

EFFECTS OF TECHNICAL SUPPORT TO SUPPLIER ON SUPPLY CHAIN PERFORMANCE IN THE DAIRY SECTOR IN NYANDARUA COUNTY

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ABSTRACT

The aim of the study was to assess the effects of technical support to suppliers on supply chain performance in the dairy sector in Nyandarua County. The study was founded on Social Capital Theory and Resource based Theory to help grasp the concept of supplier development and its effects on supply chain performance. Descriptive study design was adopted for the study. A sample of 158 respondents was selected from the target population of 263. Structured questionnaires were deployed to collect primary data while secondary data was obtained from journals, the selected dairy firms websites and Kenya Dairy board reports. The data collection instruments were pilot tested to improve their reliability. Cronbach Alpha coefficient with a value of 0.70 or above was considered to indicate that the instrument is reliable. Data was analyzed with the support of SPSS version 22. Descriptive and inferential statistics were employed to test the degree of relationship among the variables. The study findings indicate that technical support to suppliers had a positive and statistically significant effect on supply chain performance in the dairy sector in Nyandarua County at 95% confidence level. The study recommends that dairy firms should lobby the support of the county government for elaborate infrastructure such as road network, electricity and water in Nyandarua County to facilitate establishment of milk cooling plants across the region and reduce milk transportation cost. A milk processing and packaging industry should be established in Nyandarua County to enhance value addition which will further boost income and create jobs in the sector as well as promote food security in the country. However, this will only be sustainable if milk supply in Nyandarua County becomes constant.

Key words; Supplier Development, Supply Chain Performance, Technical Support, Dairy sector, Nyandarua County

Background of the Study

Supplier development (SD) is the process of working with certain suppliers on a one-to-one basis to improve their performance and capabilities for the benefit of the buying organization. and can take the form of a one-off project or an on-going activity that may take some years to come to fruition (Scott, 2012). The collaborative effort between a buyer and suppliers contributes positively to a firm through creation and maintenance of capable suppliers, which leads to improved quality, at reduced cost (Rajput & Bakar, 2012). SD is a resource-intensive process and CIPS, (2013) suggests that it should only be undertaken with those suppliers from which real business benefit can be derived.

Technical support is any initiative by the buyer aimed at provision of support facilities to suppliers with an aim of enhancing the supplier productivity (Krause & Ellram, 2007). For instance the major dairy firms have opened agro vets across the County for easier access of farm inputs and extension services to the farmers.

Supply chain performance is the level to which a supply chain fulfills the objectives of dependability, cost speed, quality, and flexibility (Slack, 2007). Supply chain excellence occurs when an organization acquires or develops an attribute or combination of attributes that allows it to gain a competitive advantage that helps it outperform its competitors (Christensen & Fahey, 2004). Gonzalez and Quesada, (2004) pointed out that supplier development is the most influential management process for achieving product quality and customer satisfaction.

Supplier Development

Krause, (2009) identified two models of SD (indirect or direct) which are distinguished by resource invested and level of organization commitment towards the program. Indirect Supplier development program is passive and only focus on supplier identification, evaluation and selection with the goal of compliance to a buyer's needs and requirements. On the contrary, active SD programs represent activities undertaken by the buyer with the proprietary aim of improving supplier capabilities for long-term mutual benefit (Watts & Kim, 2008). The broader aspect of SD is characterized by committing financial and/ or human capital by a buyer towards enhancing

supplier capacity, a trend observed in the dairy sector in Nyandarua County which have intensified competition in the sector.

SD started gaining attention as a business concept after the Second World War, particularly in Japan. In the 1970's the idea of SD started to take hold and began to be used more widely as a business tactic in the United States of America (Scott, 2012). In the UK competitive pressure was forcing companies to reduce inventory costs and, as a result, quality and delivery times were becoming important considerations alongside price. In response, purchasing departments were instrumental in improving the quality of goods and services by specifying a requirement for suppliers to achieve ISO 9000 quality standards. As interest in quality migrated to the concept of 'continuous quality improvement' it was a logical step for buyers to expect their suppliers to also adopt this enhanced approach (CIPS, 2013).

Across the world, companies operating in extractives industries become increasingly aware of the need to earn a social license to operate beyond the legal rights typically awarded by governments. Host communities need to be involved and happy, since they have a lot of power to hinder operations. The development of suppliers from host communities emerged as one way to create a greater sense of participation and benefit for these communities for harmonious relations (Adam, Temple, & Muzart, 2009).

In Africa SD was spearheaded by the South African International Business Linkages Program – Phase II (SAIBL-II) began in 2008 and sought to promote the creation and development of a corporate-led movement that fosters supplier development as a national competitive advantage and priority (Jenkins, Ishikawa, Barthes, & Giacomelli, 2008). Supplier development has become an important avenue for supply chain integration for continuous improvement (Hahn, 2008). According to Rezaei, Wang and Tavasszy, (2015) companies are increasingly realizing that supplier performance is an important pillar to their growth and competitiveness.

In Kenya, supplier development is not new concept especially in the dairy sector which has seen substantive changes with major intensification, scaling-up and efficiency in production which has been achieved through the developments in animal breeding, feeding efficiency, animal health, supporting policies, strategies by the government and massive investment by private investors

(Muriuki, 2011). However these changes are not reflected across the country and expansion in small-scale milk production has largely stagnated.

A report by Kenya Dairy Board (KDB), (2014) on Dairy Development indicates that the dairy sector has a huge potential of turning around the economy especially in the rural areas but is littered with hurdles along the supply chain. If executed properly, supplier development can lead to significant cost reductions in the long term. Cost reductions can be realized through establishment of more cooling plants, reduction in transport costs, improved animal breeds and feeds. Commercialization of the dairy industry will be possible if the quality of milk and milk products is improved and supply becomes constant. In order to compete effectively and grow in the dairy sector, dairy firms in Nyandarua have invested heavily in enhancing small scale farmers' capacity in milk production and therefore should find a way of extract maximum value from the network of suppliers it has built and developed.

Nature of Dairy Sector Supply Chain in Kenya

Dairy farming in Kenya is crucial for economic development, poverty reduction and food security. Despite a strong interest from the government and the private sector, the on-going re-structuring of dairy value chains, productivity, marketing and trade constraints hinder the sector development (Tondel & Bingi, 2015). The dynamics that affect productivity in the Dairy sector in Kenya differs from one county to another. Milk production is affected by drought since most of the counties in Kenya are in arid and semi arid lands (ASAL). Before market liberalization in the early 1990s, there was an organized milk collection and bulking system in the formal market, with two forms of milk delivery to Kenya Creameries Cooperative (KCC) facilities which was done by either individual dairy farmers or by dairy cooperative societies. With liberalization and the collapse of KCC, the collection and bulking system also collapsed (KDB, 2007).

In Kenya, Milk and milk products reaches consumers through many channels; large processors have more elaborate distribution and retail systems. In rural and sub-urban areas of Kenya, consumers buy mostly unprocessed milk directly from producers, kiosks, neighborhood shops and hotels. In urban centers, unprocessed and processed milk compete, using more or less the same retail outlets, shops and kiosks near residential areas (KDB, 2013).

The main dairy feed used in Kenya highlands especially Nyandarua is natural forage, Napier grass and crop by-products. A report by East Africa Dairy (EAD), (2013) indicates that the dairy industry in Kenya is increasingly moving towards consolidation. This push towards consolidation has led to the increasing need for processors to link up the all stages of milk supply chain from the farm to the factory by taking up the challenge of buying, processing, distributing and selling through major retail outlets across the country.

Supply Chain Performance

Supply chain performance measurement is fundamental way of understanding whether supply chain processes are improving or worsening and whether action is required (Krause, 2007). All too often majority of companies learn about performance problems when revenues fall short of targets, customers take their business elsewhere, or margins fall below expectations. The extant literature indicates that supply chains typically improve performance and capabilities by increasing supplier performance goals (Monczka *et al.*, 2011), providing the supplier with training (Galt, Newman, Dale & Hohn, 2010); providing the supplier with equipment, technological support, and financial investments (Monczka *et al.*, 2011; supplier performance evaluation (Benton, 2004), and rewarding supplier for improved performance (Galt *et al.*, 2010). Studies indicate that, after General Motors implemented supplier development program, suppliers' productivity improved by 50%, lead time was reduced by 75%, and inventory levels reduced by 70% (Pazirandeh & Mattsson, 2009).

Pisello and Gordon, (2008) argue that, many organizations both in public and private sector are focusing more on their core competences and becoming more dependent on their suppliers to meet ever-increasing demand for quality products by viewing them as partners. As a result for a supply chain to compete in respective markets it must ensure that suppliers' performance, capabilities and responsiveness equals, or surpasses those of competing supply chains.

Krause, (2005) on a study on the relationships between SD, commitment, social capital accumulation and performance improvement opines that one of the supply chain basic objectives is to maintain a network of capable suppliers since suppliers have a direct bearing on quality and

cost improvement, delivery performance, as well as new product development. However, it is difficult to identify the specific efforts of supplier development that will uniquely contribute to a supply chain performance.

Supply Chain Performance in the Kenya Dairy Sector

The primary objective of supply chain management is to create value to customers, increase profits, improve efficiency of production operations, reduce cycle times, and increase market share (Williams, 2013). Milk industry supply chains in Kenya experiences inconsistent supply of milk which can be attributed to lack capacity by suppliers and high cost of milk production which are attributed by low quality of feed and fodder, the lack of year-round availability of quality forages, animal diseases, and low quality breeds (Wanjala and Njehia, 2016)

According to KDB, (2012) many local milk processors suffer milk fluctuations between dry and rainy seasons, resulting in low capacity utilization of between 40-60%. To overcome this challenge, major dairy firms in Nyandarua County has embarked on an projects aimed at enhancing small scale farmers capacity by improving farm-management skills in production, mechanization and preservation, introducing feeds varieties, provision of veterinary services, financial support, improving quality of breeds to enhance small scale farmers capacity to produce more and quality milk.

The Kenyan Dairy Sector

In Kenya, the dairy industry is the largest agricultural sub-sector (Yegon, Omunyin, Ruto, & Bii, 2016). The sector contributes about 4% to the country's GDP and is a major source of livelihood to millions of people in the country (Wanjala, & Njehia, 2014). The sector is dynamic with high growth figures of marketed milk and investments by dairy societies and processors mainly in the cold chain, production of long life milk and milk powder. Studies indicate that 80% of Kenya's total milk production is produced by small scale farmers (ROK, 2010). This becomes a major challenge to the dairy industry especially on cost of production, milk collection as well as quality control (Wanjala & Njehia, 2014).

The dairy industry provides food, income and employment to approximately 2 million Kenyans involved in milk value chain including the dairy farmers, milk transporters, dairy products vendors, employees of dairy firms, farm input sellers and manufacturers, veterinary officers, milk retailers and distributors (FAO, 2012). However, the growth of the industry has been constrained by frequent fluctuations in milk production and low quality feeds (Muriuki, 2011).

Acknowledging this opportunity, dairy companies in Nyandarua has embarked on various programs enhance milk production and build strong ties with the farmers for to wade competition and improve efficiency in the milk sector by advocating for stronger and more inclusive relationships between among key industry players. In the broader context of food security Kenya Market-led Dairy Programme (KMDP), (2012) acknowledges the need for more efficient and competitive dairy value chains, to assure enhanced access for consumers with lower income to safe and affordable milk products.

Kenya's development blue print, vision 2030 recognizes that the agriculture sector (including dairy) has been operating under outdated colonial legislation dating back to the 1930s, which is impeding growth in the sector; the government has promised to reform this legislation and other areas that need updating to transform the agricultural sector and boost income for small scale farmers (Vision, 2030).

Statement of the Problem

Poor Supply chain performance have a negative impact on a company well being as it reduces revenue, cut into market share, inflate operational cost, damage a company's credibility with investors and other stakeholders, which drive up its cost of capital; such firms experiences 7% lower sales, 11% higher costs and 14% increase in inventories (Ruud & Bosman, 2006). If this is allowed to go unchecked, it would hamper a company's growth and competitiveness.

Dairy farming is a major economic activity in Nyandarua County and remains a source of income to household, however, the industry faces a number of challenges in milk production, transportation, processing and marketing. Specifically, some of the main challenges affecting the

dairy sector in the County have been identified as fluctuations in quantity of milk produced, poor infrastructure which affect milk collection and transport, inadequate quantity and quality of animal feeds, lack of good quality animal husbandry, poor farming practices, and wastage which limit the realization of the full potential of this industry.

As a result, the major dairy firms in Nyandarua County experiences inconsistent milk supply attributed to lack of capacity by suppliers. For instance on average, the annual milk production per lactating cow in the county is less than 2,000 liters against the estimated average of about 4,000 liters per cow over the lactation period. This has a negative impact to dairy processing firms leading to low capacity utilization of about 60%. This translates to idle capacity within the dairy firms which limit their growth and profitability. Acknowledging this opportunity, the major dairy firms in Nyandarua have embarked on providing technical support to the suppliers to enhance milk production in the region to allow the firms operate at optimal levels.

A study on post-harvest milk losses indicate that about 6% percent of total milk produced in Nyandarua County occurs at the farm level as a result of spillage, lack of market and rejection resulting from poor milk handling which negatively affect supply chain performance (Ndungu, Muliro, Omwamba, & Oosterwijk, 2016). Through provision of technical support, capacity building and improved handling these losses can be reduced across the milk value chain. The industry's supply chain performance is further constrained by fluctuation in milk production, and quality of animal feeds and fodder. Overcoming these through technical support will boost the growth of this industry which will have a multiple effect by improving household income, reduce overdependence by increasing employment opportunities, and enhance food security in the Nyandarua County and Kenya at large.

Current literature have extensively analyzed and discussed the concept supplier development especially its establishment of and the challenges in managing such programs which have provided valuable information in understanding the process of supplier development. However, there is a gap in the current research on understanding the effects of specific supplier development effort in a particular industry as a means of achieving effectiveness across the entire supply chain. For this

reason, this study focused in assessing the effects of technical support to suppliers on supply chain performance in the dairy sector in Nyandarua County.

Objective of the Study

To assess the effects of technical support to supplier on supply chain performance in the dairy sector in Nyandarua County

Theoretical Literature

Theories are formulated to explain, predict, and understand phenomena and, in many cases, to challenge and extend existing knowledge (Abend, 2008). Theories are very essential in understanding the complex environment in which organizations operate in (Chicksand, Watson, Walker, Radnor & Johnston, 2012).

Social Capital Theory (SCT)

SCT emerged from the concept that acknowledged the inherent value of social structures such as relationships and networks (Wagner, 2011). Central to the use of SCT in the study is the idea that interactions among supply chain actors facilitates creation of value (Wagner, 2011). Social capital concept advocates for an investment in relationships through which parties gain access to strategic resources that enhance the expected returns through improved performance (Huggins, 2009).

The tenets of this theory consist of three processes which include; investing in social capital, access to and mobilization of social capital, and facilitating the creation of value within supply chains (Cropanzano & Mitchell, 2005). SCT is applicable to this study since it facilitates a better understanding of buyers efforts in extending a helping hand to the farmers through technical support which have been found to enhance the efficiency resulting in the creation of opportunities that otherwise may not have been possible (Cousins *et al.*, 2006; Krause *et al.*, 2007; Lawson *et al.*, 2008 & Wagner, 2011).

Benfine (2008), a critique of social capital theory opines that the theory is vague, hard to measure and poorly defined. He claimed that while it is presented as a tool of consensus for overcoming ideological divisions it is highly political in both neutralizing dissent and systematically disregarding key questions and issues concerning the social problem and perhaps not even a form of capital at all.

According to Woolcock, (2008) there are a number of dimensions that have been unified as a single concept grounded in different sociological traditions trying to explain too much with too little. The theory relate well to the unique relationship established by the buyer through supplier development for mutual economic exchanges that is beneficial to both parties. The study employed this theory to understand how buyer empowers their supplier via technical support to reduced risks of non - supply, reduced lead time, improved product quality and reduced production cost in the dairy sector value chain.

Resource Based Theory

Steinle and Schiele, (2008) points out that; suppliers can be regarded as resources if they are sufficiently bound to a particular firm. According to Li, (2007) there is sufficient theoretical evidence supporting the assertion that buyers' performance is enhanced by supplier quality and technological capabilities. When firms interact with suppliers and its customers on issues related to materials flow and quality, firms can expect better time-related performances in terms of speed of delivery (Cooper *et al.*, 1997, Mentzer *et al.*, 2001, Chen & Paulraj, 2004).

According to Junge, (2014) on a study on creating value through supplier development argued that a firm with the ability to accumulate strategic resources that are valuable, non-substitutable, and difficult to imitate will enable it achieve a competitive advantage that help the firm to capitalize on opportunities and ward off threats. According to Li, (2007) providing technical support to suppliers can be considered as actions taken by a buying firm to strengthen the capability of its suppliers who becomes a valuable asset to the buying firm through improved supplier performance resulting from unique and strong relationships. This will become unique resources of the buying firm since the supply chains will reap benefits from supplier development efforts through improved efficiency, quality and supplier reliability (Chen, Lin & Huang, 2006).

Perry, (2009) pointed out that gains from trade between trading partners are enhanced by investments in assets that are specialized to their exchange. Buying firms with a vibrant SD program expects to realize an advantage over competing firms (Li, 2007, Schoemaker, Amit, De Toni & Nassimbeni, 2010). This theory helps in understanding how unique programs such as Maziwa 365, provision of subsidized artificial insemination services, agro vets shops, cooling

plants and efficient milk transport system initiated by the dairy firms in Nyandarua County have affected their supply chain performance with respect to production cost, delivery times and milk quality.

Review of Empirical Literature

Cooperative business relations are significantly linked to reduced production cost, shorter lead times, higher productivity, and enhanced quality, as a result many organizations are developing closer ties with their suppliers (Li, Humphreys, Andy Yeung & Cheng, 2011). According to Li, Humphreys, Yeung, and Cheng (2012), supplier development through provision of technical support is a kind of cooperation between a buyer and a supplier to seek continuous improvement in supplier performance and, at the same time, strengthen the buyer's competitive advantage (Hahn, 2008). According to Abdul, and Parthiban, (2014) one of the primary goal of the purchasing function is to maintain a network of capable suppliers since suppliers have an explicit effect on quality, cost, and delivery performance in a firm. However, it is difficult to identify the specific efforts of supplier development that will uniquely contribute to an improved supply chain performance.

We are now entering the era of supply chain competition where the prize will be taken by those organizations that can better structure, coordinate and manage their relationships with suppliers and customers (Christopher, 2008). The fundamental change from the old paradigm is that firms cannot operate or survive in isolation but instead need to create value delivery systems that are more responsive to the dynamic market and that are much more consistent and reliable in delivering value to customers (Christopher, 2008).

For a long-term sustainable growth, the dairy industry needs a transition from small scale semi-subsistence farming, to an industry that relies on fully commercial dairy farming systems. In regards to milk procurement and processing, the sector needs processors that invest in supply chain development for enhanced productivity and milk quality, offering credible long-term milk procurement contracts (Ettema, 2013).

The basic objective of supply chain management is to secure and organize the supply of quality materials whenever required in quantities needed (Monczka *et al.*, 2011). As such, no organization can operate in isolation, and therefore they have to engage in supplier capacity building in order to build and sustain a competent supply base. In Kenya, over seventy percent (70%) of organizations experience supply chain performance challenges which have a negative impact on effective service delivery (Edward, 2008).

Suppliers' plays a critical role in a firm and their actions have a direct influence on buyer's performance (Jabbour & Jabbour, 2009). A number of studies suggested strategies to improve supplier performance and capacity which include, instigating competition among suppliers, supplier performance assessment, supplier certification programs, establishing training program and increasing supplier performance expectations (Krause, 1997). Supply chain management problems continue to persist in many well-known firms threatening shareholder wealth and leading firms to compete through supplier integration (Kull, & Narasimh, 2013).

Yegon, Kosgei and Lagat, (2015) investigate the effect of supplier development on buyer performance and found out that supplier development have positive effect on buyer performance. Another study by Wachiuri, Waiganjo and Oballah, (2015) evaluated the role of supplier development on organizational performance of manufacturing industries with specific reference to East Africa Breweries Limited in Kenya (EABL). The study revealed that rewards, financial support and firm involvement have a great role in the performance of EABL. However these studies failed to assess the effects technical support o suppliers on specific supply chain performance deliverables in areas such as production cost, delivery times and quality of products a gap to be addressed by this side.

Technical Support

The Kenyan dairy sector is characterized by a number of systemic bottlenecks, of which high cost of production and poor raw milk quality are perhaps the most pressing. High cost of production is largely due to low skills and knowledge of farmers and the low quality of feeds and forages, and the seasonality of supply (FAO, 2012). Addressing these challenges and issues affecting productivity in the dairy industry requires innovations and investments by dairy value chain

players. KMDP, (2015) acknowledges that innovations and technical support can be adopted improve productivity in the sector.

Technical support enables suppliers deliver in time, improves quality, reliability (Langfield & Greenwood, 1998; Carr & Pearson, 1999). Furthermore, when the buying firm provides technical support to suppliers, the performance dimensions of the buying firm will improve in terms of cost, quality, productivity, and design (Lee & Ansari, 2005). Supplier development results in reduced costs, improved communication, risk sharing, and improved problem solving (Quayle, 2000).

According to Rodriguez, (2005) technical capability relates to engineering issues and the supplier's capability to meet performance and technical specifications and requirements. Rytter, Boer and Koch (2007) argued that, activities related to the provision of technical assistance are fundamental to suppliers' performance. A study by Carr and Pearson, (1999), predicted existence of a positive relationship between technical support and buyers performance. This is because as the supplier put into use the acquired technical capability, it translates into product innovation and product quality. This leads to supply of superior products by the suppliers which in turn enhances the effectiveness and efficiency of performance on the part of the buyer.

A USAID report by Easterling, M'mboyi, and Management Systems International, (2013) indicate that, to achieve international quality standards for raw fresh milk, the bacteria count must not exceed the industry standard of 200,000 colony-forming units of bacteria per milliliter, their findings revealed that much of the milk supplied to the processing plants in Kenya contained a bacteria count of over 1 million—far beyond the internationally acceptable standard. This has been attributed to the time taken to deliver milk to the cooling plants which have necessitated dairy firms invest heavily in establishing milk cooling plants across the Country.

Dairy firms in Nyandarua County have realized that animal feeds nutrition is the major factor in milk production and incorporated this concept in their training programs to equip farmers with adequate knowledge on feed establishment, preservation and feeding. This intends to enable farmers make informed decision on how much to preserve to feed their dairy hers during drought,

how to balance the feed available with physiological requirements of a cow and which concentrate to supplement feeding for dairy farming to remain profitable.

As a way of providing technical support to farmers, dairy firms in Nyandarua County have established agro vet units, cooling plants and dairy feeds processing firms to promote milk production with the objective of farmers getting high quality nourishment for their livestock, for high quality milk which is collected at the Dairy plant through Maziwa-365 days-initiative whose ultimate goal is to stabilize milk production across the year for years (Gethi, 2011). These initiatives by dairy firms are farmer oriented and coupled with weekly or monthly follow ups. Farmers are mobilized into groups and inducted on aspects such as challenges in dairy herd feeding, Nutrition and supplements, fodder and concentrate cultivation and conservation, farm management, preventive medicine and breeding strategy (Ndaragwa Milk Farmers Forum, 2012).

Supply Chain Performance and SD

The first step of SD is supplier's evaluation that identifies areas where improvement is needed. This step helps to point out exact cause of problem i.e. whether the problem is in material or in design or in production process or in workmanship (Hartley & Choi, 2007). Suppliers are evaluated on the basis of parameters like technical capabilities, quality, cost, delivery, managerial capabilities (Hartley & Choi, 2007). SD plays a critical role in driving supply chain performance improvement which contributes strategically to overall organizational effectiveness, therefore, there is an increasing interest in SD, which is driven primarily by the buyer's desires to improve supplier performance which is likely to reduce cost of materials and bring about greater efficiency across the entire supply chain (Li, Humphreys, Yeung & Cheng, 2012).

Handfield, (2003) posits that there exist supply chain performance gaps between what supply chains are currently achieving and what they are capable of in cost and quality controls, and their responsiveness to changing customer needs. SD can be initiated to close this performance gap to meet the buying firm needs both in the present and in the future. Njeru, (2013) in her case study of Kenya Power sought to investigate factors which influence SD in public entities in Kenya. The study concluded that Kenya Power recognized SD as a means to improving their efficiency.

However, the study was too narrow to only supplier communication as the only tool in SD and hence no enough scope to generalize on the effect of SD on supply chain performance.

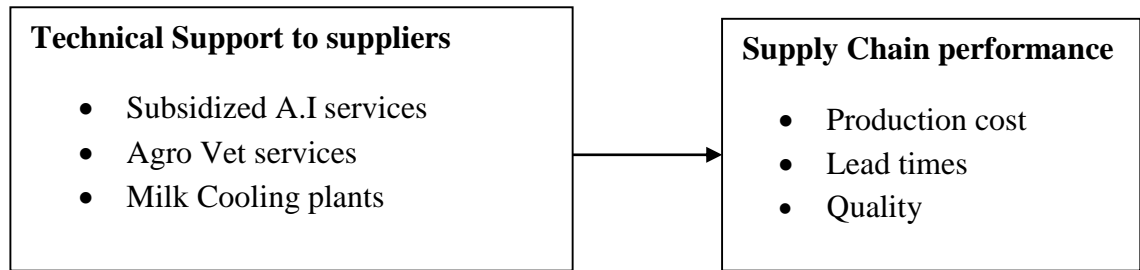
Another study by Waraporn, Kamonchanok, Pongsa and Pornchaiwisesku (2012) on the impact of SD on supplier performance investigated the role of buyer-supplier commitment in supplier performance improvement. The study recommended that managers should place strong emphasis on developing specific relationship with suppliers. These studies did not dwell on the explaining the benefits and implications of SD efforts on the supply chain performance in areas such as cost of production, lead times or quality improvement, an issue addressed by the current study.

Review of Critical Literature

It is worthwhile noting that, a large number of companies execute supplier development programs and yet they fail at surprising rates. Not all supplier development initiatives are successful, as many as 50% are not successful due to poor implementation and follow-up (Handfield, 2002). This failure demoralizes employees who have worked diligently to complete their share of the work in the supplier development project. Thus the success supplier development depends on willingness and commitment of both the buying firm and its suppliers. Opponents of supplier development concept argue that hedging may expose the buying firm to supplier activities and may give a lot of control over the business operations to an external force notwithstanding the immense use of resources during the exercise (Krause, 1998).

2.8 Conceptual framework

A conceptual framework displays the relationships between independent variables and dependent variables (Kothari, 2004). According to Mugenda and Mugenda, (2012) a conceptual framework is the main structure that gives the study its form and shape by tying all the elements in the logical configuration. A buying firm can implement SD programs through provision of technical support to improve supply chain performance as summarized in Figure 1.1.

Independent Variable**Dependent Variable****Figure 1: conceptual framework****METHODOLOGY**

The study adopted a descriptive study design. A descriptive study design includes scientific surveys and fact-finding enquiries to provide a description of the state of affairs as it exists at present (Kothari, 2004). The study engaged the target population in assessing the effects of technical support to suppliers on supply chain performance in the dairy sector in Nyandarua County. Descriptive study design was successfully used by Lukhoba, (2013) and enabled him to draw credible conclusions.

The target population comprised 263 employees drawn from membership based dairy firms in Nyandarua County with a capacity to handle at least 100,000 liters of milk per day. The Slovin's formula was used for calculating the sample size which yielded a sample size of 158. Primary Data was collected using questionnaires and analyzed with the support of statistical package of social sciences (SPSS) version 22. Descriptive and inferential statistics were used in explaining the relationship between the variables in the study.

STUDY FINDINGS AND DISCUSSION**Response Rate**

A total of 158 questionnaires were administered to the target respondents with the help of the management of the three dairy firms in Nyandarua. However, 138 questionnaires were properly

filled and returned within the time given. This translates to a response rate of 87.3%. According to Mugenda and Mugenda, (2003) a response rate of 50% or more is adequate to draw meaningful inferences

Pilot Studies Reliability Test Results

The reliability of the questionnaire was tested using the Cronbach's Alpha correlation coefficient with the aid of SPSS software. As shown in Table 4.2 Cronbach alpha values for technical support to supplier was 0.813. According to Nachmias & Nachmias, (2006) a Cronbach Alpha value greater than 0.7 is regarded as satisfactory for reliability assessment

Summary of Descriptive Analysis

The objective of the study sought to evaluate the effect of technical support to supplier on supply chain performance in the dairy sector in Nyandarua County. Descriptive statistics were done to determine the effect of technical support to suppliers on supply chain performance.

Table 1: Descriptive Analysis for Technical Support to Supplier

Technical support to supplier factors	N	Mean	Std. Error	Std. Dev
The dairy firms' owned Agro vets outlets have made it easier for farmers to access quality animal feeds and supplements at affordable prices	138	4.6304	.04124	.48445
Provision of reliable Artificial Insemination services at subsidized rates have enabled farmers to upgrade the quality of dairy herds and milk production in Nyandarua County	138	4.6087	.04170	.48982
We provide efficient milk transport services at farm levels which has reduced time between milking and collection for processing	138	4.2899	.06440	.75651
We have established adequate milk cooling plants/facilities closer to farmers to aid in milk collection and reduce post-harvest losses	138	3.4604	0.5316	.73281
Provision of the above technical support has helped farmers to reduce cost of milk production and improved milk quality and reduce milk wastage/spoilage	138	3.8333	.06389	.75051
Valid N (list wise)	138			

As shown in Table 1, dairy firms in Nyandarua have Agro vets shops that made it easier for farmers to access quality animal feeds and supplements than before with a mean score of 4.6304 and standard deviation of 0.48445. Moreover, dairy firms facilitated upgrade of dairy herds through provision of reliable Artificial Insemination services at subsidized rates to their members with a mean score of 4.6087 and standard deviation of 0.48982.

The provision of efficient milk transport services at farm levels which has reduced time between milking and collection for processing had a mean score of 4.2899 and standard deviation of 0.75651. In addition, provision of the above technical support through establishment of milk

cooling plants/facilities closer to farmers have aided efficiency in milk collection and also reduction of post-harvest losses with a mean score of 3.4604 and a standard deviation of .73281. The study further revealed that, technical support extended to farmers have helped them in reducing the cost of milk production, improve milk quality as well as reduced milk wastage/spoilage which had a mean score of 3.8333 and standard deviation of 0.75051.

Therefore, farmers in Nyandarua County have been provide with technical support such as reliable Artificial Insemination services at subsidized rates, efficient milk transport services at farm levels, access milk cooling facilities and could access quality animal feeds and supplements in Agro vets shops to help in reducing cost of milk production, reduce time between milking and collection, upgrade dairy herds, improve milk quality and reduce milk wastage/spoilage.

Descriptive Analysis for Supply Chain Performance

a) Frequency of shortage or excess milk supply

The study sought to establish the level of shortage or excess milk supply. The results are shown in Table 2

Table 2: Descriptive Analysis for Frequency of shortage or excess milk supply

Shortage or excess milk supply	N	Mean	Std. Error	Std. Dev
Short	138	3.3768	.07572	.88954
Excess	138	1.8913	.04899	.57547
Valid N (list wise)	138			

As shown in Table 2, there are times when dairy firms in Nyandarua experience high shortage of milk with a mean score of 3.3768 with a standard deviation of 0.88954. The excess of milk in Nyandarua is very minimal with a mean score of 1.8913 with a standard deviation of 0.57547. The finding of the study is consistent to a study by Food and Agriculture Organization (FAO) and the United Nations (2011) on Dairy development in Kenya concluded that, milk industry supply chains in Kenya experiences inconsistent supply of milk which can be attributed to lack capacity by suppliers and high cost of milk production which are attributed by low quality of feed and fodder, and the lack of year-round availability of quality forages, animal diseases, and low quality breeds.

According to KDB, (2012) many local milk processors suffer milk fluctuations between dry and rainy seasons, resulting in low capacity utilization of between 40-60%. To overcome this challenge, major dairy firms in Nyandarua County has embarked on an projects aimed at enhancing small scale farmers capacity by improving farm-management skills in production, mechanization and preservation, introducing feeds varieties, provision of veterinary services, improving quality of breeds to enhance small scale farmers capacity to produce more and quality milk

b) Capacity utilization level

The trends indicated that capacity utilization level increased between the 2013 and 2014. This forced the firms to increase their internal capacity in 2015 which again indicate a decrease level of utilization in year 2015 attributed to the upgraded capacity. However there was a further increase in the capacity utilization from 74% in 2015 to 80% in year 2016 which can be attributed to increased productivity by suppliers as a result of continued technical support by the dairy firms. The implication is that capacity utilization level for the dairy firms in Nyandarua County fluctuates depending on farmers productivity and the average annual capacity available in the dairy firms as shown in Figure 2 below.

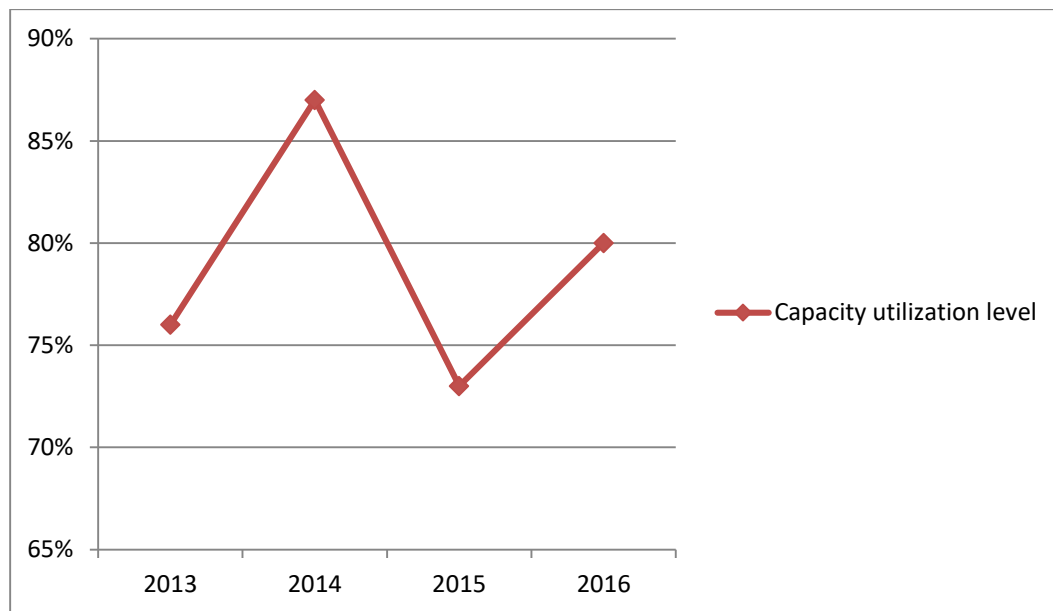


Figure 2: Capacity utilization level

c) Average cost of processing the collected milk

The trends indicated that average cost of processing the collected milk has been in the decreasing trend for a period between 2013 to 2016 (from Kenya Shillings 12 to 7). The implication is that technical support and training provided to the farmers has brought about quality and efficient services which resulted to reduction in processing cost the as shown in Figure 3 below.

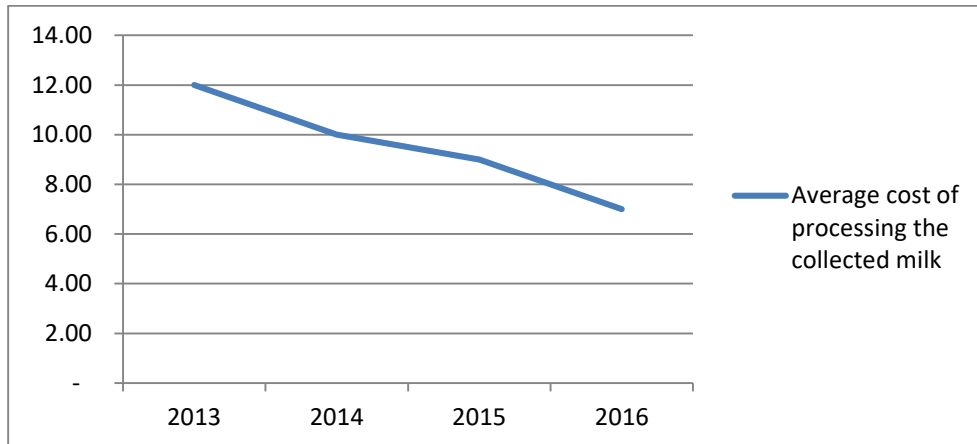
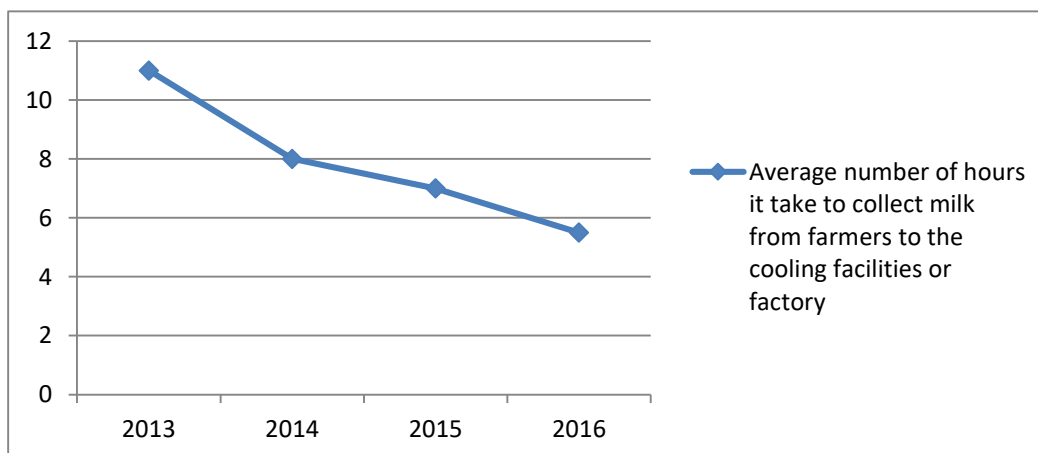


Figure 3: Average cost of processing the collected milk

d) Average number of hours it takes to collect milk from farmers to the cooling facilities or factory

The trends indicated that average number of hours it take to collect milk from farmers to the cooling facilities or factory been in the decreasing trend for a period from 2013 to 2016. The implication is that the time it takes to transport milk from the farmers has collection centers and cooling plants as shown in Figure 4 below.



*Figure 4: Average number of hours it takes to collect milk***e) Average milk rejected before it could reach the factory**

The trend analysis drawn indicated that the annual average milk rejected on the basis of low quality or spoiled in transit before it could reach the factory has been in the declining trend from around 1,200 liters in year 2013 to around 400 liters in 2016. The implication was that the quality of milk had improved over time which implies technical support to suppliers objective are being realized

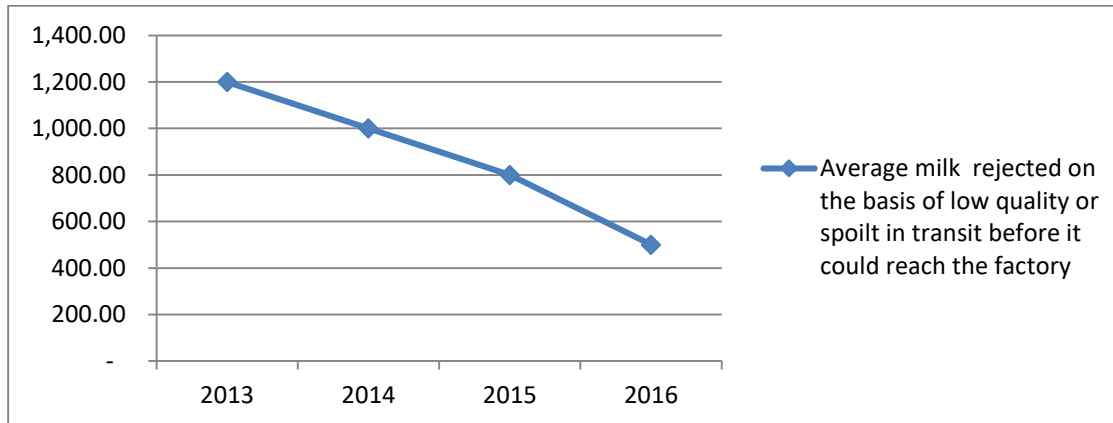


Figure 5: Average milk rejected

Regression analysis on effects of Technical Support to Supplier on Supply Chain Performance

The bivariate linear regression analysis results of technical support to supplier on the on supply chain performance in the dairy sector were as shown in Table 3, 4 and 5

Table 3: Model Summary for Technical Support to Supplier

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.657 ^a	.431	.427	.50783

a. Predictors: (Constant), technical support

From the regression results in Table 3, the R value was 0.657 indicating that there is a relationship between technical support to supplier on the supply chain performance in the dairy sector in Nyandarua County. The R squared (R^2) value of 0.431 shows that 43.1 percent of the supply chain performance is explained by technical support to supplier all other factors held constant. The remaining 56.9 percent is explained by other factors.

Table 4: ANOVA Model for Technical Support to Supplier

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	26.618	1	26.618	103.217	.000 ^b
	Residual	35.073	136	.258		
	Total	61.691	137			

a. Dependent Variable: supply chain performance

b. Predictors: (Constant), technical support

The model was significant with the F ratio = 103.217 at p value $0.000 < 0.05$. This is an indication that technical support to supplier when considered singly has a significant effect on the supply chain performance in the dairy sector in Nyandarua County.

Table 5: Model Coefficients for Technical Support to Supplier

Model		Unstandardized		Standardized	t	Sig.
		Coefficients		Coefficients		
		B	Std. Error	Beta		
1	(Constant)	1.561	.130		12.002	.000
	technical support	.347	.034	.657	10.160	.000

a. Dependent Variable: supply chain performance

Technical support to supplier had positive and significant effect on supply chain performance with $\beta = 0.347$ at p value 0.000 which is less than 0.05. From Table 5, the bivariate linear regression model equation fitted using unstandardized coefficients is; $Y = 1.561 + 0.347X_1 + e$. where 1.561 is the constant where X_1 is technical support to supplier index. This means that technical support to supplier positively and significantly influence supply chain performance in the dairy sector in Nyandarua County. It also means that an increase of one unit of X_1 increases Y by 0.347.

The indication was that technical support to supplier is a major factor that affects supply chain performance. A study by Carr and Pearson, (1999), predicted a positive relationship between technical support and buyer performance. This is because as the supplier put into use the acquired technical capability, it translates into product innovation and product quality.

Table 6: Effects of Technical support on Supply Chain Performance Model Coefficients

Model	Unstandardized		Standardized	T	Sig.
	Coefficients		Coefficients		
	B	Std. Error	Beta		
(Constant)	.557	.220		2.525	.013
Technical support	.188	.034	.357	5.547	.000

a. Dependent Variable: supply chain performance

Technical support had positive and significant effect on supply chain performance with $\beta_1 = 0.188$ at p value 0.000 which are less than 0.05. The optimal regression equation for this study can be stated as:

$$Y = 0.557 + 0.188X_1 + e.$$

Where 0.557 is the constant, X_1 is technical support index

CONCLUSIONS

Technical support to supplier had positive and statistically significant effect supply chain performance in the dairy sector in Nyandarua County at 95% confidence level. The study further revealed that dairy firms in Nyandarua County provides technical support to farmers by opening up agro vets shops across the county which has made it easier for farmers to access quality animal feeds and supplements at fair prices. In addition, the dairy firms have facilitated upgrade of dairy herds through provision of reliable Artificial Insemination services at subsidized rates to their members. They have also provide efficient milk transport services at farm levels as well as establishing milk cooling plants in strategic locations which has reduced time between milking and collection for processing. All these are geared towards helping the farmers to reduce cost of milk production and reduce milk wastage/spoilage previously resulting from time taken to collect the milk.

The effectiveness of supply chain was reviewed and study revealed that despite deliberate effort by the dairy firms in Nyandarua County to offer and technical supports to dairy farmers, there

times when dairy firms in Nyandarua experience high shortage of milk. However some of the reasons for fluctuations in milk production and supply can be attributed to some factors beyond the control of the dairy firms such as adverse climatic conditions experienced in the region.

The study established that farmers are able to access quality animal feeds and supplements from the Agro vets shops which are conveniently located across the region. In addition, dairy farmers are provided with reliable Artificial Insemination services at subsidized rates with the aim of upgrading their breeds. This is coupled with efficient milk transport services at farm levels which have reduced time between milking and collection for processing. All these are geared towards helping the farmers to reduce cost of milk production and improved milk quality and reduce milk wastage.

Recommendations

Dairy firms should lobby the support of the County and national government to ensure the region has an elaborate infrastructure such as road network, electricity and water as these were cited as the factors that hinder application of modern farming techniques and installation of cooling plants in Nyandarua County. The aspect of value addition should also be looked into where the government can support establishment of mega milk processing and packaging industry to take advantage of the enhanced milk production in the County and the ever increasing demand for milk and milk products worldwide. This will have a multiple effect as it will increase income, create jobs, and enhance food security in the country.

To sustain consistent milk production in Nyandarua County, the dairy firms should pull resources together and establish a feed processing firm that has the capacity to produce quality animal feeds and sell to farmers at reasonable prices to enable farmers lower their cost of production which will be an incentive to farmers to increase their production capacity.

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