2010). Cheese was not considered as an option because there is no tradition of consuming cheese in Tanzania, especially in poor rural areas like Mgeta. There are several reasons for choosing yogurt over other dairy products as a means to add value to surplus milk.

In tropical environments characterized by high temperatures, milk deteriorates rapidly, and requires processing to prolong its shelf-life and reach more distant markets (Staricko, 2015). Once processed into fermented milk products like yogurt or cultured sour milk, its shelf life may be extended up to one week (or more) depending on quality, packaging, and storage temperature. Fermented milk is also considered easier to digest and healthier than fresh milk (Staricko, 2015). Survey on marketing of milk products in Bungoma County has indicated that most smallholder dairy farmers supply their milk to milk collection centres (some are the Dairy Cooperative Societies) on a daily basis. These centres usually buy the milk either directly from the farmers or via some agents (FAO, 2007). Membership to these milk collection centres is through payment of a fee and a farmer automatically becomes a shareholder. It is also the duty of milk collection centres to store milk in refrigerated cooler tanks and market it store longer. The farmers are paid at the end of the month. From the foregoing literature, it is evident that the farmer is central figure in the dairy value chain but is not the ultimate beneficiary of major returns accrued from sale of products. For sustainability sake, this study will provide a roadmap towards making the farmer gain more from their role in the value chain.

Theory on Dairy Value Chain

This study was anchored on Porter's Value Chain Approach (Porter, 1985). The approach of the value chain is based on the process view of organizations, the idea of seeing a manufacturing (or service) organization as a system, made up of subsystems each with inputs, transformation processes and outputs. Inputs, transformation processes, and outputs involve the acquisition and consumption of resources like money, labour, materials, equipment, buildings, land, administration and management. How value chain activities are carried out actually determines costs and affects profits. According to Porter (1985), the primary activities are: inbound logistics which involve relationships with suppliers and include all the

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activities required to receive, store, and disseminate inputs. Operations are all the activities required to transform inputs into outputs (products and services). Outbound logistics include all the activities required to collect, store, and distribute the output. Marketing and sales are activities that inform buyers about products and services, induce buyers to purchase them, and facilitate their purchase while service refers to all the activities required to keep the product or service working effectively for the buyer after it is sold and delivered.

These activities involved in dairy value chain include milk production; milk collection; transportation and storage; processing; quality/standards; marketing and market outlets for dairy products; input supply; service provision; constraints to milk production; and opportunities for dairy development (Seifu & Doluschitz, 2014). All these activities are performed by a company to create value for its customers in terms of cheese, butter, yoghurt, skimmed milk, toned milk, full cream milk, ghee and standardized milk. Value creation facilitates added value which leads to competitive advantage. Ultimately, added value also creates a higher profitability for an organization and other stakeholders. The theory has been successfully applied by Nabiswa and Siamba (2017) on the effect of marketing strategies on the dairy value chain returns and food and nutrition security in Bungoma County, Kenya. The key players in the value chain are the input suppliers, farmers, milk collection centers, processors, research institutions, quality regulator and retail outlets. Each of the players in the value chain carry out various value adding services, the input suppliers for instance providing various veterinary drugs, milking equipment, all services, feed among other services. The primary producer in the dairy value chain (the farmer), executes various animal husbandry measures such as disease control measures, provision of feed to in-calf and lactating cows' requirements and traded through the formal marketing channels.

METHODOLOGY

The study adopted a correlational research design and involved Seven (7) cooperative societies covering 10,062 dairy farmers, seven (7) managers of the Dairy Cooperative Societies and twenty four Livestock Officers from eight sub-counties in Bungoma County, Kenya. Multi-stage random sampling was used to group/cluster the 10,062 farmers spread in eight sub-counties, and involved selecting a sample within each chosen cluster, done by selecting a sample in at least two stages, where in the first stage, large groups or clusters are selected. Purposive sampling technique was used to select seven (7) managers of the Dairy Cooperative Societies and twenty four Livestock Officers from eight sub-counties. The milk vendors and transporters were obtained using simple random sampling technique. The study used key informant interview schedules, Focused Group Discussions, observation checklist as triangulation in data collection. The data analysis involved quantitative and qualitative methods (numerical and descriptive). The effectiveness of dairy marketing framework was achieved using spearman correlation coefficient (R) and multiple linear regressions (R^2). Qualitative data was analysed based on content analysis. Data was analysed using SPSS programme which has analysis tools. The collected data was presented using statistical techniques which included percentages, frequency distribution tables, charts and figures.

The effectiveness of marketing frameworks was determined using linear regression. The following model was specified for dairy farmer income from the market channel choice analysis;

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$DMI=\beta_0+\beta_1X1+\beta_2X2+\beta_3X3+\beta_4X4+\beta_5X5+\varepsilon$

Where DMI is the dairy marketing income while $\beta_1 \ldots \beta_5$are coefficients associated with each explanatory variable and the ε is the error term

FINDINGS

Profile of the Respondents

The study sought to find out the duration of time respondents (farmers) have been marketing dairy products in Bungoma County. Majority of the farmers had been in dairy farming value chain for between 11-15 years; accounting for 56.1% (60) while those with over 15 years of experience being 20.6% (22).

Marketing of Dairy Products

The study established that majority of farmers marketed their milk informally (67.92%) (72), while 33.02% (35) marketed their milk formally, confirming that majority smallholder farmers in Bungoma County marketed their dairy products informally, a practice commonly undertaken in developing economies.

Marketing Framework

After establishing the marketing strategies adopted by smallholder farmers in Bungoma County, the study presents a schematic diagram of dairy products marketing channels currently adopted by actors in the dairy value chain in Bungoma County as shown in Figure 1.0 below:

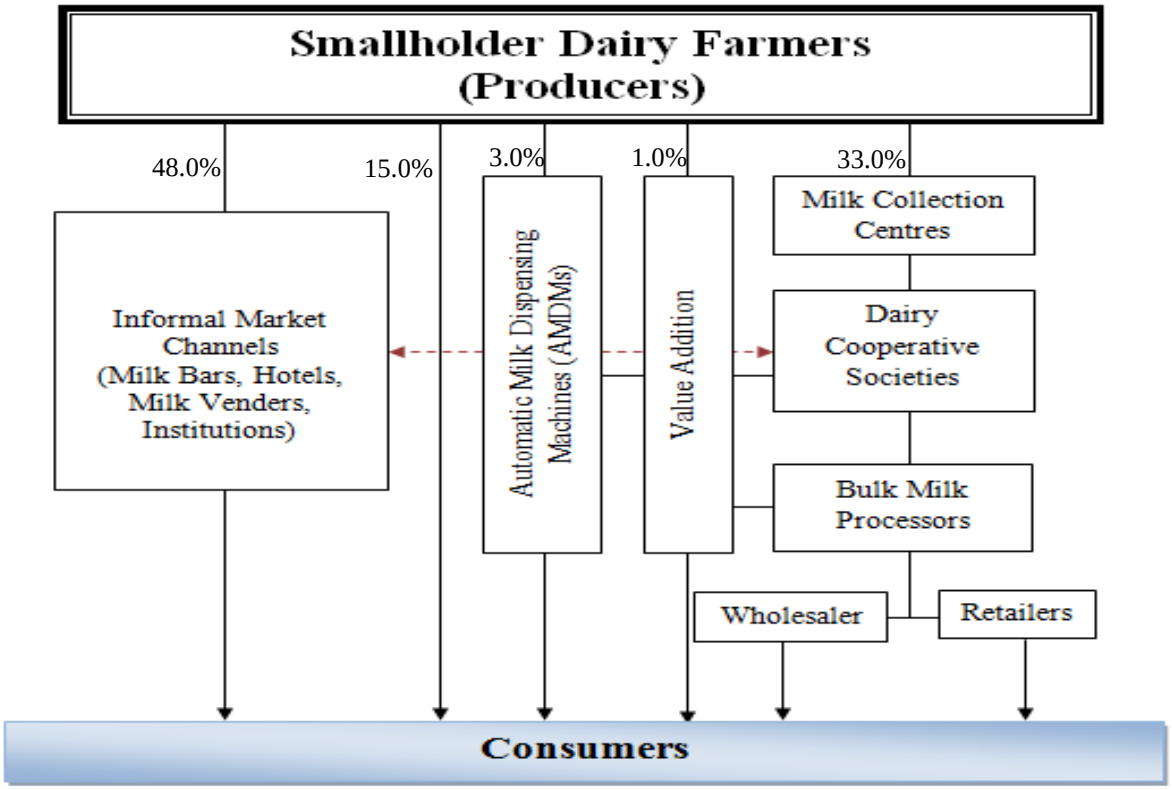

Figure 1.0: Marketing Model Adopted by Dairy Farmers in Bungoma County, Kenya

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Source: Field Data, (2016)

From the above framework, 48.0% of farm produce was sold through intermediaries such as milk bars, milk vendors, hotels and learning institutions; 15.0% directly from the farmers to consumers; 3.0% through AMDMS; 1.0% through value addition channel and 33.0% through cooperative societies.

It is evident that dairy farmers in Bungoma County sell their milk and dairy products through various informal and formal channels. There are six channels through which consumers receive milk and dairy products while other actors access the same through five channels from producers. The channels consist of formal and informal marketing strategies. Informal market channel consists of selling directly to consumers, milk bars, hotels, milk vendors, individually owned Automatic Milk Dispensing Machines (AMDMs) and learning institutions. Formal marketing channel is characterized by milk bulking, value addition and processing of milk into various products which are then supplied to supermarkets, retail and wholesale outlets that have adopted new food safety-based technology of Automatic Milk Dispensing Machines (AMDMs). The milk is mainly obtained from dairy cooperative societies and individual large-scale dairy farmers.

Intrinsic and extrinsic factors influencing marketing strategies

The study sought to find out factors that influence marketing strategies adopted by dairy farmers in Bungoma County. The results are as shown in Figure 2.0 below:

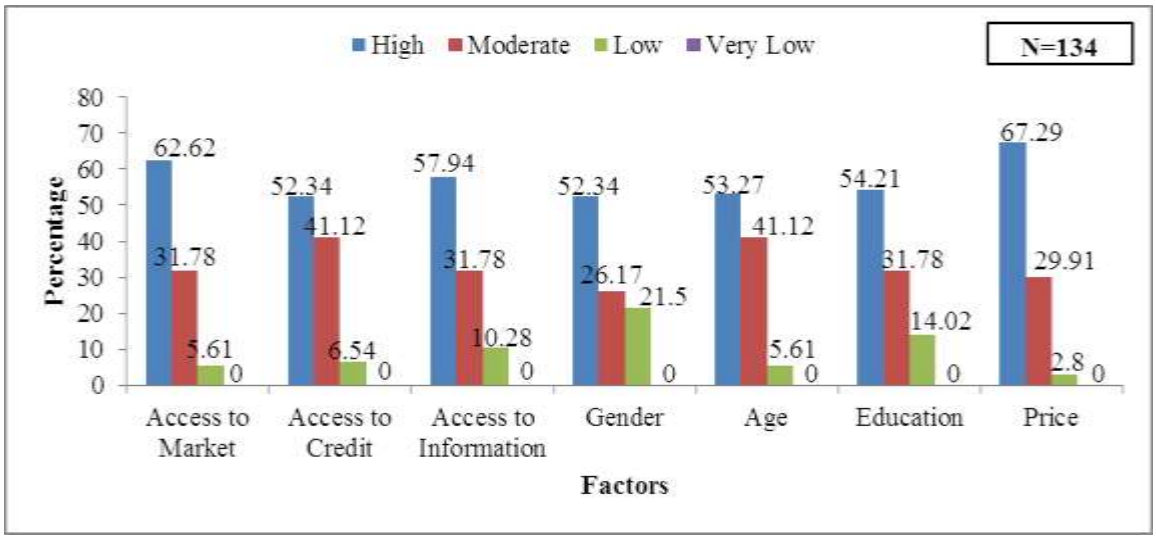

Figure 2.0: Factors Influencing Marketing Strategies in Bungoma County, Kenya

Source: Field Data, (2016)

Access to market and channel of marketing

From Figure 2.0 above, 62.62% of the dairy farmer respondents revealed that access to the market influenced their decision on how to market their milk and dairy products. Dairy farmers near the cooperative societies easily deliver their produce and products to these facilities. Further, the study noted that those farmers near urban centres preferred to sell their milk to milk bars; hotels and restaurants while those closer to institutions like schools and

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colleges prefer selling their milk to these institutions due to ease of access to their nearest market or point of sale.

Access to credit and channel of marketing

From Figure 2.0, 52.34% of farmer respondents revealed that access to credit influences their dairy products marketing strategies. Majority of the farmers earned less than Ksh. 10,000.00 per month which limits their ability to adopt better marketing strategies that require substantial capital. Most of the farmers accessed capital from sale of farm produce, sale of livestock, sale of other farm products (firewood/trees etc.). Others engaged in regular employment, casual employment (both agricultural and non-agricultural related), running own business, Micro-finance Institutions and Banks (with agro-based programmes).

Extension information and services and channel of marketing

From Figure 2.0, 57.94% of the respondents revealed that access to extension information and services influenced their decision on dairy product marketing strategies. The dairy farmers in Bungoma County suffer from inadequacy of extension services which are necessary to increase their milk production. This has resulted in low production outputs which could only be marketed informally unlike through formal channels.

Demographic characteristics and channel of marketing

The demographic characteristics found to influence marketing strategies of dairy products were age, education and gender. The results from Figure 2.0 revealed that education highly influenced milk marketing strategies by 54.21%. Milk marketing strategies were influenced by age to the extent of 53.27%. The influence of gender on milk marketing strategies was found to be 52.34%.

Production and marketing information sources and channel of marketing

Source of information about production and marketing influenced the marketing strategies adopted by farmers. Majority of the dairy farmer respondents (87.56%) obtained dairy market information from fellow farmers since they were in close contact with them and found this to be effective. It was revealed that farmers would meet anywhere, anytime and were willing to share information about the market. Other sources of market information that were extensively used included market place (45.6%), traders (45.6%), family and friends (56.7%) and farmer organizations(47.8%). Results from FGD confirmed that it was easier for farmers to obtain information about milk market from these sources as they are in constant interaction with either of them.

The results further showed that 35.6% of the respondents revealed that they obtained extension services and marketing information from the few extension officers in Bungoma County. Other sources of information about dairy market were research organizations (23.5%), Field days (12.4%), Agricultural shows (12.6%), Print materials (Posters, bulletins) (2.5%), internet (6.32%) and Mass media (Radio/TV) (23.4%).

Pricing and channel of marketing

Majority of the farmers interviewed ranked low market prices as the key challenge in selling their milk. The study discovered that membership in cooperative societies is still low, implying that farmers who are not members of these cooperatives seek for their own markets.

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Pricing of milk was found to influence the marketing of dairy products in Bungoma County to a greater extent as shown by 67.29% of the respondents. This postulates that dairy farmers would prefer to engage in markets where the prices are determined by forces of demand and supply rather than written agreements which would have to expire before they are renegotiated. The prices were seen to further fluctuate upwards in sub-counties hosting the major towns such as Bungoma, Webuye and Kimilili. In Bumula and Kanduyi sub-counties, raw milk was purchased from farmers at Kshs. 40/- per litre while prices for processed milk varied based on the product. Yoghurt goes for Ksh. 50/- to Ksh. 60/- per half- litre depending on the location. The price variation is as shown in Table 1.0

Table 1.0: Average Milk Prices prevailing in the Markets in Bungoma

S/N	Offerer	Price Per Litre (KES) (Dry Season)	Price Per Litre (KES) (Wet Season)
1.	Vendors	50	40
2.	Hawkers	50	40
3.	Cooperatives	40	30

Source: Field Data (2017)

Food & nutrition security and sustainable development in Bungoma County

Respondents were required to appraise the status of food and nutrition in Bungoma County under various subject headlines. The findings are presented as follows:

Income received from dairy marketing

The small scale dairy farmers were expected to state their income as a result of milk and dairy products marketing. It was difficult to get the exact income as majority of farmers were found not to keep records; they however, were required to indicate their gross monthly income based on their daily earnings. The results are as shown in Table 2.0 below:

Table 2.0: Monthly Income

Dairy Monthly Income (Ksh.)	Frequency	Percentage
Less than 10,000	**79**	59
10,001-30,000	**31**	23
30,001-60,000	**20**	15
Over 60,000	**4**	3
Total	**134**	**100**

Source: Field Data (2017)

From Table 2.0 above, slight majority of the smallholders (59%) were found to earn less than Ksh. 10,000 ($100) with 23% earning between Ksh 10,001-30,000 ($100-300); 15% earned between Ksh. 30,001-60,000 ($300-600) while 3% got over Ksh. 60,000 ($600) per month. Some of the factors that were associated with these earnings include low uptake of technology especially in breeding.

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Scarcity of food in Bungoma County

The respondents were also required to state which years between 2010 and 2015 did they experience scarcity of food in their households. The years identified were 2011, 55 (58.7%) and 2012, 38 (41.3%). Further the study noted that, in the previous 12 months of year 2015, 62 (67.4%) of the respondents did not have adequate food to meet their family needs. The months they faced severest food shortage were between January and march, 22 (23.9%) as well as between April and June, 70(76.1%).

Insufficient Quality of Food

The findings indicated that 61(66.3%) of the respondents were not able to eat the kinds of food they preferred due to low purchasing power by individuals and households. Similarly, the findings indicated that 59(64.1%) of the respondents ate limited variety of food due to lack of resources. Lastly, the finding suggested that 63 (68.5%) of the respondents ate some food that they really did not want to eat due to lack of resources as shown (Figure 3.0) below.

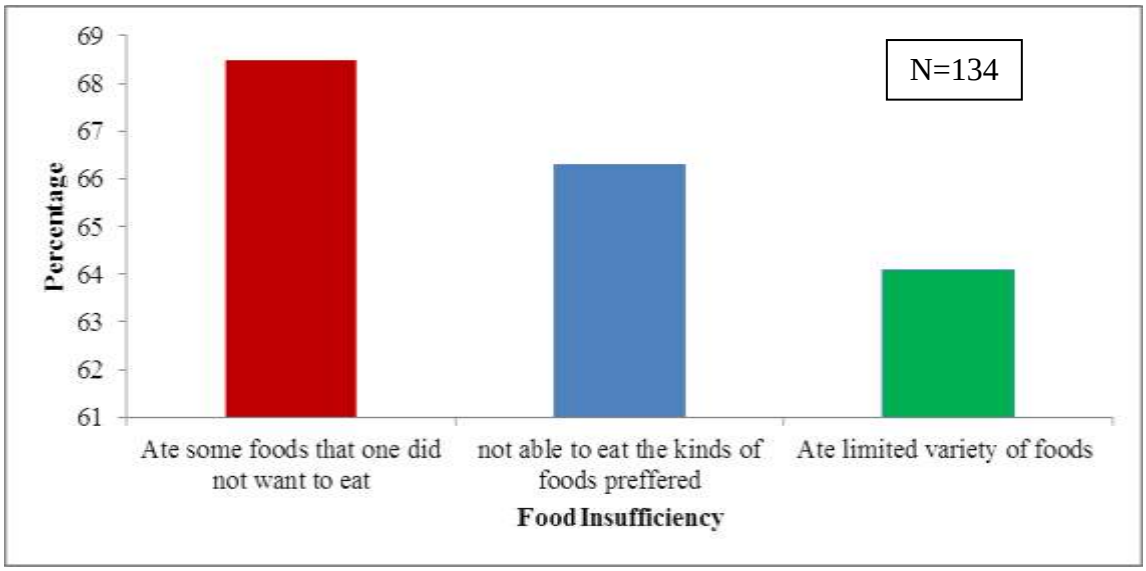

Figure 3.0: Household Food Insufficiency in Bungoma County, Kenya

Source: Field Data, (2016)

Food intake and its related physical consequences

The study sought to find out the physical consequences of insufficient food intake. The results revealed that more than half 69(75.0%) of the farmer respondents affirmed that they or their household members ate smaller meal than what they needed because the food was not enough. On having fewer meals a day, 54 (58.7%) of the farmer respondents indicated that they ate fewer meals in a day because food was not enough. More than half of the respondents, 73.9% (68) revealed that there was no food of any kind to eat due to lack of resources to access food. Similarly, less than half of the respondents confirmed that they or members of their households went for a day and night without food due to insufficient provisions.

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Sustainable development

To establish contribution to sustainable development as a result of dairy farming in Bungoma County, the respondents were required to state the number of cows that have been bought in the previous five years; trend in milk production and type of dairy breeds, which indicates sustainable dairy farming. The sustainable development at household level for sample respondents was measured using number of children that completed secondary school and the main household structures. It was found that majority of dairy farmers' households have a number of students in post primary and post-secondary level institutions. We noted that the number of dairy cows have been increasing over the years, indicating that some farmers continue to reinvest in dairy farming. It was further revealed that there is increase in the number of improved dairy animals through calves born in some of the dairy farms in Bungoma County. Similarly, there has been a positive trend in milk production between 2014 and 2017 as shown in Figure 4.0:

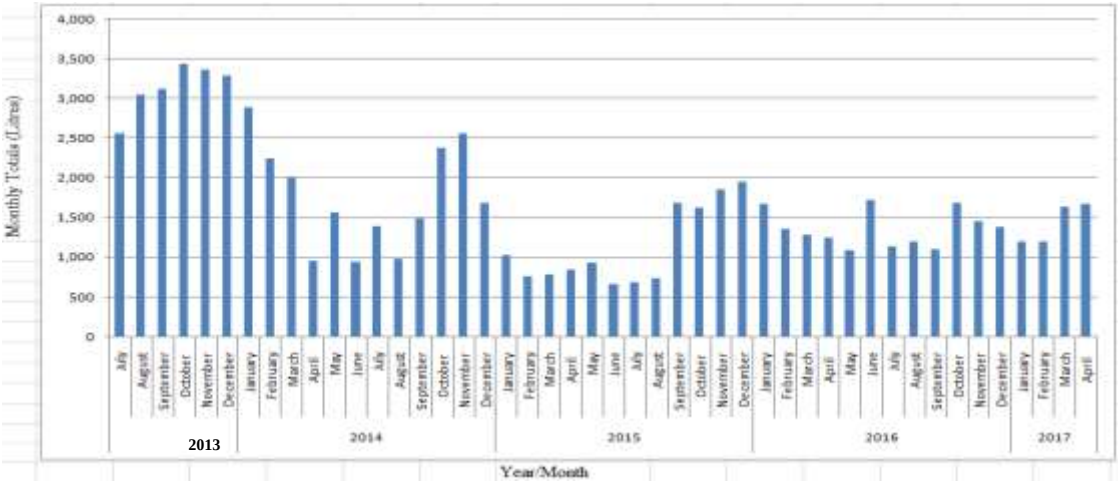

Figure 4.0: Milk Production Trend at LBDA's Sang'alo Integrated Farm, Kanduyi Sub-County in Bungoma County, Kenya

Source: Field Data (2017)

Effectiveness of marketing framework in the dairy value chain for food security and sustainable development in Bungoma County, Kenya

Having examined the dairy marketing strategies and marketing framework thereof adopted by dairy farmers in Bungoma county as well as state of food security and sustainable development, the study sought to find out the model fit of the framework that was adopted in this study using linear regression analysis. The aim of this analysis was to establish how best the framework adopted in this study represents practical significance and to estimate the extent to which statistical findings exist in the population.

The coefficient of correlation was 0.890, ($r=0.890$, $P<0.01$). The coefficient of determination (r^2) was 0.793, and this shows that 79.3% of the variations in the food security and sustainable development can be explained by the dairy marketing framework adopted in Bungoma County. This implies that the framework developed in this study has practical significance of 79.3% leaving 20.7% not to be accounted for by this framework. According to

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Cohen (1988) this figure has a fairly large effect; hence, suggests practical significance. Therefore, the recommendation made from this framework can be used to improve dairy sector in Bungoma County so as to achieve food security and sustainable development. Detailed results are as shown in Table 3.0

Table 3.0 Effectiveness of Marketing Framework in the Dairy Value Chain for Food Security and Sustainable Development

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.890[a]	.793	.785	.39836
a. Predictors: (Constant), Coop, Direct, VA, AMDM, Intermediaries				

Coefficients[a]					
Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	1.244	.181		6.854	.340
Intermediaries (CH1)	.046	.083	.036	.548	.584
Direct to Consumer(CH2)	.061	.093	.032	.659	.511
AMDM (CH3)	.048	.077	.060	.620	.536
Value Addition (CH4)	.217	.083	.306	2.605	.010
Cooperative Societies (CH5)	.261	.045	.561	5.764	.000
a. Dependent Variable: Food Security and Sustainable development					

Source: Field Data (2017)

The Model of the framework is as shown below:

DMI=1.244+0.061CH2+0.048CH4+0.217CH3+0.046CH1+0.261CH5+ε

Where

CH1=Producer→intermediaries→Consumers

CH2= Producers→Consumers

CH3= Producers→AMDMs→Consumers

CH4= Producers→Value addition→Consumers

CH5=Producers→Milk collection-Dairy coop→Processor→Wholesalers→Retailers→Consumers

From the above model, it can be deduced that Selling milk and dairy products through intermediaries to consumers with coefficient of 0.046, holds selling direct to consumers, AMDM, value addition and cooperative societies constant leading to increase in selling milk through intermediaries by one percent and results to increase in food security and sustainable development by 4.6%. Selling direct to consumers with coefficient of 0.061, holds selling through intermediaries, AMDM, value addition and cooperative societies constant leading to

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increase in selling milk direct to consumers by one percent and results to increase in food security and sustainable development by 6.1%.

Selling through AMDM to consumers with coefficient of 0.048 holds selling directly to consumers, intermediaries, value addition and cooperative societies constant, leading to increase in selling milk through AMDM by one percent resulting to 4.8% increase in food security and sustainable development. Selling after value addition to consumers with coefficient of 0.217 holds selling directly to farmers, intermediaries, AMDM and cooperative societies constant leading to increase in selling milk after value addition by one percent resulting to increase in food security and sustainable development by 21.7%. Lastly, selling through cooperative societies to consumers with coefficient of 0.261 holds selling directly to consumers, intermediaries, value addition and AMDM constant leading to increase in selling milk through cooperative societies by one percent resulting to increase in food security and sustainable development by 26.1%.

DISCUSSION

Marketing of Dairy Products

Majority of smallholder dairy farmers have been practicing dairy marketing for over ten years. This implies that dairy production is vital to the livelihood of dairy farmers for food and nutrition security as well as sustainable development. The findings agree with Mwangi *et al*. (2015) who found out that majority of smallholder dairy farmers in Nyeri County have been in agribusiness for over 10 years. The milk was mainly marketed informally while few of them opted for formal marketing through contracts with private milk processors.

Informal milk marketing involves the direct delivery of fresh milk by the farmer to the consumer or milk that may pass through two or more milk vendors before reaching the consumer; this is a typical example of traditional markets in developing countries. Generally, it is revealed from the previous studies that the producers get maximum share (80-100 %) when they sell directly to the consumers. Direct sales however, are not always possible for smallholder farmers as they are often outsmarted by the middlemen who in some cases manipulate them. Formal milk marketing is described as a process involving all the channels through which farmers deliver milk directly to the milk processing plant or to a Milk Collection Centre (MCC). In this process retailers have the role of supplying the products that are mainly demanded and can influence what the processors produce.

Informal markets are usually small scale local markets, involving few participants and milk is often sold as raw product (unprocessed). Consumers in these markets are at the lower cost end where price is considered to be more important than milk quality. The farmers were also found to sell their milk to milk bars, hotels, and institutions while some of them operated AMDMs in urban centers. The dairy products sold in informal market are of various quantities which makes it attractive to majority of consumers. Milk from informal market is cheaper, has a higher fat content, is widely accessible and comes in varying quantities to suit every consumer's purchasing power. Middlemen have created monopoly in informal marketing system and provide little incentive for farmers.

The results agree with various studies conducted in Kenya and other developing countries. According to Omore *et al.*,(2004) these traditional small scale markets still account for over

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80% of marketed milk in many countries in South Asia, Sub-Saharan Africa and in Latin America. In India some 80% of milk marketed still passes through these traditional milk marketing channels in spite of the high profile given to co-operative dairy development throughout the Operation Flood programs (Rajendran and Mohanty, 2004). In Madagascar it is estimated about 90% of milk is marketed in the informal sector. It is believed that the bulk of this production is marketed through an informal system operated by individuals locally known as cycling milkers. In Kenya, similar results were obtained by Njaruai *et al*., (2009) who indicated that informal milk outlets are known to absorb most of the milk from small holder farmers accounting for over 80% of the total milk sold. Brokers, hawkers, cooperatives and farmer groups are identified as the most important participants at the rural markets.

The formal marketing of milk consists of selling milk to marketers through some form of agreement which can either be verbal or written. The study observed that contract marketing exists between the large scale milk processors such as New KCC, Brookside Dairies, Daima Dairies and the Farmer Co-operatives. The study established that the farmers' co-operatives enter into milk delivery contracts with these processors to supply them with raw milk over a specified period of time usually 6 months to 1 year. In Germany, 96% of the total milk production was marketed through formal marketing strategies by delivering it to dairies (Aziz & SIivia, 2008), thereby contradicting findings by Mwangi *et al*.,(2015) who found that 84% of milk in Kieni East and West Districts, Nyeri County is marketed using formal channel through cooperative societies.

On the contrary contract marketing, according to Swinnen and Maertens (2006) has a negative effect to the producer, such as long delays in payment, non-payments for delivered products or non-delivery. Singh (2002) further notes that contract marketing is a means of exploitation of farmers by agribusinesses/contractors due to unequal power relations. He also examined the demerits of contract marketing for producers such as loss of autonomy / flexibility, lack of transparency (particularly in price determination), reneging on contracts, risk of indebtedness and adverse gender effect.

Marketing Channels

There are six channels in which milk and dairy products reach the consumers. The shortest channel is from farmer to consumers while the longest channel is from farmers to collection centers then cooperative societies then to bulky milk processors to wholesalers then to retailers before reaching consumers. The distribution of milk in this framework is similar to Tegegne *et al.,* (2017) where majority of milk in Ethiopia is sold through middlemen. Muriuki *et al., (*2001), indicated that 58.0% of milk in Kenya is sold through middlemen to reach final consumers while Rajendran and Samarendu (2004) revealed that 46.0% of milk in India is sold through middlemen. In Ethiopia, Tegegne *et al.* (2017) developed six channels that were used to market milk to consumers while there were three channels used to obtain milk from farmers with the longest channel having four actors. In India, Rajendran and Samarendu (2004) developed a model with seven outlets from farmers which increased to nine by the time consumers were accessing dairy products, with longest channel having three actors. In South Africa, Small and medium size producers sell most of their milk directly to consumers and some to processors implying two outlets (Balirwa *et al*., 2016). In Kenya, Mwangi *et al.,* (2015) established four channels in Nyeri County with the longest channel having 3 actors before reaching the consumers.

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It is evident that channels from farmers are few but increase by the time they reach final destination (consumers). It is also evident that there is difference in number of intermediaries before the milk and dairy products finally reach consumers. Several authors have indicated merits and demerits of each channel. Long informal channels have been associated with low income to the farmers and high prices to the consumers. The different types of middlemen earn a major share of profit from unorganized milk marketing systems, which could have been earned by poor rural farmers if they could do collective marketing. Further, long informal channels have resulted in compromise of milk quality through adulteration thereby tilting nutritional contents. Short informal channels although highly favoured by farmers, are the most unsustainable in the long run. Short formal channels through processors and cooperatives have advantages to farmers as the milk can be processed into various products thereby creating demand for dairy products and increase in market-share (Artukoglu, *et al.,* 2008).

Intrinsic and extrinsic factors influencing marketing strategies

The study established that the factors influencing milk and dairy marketing strategies are access to market, price, access to credit, access to information and socio-demographic characteristics of the farmer such as gender, age and education.

Smallholder dairy farmers have preference for immediate cash as compared to payment after a period of time, as it is the case with contract engagements. The formal markets face stiff competition from the informal marketing channels was noted especially during dry seasons when the milk supply is low. In some cases, the milk vendors deliver animal feed as they collect milk, further relieving the smallholder dairy farmer from the cost of transporting feeds from Agro-vets. In south-western Uganda, dairy farmers' choice of the milk marketing channel was influenced by form of payment with majority farmer's preferring cash payments. Distance to market has negatively influenced likelihood of producers' market participation, irrespective of hills or plains Bardhan *et al*. (2012). Mburu *et al*., (2007) observed that the longer the distance to selling points, ceteris paribus the higher the transaction costs, which in turn negatively influence producers' participation in a particular marketing channel.

In terms of accessibility to credit, most dairy farmers prefer selling milk through cooperative societies as opposed to individuals, middlemen, and hawkers because cooperative societies offer credit facilities such as short term loans. Fubio (2007) asserts that majority of dairy farmers opt for distribution channels that provide avenues for credit facilities. Fubio (2007) further acknowledges that market channels which provide avenues to credit facilities are becoming more and more preferred choice of distribution by small and large scale sellers. He argues that farmers in highly productive areas that have high milk production returns are likely to choose distribution networks that provide access to credit. Mburu and Gitu (2007) suggested that the choice of milk distribution channel is heavily influenced by availability of credit. The authors argue that most dairy farmers prefer cooperative societies because they can access credit through them.

Milk production and extension contact emerged as the two most important policy variables favourably influencing intensity of market participation due to increase in milk production (Bardhan *et al.,* 2012). Muriuki (2003) acknowledges that dairy farmers opt for channels that absorb or take their produce (milk) in large quantities throughout the production season. Weimer (2012), found out that farmers do not actually evaluate the type of channel to use whether formal or informal markets. The author further asserts that farmers will go for those

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channels that absorb milk in large quantities for fear of losing the commodity due to its high perishability levels and sensitivity in handling.

Cross tabulation between marketing strategies and these demographic characteristics revealed that majority of female dairy farmers sold their milk informally to their neighbours as well as hawking especially when the supply is low compared to demand. Male dairy farmers transported their milk to formal market collection centres. Most of the male farmers would use their bicycles or motor cycles to ferry milk to the centres from where it could be delivered to processing plants. Sserunkuuma *et al.,* (2010) indicated that although female-headed households are less likely to produce milk than a typical household, when they do, they are more likely to participate in milk markets as sellers.

Majority of the respondents had scanty information about the market segment and the middle men would easily exploit them because of their ignorance. These middlemen seemed to misinform farmers about the market prices to procure milk cheaply and resell at exorbitant profit margins. The findings also showed that dairy farmers who were advanced in age would prefer to sell their milk through the informal market channels due to ease of access. While studies by Winter-Nelson *et al.*,(2005) and Arega *et al*.,(2008) hypothesized a positive relationship between age and participation arguing that the younger the respondent the less likelihood to participate, Heltberg *et al.*,(2002) and Woldemicheal (2008) also came up with related findings to the effect that young people participate less in markets.

On the other hand, farmers who had been in the dairy business for long had formal contracts and are also members of cooperative societies and marketed their milk formally. Male and more educated dairy farmers (having post-secondary qualifications) sold their milk through formal channels. Most of them would sell their milk to cooperative societies or were in contract with processors and hence able to even organize transportation of their milk either to the collection centres or the processors. Majority had information about dairy markets and would rarely be exploited by middlemen.

Formal education enhances managerial competence and successful implementation of improved production, processing and marketing practices (Marenya &Barret, 2006). Additionally, education has an implication on the ability to understand and interpret extension information received by an individual. Education levels affect market information interpretation and hence, market participation status of farmers (Jari, 2009). The more educated a farmer is the more they are likely to spend less time doing marketing activities hence would rather sell through cooperatives than middlemen. Mutura *et al.,* (2015) found that households that were headed by more educated heads sold more through the cooperatives than through the middlemen.

This indicates that dairy farmers benefit each other through information sharing about dairy markets. Further, farmers were found to believe their fellow farmers from what they had achieved through the marketing. Most of the information however, was based on informal marketing of milk and dairy products. The traders were found in some cases to misinform the farmers about market situations thereby controlling prices of milk affecting the farmers' earnings negatively. Farmers' organizations were also found to be used for marketing but not frequently, due to the unregulated, infrequent meetings for decision making.

These sources of information were found to be expensive to farmers and focused mainly on formal marketing of milk and dairy products. Few of the dairy farmer respondents were

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found to have smart phones and accessible to 3G/ 4G internet service. Interviews with officers from the county government revealed that there have been few events organized by the county government targeting dairy farmers due to limited funding. Further, the events were organized far away from their farms which would require transport for them to access the information on dairy product market. An agricultural show is usually held once a year and one is required to pay gate fees to access the services. With low returns from milk, majority of the farmers were found not to afford this expenditure even though the information obtained would be crucial in dairy value chain. Therefore, they lacked information about formal dairy marketing which is considered stable in terms of returns. These results affirm the notion that market information gotten by the farmer about a certain marketing channel increases farmer willingness to participate in that channel, hence likelihood to increase his/her output and sales through that market channel (Otieno, *et al*, 2009). Mutura *et al.,* (2015) indicated that households that had information of market prices preferred to sell on their own than to sell through the dairy cooperatives.

Over three quarters of the respondents said they would prefer to sell their dairy products to informal market because of unattractive prices from formal contracted marketers. Also, dairy farmers fear selling on credit which is the practice of most formal marketing channels where milk is delivered and payment is made at later dates. They need instant cash to cater for immediate needs like school fees, buying food for their families and for adoption of dairy technologies for the dairy value chain development. An efficient milk marketing chain is one which enables farmers to receive at least 50% of the retail price of milk. Furthermore, findings of Owango *et al.* (1998) assert that higher prices in the informal market for neighbours seem to determine part of the decision to choose this channel, while Kaitibie *et al.,* (2009) states that the informal marketing channel is chosen, amongst others, due to farmers receiving a higher price and consumers preferring the lower price as compared to buying it from a supermarket, which is confirmed in our evidence. It is important however, to distinguish between different informal channels, since brokers for instance, offer generally lower prices than neighbourhood markets.

This study established that market price for both raw and processed milk varies across the county. In Tongaren Sub-County for instance, the Naitiri Dairy Farmers Cooperative (NADAFA) purchases raw milk at a negotiated price of Ksh. 33/-, Kaptama Ksh. 30/-, Kitinda Ksh. 37/-, Ndalu Ksh. 27/-per litre during the dry season and the price fluctuates downwards to as low as Ksh. 20/- during the rainy season. NADAFA on the other hand retails processed milk at Ksh. 50/- per litre of fresh milk being the only product they dealt in at the time of the survey. A community based group (Top-Food Dairy) in Ndalu buys farmers' milk at Ksh. 30 per litre and processes it into various products including yoghurt, pasteurized milk, cream and *mala*.

Amalanathan and Jaffer (2015) revealed that the private sector can pay their producers every day, whereas the co-operatives pay weekly or fortnightly. Producers sometimes have to fight with co-operatives to get their payment. Mburu *et al.,* (2007) found that smallholder dairy farmers' adoption of various milk marketing channels in Kenya highlands was influenced by average milk price. Mburu *et al.,* (2007) agrees that pricing and payment of the various actors in the distribution channel are essential in determining the choice of distribution. In relation to the price, the underlying factor is the cost structure that is maintained in various distribution channels. The author argues that the distribution channel that offers the best value is likely to be chosen by dairy farmers. They assert that the distribution channel that offers

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more value to the dairy farmers becomes the preferred choice. The value chain is the profitable price that the efficiency of the distribution chain of choice offers. Furthermore, Njaruai *et al.*,(2009), contend that the prices at the milk collection centers are lower than at the informal market point and also lower than the prices hawkers would pay farmers for their milk. The prices paid to the farmers differ substantially as per the distribution channel. The authors further assert that the relationship between price and choice of distribution channel is the quantity of milk sold by the farmer (for example price per litre the farmer receives for the milk). Therefore famers are more likely to choose a distribution channel that offers a financial incentive (premium price).

These results mirror the study carried out in Bungoma County by Nabiswa and Siamba (2017) whereby the uptake of breeding technologies was found to be 48.0%. Apart from breeding, it was also revealed that there is low capacity in feed technologies especially during dry months between December and April which reduces milk production (Nabiswa & Siamba, 2017). Thus it can be deduced that there is room for improvement in small holder dairy farmers' development in Bungoma County, by up scaling production and marketing technologies through access of credit, technology and information.

During scarcity the food prices are high, the feed also cost higher, making it difficult for dairy farmers to adequately reinvest in the dairy enterprise. This results in low milk production due to bare minimum feeding for small-scale farmers as it is difficult to feed optimally. This creates a vicious circle of scarcity where there is inadequate food as well as feed and at the same time there is inadequate milk production which is expected to supplement dairy farmers' earnings and cushion them from adverse effect of food scarcity.

Food & nutrition security and sustainable development in Bungoma County

The results revealed that in case of food scarcity in Bungoma County, the respondents have limited choice of food unlike when food is in plenty. This affects their nutrition as they are unable to get the nutrients that the body requires. The most affected are children and women especially the pregnant women and lactating mothers who need a lot of nutrients. During this period, dairy farming would be essential to fill the gap either through income or provision of milk and dairy products to households. Considering the biological value of milk protein, our traditional habit of including milk in daily diet have been one of the most important factors that had saved millions of children of our country from developing malnutrition syndromes (Kumar *et al.,* 2012).

It was noted that some of the households which depend entirely on crop farming with supplements from dairy farming are the most affected. Some respondents from Bumula Sub county revealed that there is usually wide spread scarcity of food in the sub county and the neighbouring sub-counties and that the situation is mitigated through engagement in other activities apart from crop or livestock farming. However, interviews with farmers in Kanduyi Sub County revealed that scarcity of food can be solved if farmers especially the dairy ones, embraced value chain approach to farming. According to the farmer with this paradigm, value chains and agribusiness offer them various opportunities within the agriculture (Crop and livestock farming) to mitigate food insecurity. These findings agree with Nabiswa and Siamba (2017) who established that dairy farmers in Bungoma County are unable to access a variety of food during food scarcity which impact negatively on their nutrition. This is an indication that proceeds from dairy farming have been partially used in education of dairy farmers' children. It was also noted all of the sampled farmers had permanent or semi-

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permanent farm structures. This is in agreement with Muriuki *et al.*,(2000) who asserted that Smallholder dairying contributes directly (thro' milk consumption) and indirectly (thro' income generation) to both the food security and to alleviating poverty of the majority of smallholders in many areas of Kenya, a contribution coming particularly from the crop-dairy cattle systems that dominate smallholder agriculture.

Effectiveness of dairy marketing framework on food, nutrition security and sustainable development

The dairy marketing framework that is adopted in this study indicated that it can account up to 79.3% changes in food and nutrition security as well as sustainable development. Further, in the absence of this marketing framework, food and nutrition security as well as sustainable development would be insignificantly affected to the extent of 1.244. It is also important to note that informal marketing strategies have insignificant effect on food and nutrition security as well as sustainable development. As indicated previously, majority of the farmers are tempted to market their milk informally as a result of price, access to market and on spot payment, however, this does not translate to sustainable development and food security. On the other hand, marketing through cooperative societies and after value addition has significant effect on food and nutrition security as well as sustainable development. Even though few farmers prefer this channel of marketing, it has profound effect on the livelihood of actors within dairy value chain. Therefore, the most pertinent questions, is how can informal marketing of milk and dairy products be transformed to make it sustainable to smallholder dairy farmers or how can formal marketing of milk and dairy products be transformed to make it attractive to smallholder dairy farmers.

IMPLICATION TO RESEARCH AND PRACTICE

The study has various research and practical implications to various stakeholders in the dairy sector. The government and private sector should provide support to smallholder dairy farmers to increase marketing of their milk and dairy products collectively so that there is reduced use of informal channels to enhance safety and assure the farmers fair, prompt, reliable, and consistent payment. Smallholder dairying contributes directly (through milk consumption) and indirectly (through income generation) to both the food security and to alleviation of poverty among the majority of smallholders in Bungoma County. The analysis of the framework adopted in this study reveals the need to develop strategies and resources devoted to marketing, and the existing linkages between the actors in the dairy value chain including producers, marketers, processors, and consumers.

From the framework developed in this study, there are various opportunities that have been identified. Trends indicate that, the informal sector will continue to play its dominant role in milk marketing in the foreseeable future. In the informal marketing channel, there is need to increase partial processing of milk before selling to consumer and use AMDMs to dispense safe and healthy milk for consumption as well as enhance accuracy in the quantity being sold. This can be undertaken by individuals working in groups to increase returns to smallholder farmers from dairy value chain. Using AMDMs also enhances the product shelf life hence reduce losses through spillage and further increases returns to farmers. There is also need to research into appropriate technologies for value addition by smallholder dairy farmers which

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are enforceable so as to increase income from informal marketing since most of the milk in the county is marketed through this channel (informal).

Currently, there are no policies to regulate milk prices at the farm level. The middlemen who account for more than 40% of milk outlets have been found to buy milk from farmers at lower prices, adulterate the milk and sell it at higher prices to consumers. Both ends of the channel suffer as farmers earn little while consumers pay more. This meagre income returns makes it difficult for dairy farmers to enhance their productivity through improved breeds and better feeds. Kenya Dairy Board (KDB) needs to improve the income of farmers who sell their milk through middlemen by specifying prices from time to time. It is advisable to licence and register middlemen through organized groups so that they can be held accountable in terms of product safety and their pricing policy. Besides, the government (both national and county) and private sectors have the opportunities in promoting increased production of milk so as to facilitate processing and bulk marketing.

On other hand, the capacity of the formal dairy processing sector is underutilized. A meagre thirty three percent processing capacity at the county level is still inadequate, given the low volumes of raw milk delivered to processors through formal commercialization. Thus given the right institutional incentives and market infrastructure, marginal and small holders are capable of scaling-up milk production and hence commercializing their dairy enterprises. The formal marketing has high opportunities as indicated by the model that fit the marketing framework in Bungoma County. However, some of the farmers have been reluctant to sell through this channel because of payments, collection centers and quantity of milk produced. Therefore, stakeholders involved in formal marketing should re-evaluate the contracts and make them more participatory to enhance farmer confidence. Further, they should provide additional services such as credit and production technologies so as to improve milk production for formal marketing.

CONCLUSION

Majority of the milk and dairy products were marketed through informal marketing channels such as direct sales to consumers or through middlemen. The remaining farmers marketed their dairy products through formal outlets such as contract and cooperative marketing options. Informal marketing strategies are unsustainable to dairy farmers' households in the long term development as the returns are low and unpredictable. This results in food insecurity especially between the months of January through to June as most households resort to other coping strategies for survival. Furthermore, returns from informal marketing were found to be insufficient and difficult to consolidate to fully support other family needs like education, shelter and health, including reinvestment in the dairy value chain.

Future Research

The study focused on marketing framework in the dairy value chain for food security and sustainable development. However, further study could be conducted on the economic level of production by smallholder dairy farmers to ensure sustainability of dairy industry.

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