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Demand Forecasting Practice on Distribution Performance of Milk Processing Firms in Uasin Gishu County, Kenya

Scovia Chepchumba Maiyo[1], Dr. Pauline Keitany[2]
Jomo Kenyatta of Agriculture and Technology, P.O. Box Private Bag, JKUAT, 1063 – 20100, Kenya

ABSTRACT: *Distribution performance is a critical component of the milk processing industry, ensuring that dairy products reach consumers efficiently and in optimal condition. While the country has made significant strides in milk production and processing, challenges in distribution performance persist. Milk consumption often follows seasonal patterns influenced by factors like weather and agricultural cycles. UasinGishu County experiences fluctuations in milk production due to rainfall patterns and forage availability, which can pose challenges for accurate demand forecasting (Odhiambo et al., 2020).In some cases, milk processing firms in UasinGishu County lack access to comprehensive historical data, making it difficult to develop accurate demand forecasts. Limited data result from the informal nature of some dairy activities in the region (Makau et al., 2019).Therefore, the study seeks to determine the effect of demand forecasting practice on distribution performance of milk processing firms in UasinGishu County, Kenya. The study adopted descriptive research design. The unit of observation was 28 procurement officers, 73 store managers and 58 employees in logistics department which sums up to 159 employees. The study also targeted 2800 customers who purchases products from the milk processing firms. The study adopted census technique to incorporate all 159 targeted employees in the study. Moreover, the study used Nassiuma Formula to sample 97 customers. The study further adopted convenient sampling to interview the customers as they visited the milk processing firms. Primary data was sourced from the respondents through the use of semi structured questionnaires and interview schedules. A pilot study was conducted among Milk Processing Companies in Nakuru Town. Qualitative data was analyzed using themes where content analysis methodology was employed. Quantitative data was analyzed using both descriptive and inferential statistics. Descriptive statistics involved the use of frequencies, percentages, mean, and std. Inferential statistics involved the use of correlation and regression analysis. After analysis qualitative data was presented in prose form while quantitative data was presented in form of tables. The study concluded that there exists a strong positive and significant relationship between transportation and distribution performance of milk processing firms in UasinGishu County.*

KeyWords: *Demand Forecasting Practice, Distribution Performance, Milk Processing Firms*

I. INTRODUCTION

Demand forecasting practice involves predicting the future demand for products or services within a supply chain's distribution network. It is a critical aspect of supply chain management that helps organizations optimize their distribution processes, inventory levels, and resource allocation to meet customer demand efficiently. Accurate demand forecasting can lead to improved distribution performance, reduced costs, and enhanced customer satisfaction.Accurate demand forecasts enable distribution centers to maintain optimal inventory levels. This ensures that products are available to meet customer demand without overstocking or understocking, which can tie up capital and lead to customer dissatisfaction.Demand forecasts assist distribution centers in planning their resource allocation more effectively. This includes allocating labor, storage space, and transportation resources based on anticipated demand patterns (Mentzer, Stank& Esper, 2018).

Milk consumption often follows seasonal patterns influenced by factors like weather and holidays (Silver, Pyke & Peterson, 2019). Demand forecasting helps milk processing firms anticipate these fluctuations and adjust production and distribution schedules accordingly to prevent overstocking or stockouts (Harris, 2019).Accurate demand forecasting enables firms to optimize inventory levels of raw milk and processed dairy products. This reduces holding costs while ensuring an adequate supply to meet customer demand (Silver, Pyke& Peterson, 2019). (Chopra &Meindl, 2016). Milk and dairy products have limited shelf lives. Effective demand forecasting minimizes product wastage by ensuring products are distributed before they expire (Cachon&Lariviere, 2015).Milk processing firms rely on efficient distribution

networks.Demand forecasting helps plan transportation and delivery routes, reducing transportation costs and ensuring timely deliveries (Felski& Thompson, 2019).Meeting customer demand on time is crucial in the dairy industry. Accurate forecasting helps prevent stockouts, ensuring customers can access milk and dairy products when needed (Ha, Tong& Zhang, 2017).

Demand forecasting also impacts relationships with milk suppliers. When milk processing firms can accurately predict their needs, they can negotiate better terms and maintain a consistent supply (Ho, Xu& Dey, 2020).Forecasting can help firms maintain product quality by ensuring that products do not sit in inventory for extended periods, which can lead to spoilage (Nahmias, 2019).Accurate forecasting allows firms to plan marketing campaigns and promotions effectively, ensuring that they have the right number of products available to meet increased demand during such events (Belch& Belch, 2018). The dairy industry often faces regulatory requirements related to product labeling, shelf-life, and distribution. Demand forecasting can help firms comply with these regulations by ensuring timely product rotation and accurate labeling (Motarjemi, &Lelieveld, 2013).

The Netherlands has a highly developed dairy industry known for its efficiency. Demand forecasting is critical to maintain the seamless flow of dairy products to retailers and consumers. Advanced technologies and data analytics are often used to predict demand accurately (Winkens&Klumper, 2017).Dutch milk processors work closely with dairy farmers to ensure a steady supply of raw milk. Accurate demand forecasting helps in coordinating production and distribution efforts with farmers to minimize waste and optimize resources (Cachon&Lariviere, 2019). The Netherlands is a significant exporter of dairy products. Demand forecasting is essential for managing export volumes and meeting international market demands (Rabobank, 2021).

Japan experiences seasonal variations in milk consumption, with higher demand during the winter months. Demand forecasting helps Japanese milk processing firms adjust production and distribution schedules to meet these seasonal fluctuations (Japan Dairy Association, 2020).Japanese consumers place a strong emphasis on product quality and safety. Demand forecasting assists firms in maintaining strict quality control standards by ensuring products are delivered and sold before expiration (USDA Foreign Agricultural Service, 2021). Japan's limited land resources make efficient supply chain management critical. Accurate demand forecasting supports efficient logistics and transportation planning to minimize costs (Japan External Trade Organization, 2019).

South Africa has a diverse market for dairy products, with varying demand across regions and demographic groups. Demand forecasting helps milk processing firms tailor their distribution strategies to different market segments (Mordor Intelligence, 2021).South Africa's vast geography can pose logistical challenges for distribution. Demand forecasting assists in optimizing transportation routes and managing inventory across the country. The South African dairy industry is subject to various regulations related to product quality and labeling. Demand forecasting ensures compliance with these regulations by facilitating timely product rotation and accurate labeling (Department of Agriculture, Forestry and Fisheries, South Africa).

Tanzania's dairy industry is characterized by a mix of rural and urban consumers. Demand forecasting helps firms understand and cater to the diverse demand patterns in both settings (Komba et al., 2018). Infrastructure limitations, such as poor road networks in some regions, can affect distribution efficiency. Demand forecasting assists in planning transportation routes and optimizing inventory management to overcome these challenges (Kamala et al., 2017). As the dairy market expands in Tanzania, firms need to anticipate and meet the growing demand. Accurate forecasting supports market expansion strategies and ensures a steady supply of dairy products (Ngowi et al., 2019).

Kenya's urban population is a significant consumer of dairy products. Demand forecasting helps firms target urban areas effectively and align production and distribution with urbanization trends (Kilelu et al., 2016).Kenya has a robust informal dairy sector. Demand forecasting assists firms in coordinating with small-scale producers and processors to optimize product availability (Oluoch-Kosura, 2016).The Kenyan dairy industry is subject to regulatory standards related to quality and safety. Demand forecasting helps firms ensure compliance by managing inventory and distribution processes (Kenya Dairy Board, 2019). Kenya's dairy sector is competitive, with several milk processing firms vying for market share. Accurate demand forecasting aids in staying competitive by reducing product wastage and maintaining product availability (Mwirigi et al., 2018).

II. LITERATURE REVIEW

Inventory Management Theory

The study was anchored on demand driven inventory management theory. According to the demand driven inventory management theory, efficient management of supply chains comprises the enhancement of the highest quality of vendor management inventory and minimization of the supply chain costs (Yadav, 2014). The theory holds that the characteristic reason behind constantly increasing supply chain expenses is the excess inventory levels in the entire the chain, hence the need for innovative supply chain designs. Accurate demand forecasting is crucial for demand-driven inventory management. It involves analyzing historical data, market trends, customer behavior, and other relevant factors to predict future demand patterns.

It is argued that any delay or variance would have significant influence on the level of accuracy of the forecasts made for the future periods. Therefore, accurate sales data and acknowledging the environmental dynamics determine the quality of the forecast, and hence more utilitarian supply chain innovation. The various models of forecasting under conditions of data constancy suggested by Kot et al. (2011) include moving averages and exponential smoothing or, in the case of inconsistencies of data, models such as time series with trend analyses. The weakness of this theoretical model is that it places much emphasis on the quantitative characteristics of the supply chain, and places less premium on the human factors on the relationship between supply chain innovation and forecasting accuracy. The application of this theory is to show how distribution performance is related to forecasting accuracy.

Demand forecasting plays a crucial role in distribution performance as it helps organizations effectively plan and manage their distribution activities (Sonneveld& Lewis, 2019). Demand forecasting allows organizations to determine the quantity and timing of distribution activities. By forecasting future demand, organizations can align their inventory levels accordingly, ensuring they have the right amount of stock available to meet customer requirements. This helps minimize stock-outs, reduce excess inventory, and optimize inventory holding costs, leading to improved distribution performance.

Demand forecasting provides valuable insights for strategic planning and decision-making. Organizations can use demand forecasts to identify new market opportunities, plan product launches or promotions, and optimize their distribution strategies based on anticipated demand. This strategic alignment ensures that distribution activities are in line with overall business objectives, contributing to improved distribution performance (Olsmats& Dominic, 2018). Accurate demand forecasting enables organizations to meet customer demands in a timely manner. By having the right products available when customers need them, organizations can improve customer satisfaction, loyalty, and retention. This leads to positive brand reputation, increased market share, and overall business growth.

III. METHODOLOGY

The study adopted the descriptive research design. This method was considered appropriate because the researcher will collect the data of the phenomenon under study in its natural environment and without any manipulation of the variables. The unit of study were 28 milk processing firms in UasinGishu County. The unit of observation were 28 procurement officers, 73 store managers and 58 employees in logistics department which sums up to 159 employees. The study also targeted customers who purchase milk products from the milk processing firms. The researcher assumed that each dairy firm receives an average of 100 customers per week. Therefore, the total number of targeted customers was 2800. The study adopted census technique to incorporate all 159 targeted employees in the study. Moreover, the study used Nassiuma Formula to determine 97 customers. The study further adopted convenient sampling to interview the customers as they visited the milk processing firms. The study collected primary data using both questionnaire and interview schedule. Structured questionnaires were used to collect quantitative data from the 159 employees. Questionnaire was organized in five parts as per the objectives. Interview schedule was adopted to collect qualitative data from the 97 customers.

Data collection process began by getting a formal letter from the university authorizing the field study. The letter together with the consent statement was then presented to the respective company as a means of seeking authority to collect data from the institution. The researcher also sought a permit from the National Commission for Science, Technology and Innovation (NACOSTI). Data was collected using drop and pick later method which was collected after two weeks. In this method, the consent statement was issued and then the questionnaire administered. The respondents were assured of their confidentiality of information to improve the response rate. A pilot study was conducted among four (4) milk processing firms in Nakuru City, where 16 questionnaires were issued out procurement, logistic and store officers. The instrument used ensured that the results obtained from the analysis of the data represent the phenomenon

under study in terms of content, criteria and the characteristics. This was done by the experts in the University. Their comments were used to improve on the instruments. Reliability of the instruments was determined using Cronbach Alpha. Items with reliability coefficients of at least 0.70 was accepted as valid and reliable in this research. Data analysis involved reduction of accumulated data to a manageable size, developing summaries, looking for patterns and applying statistical techniques. The collected data was both quantitative and qualitative. Qualitative data was collected using interview schedule, while quantitative data was gathered using questionnaire. Qualitative data was analyzed using themes where content analysis methodology was employed. Quantitative data was analyzed both using descriptive and inferential statistics. Descriptive statistics employed frequencies, percentages, mean, and std. Inferential statistics used correlation and regression analysis. This was done using the Statistical Package for Social Sciences (SPSS) Version 24. After analysiss qualitative data was presented in prose form while quantitative data was presented in form of tables. Regression analysis clarified variable relationships. The result of the findings was presented in form of tables. The study undertook preliminary diagnostic tests to ensure suitability of correlation and multiple linear regressions.

IV. RESULTS

Response Rate

The study issued 159 questionnaires to the targeted employees working in the milk processing firms. Out of which 115 were successfully filled and returned. This represented 72% response rate. However, 28% response rate was not received because the 44 questions were not correctly filled by the supervisor.

Demand Forecasting on Distribution performance

The study sought to establish the effect of demand forecasting on distribution performance of milk processing firms. The findings are shown in Table 1

Table 1: Demand Forecasting on Distribution performance

Statements on Demand Forecasting	SA (%)	A (%)	N (%)	D (%)	SD (%)	Mean	Std
Milk processing firms conducts market research which aids in demand forecasting for better distribution performance.	38	52	2	8	0	4.244	.950
Market research provides information about various suppliers, their capabilities and reputation in the market.	49	41	2	8	0	4.107	1.016
Milk processing firms share sales plans with suppliers which helps in joint planning hence improving distribution performance	35	45	3	10	7	3.869	1.023
Milk processing firms have sales plans which helps in managing inventory hence improving distribution performance	29	41	12	10	8	3.631	1.152
Sales plans provide valuable insights into customer requirements which enhances distribution performance.	39	43	2	9	7	3.735	1.134
Milk firms analyzes historical sales data which helps to identify seasonal demand fluctuations and long-term trends.	38	52	2	8	0	4.351	.767
Historical sales data serves as a valuable benchmark for evaluating the accuracy of demand forecasts.	34	50	12	2	2	4.345	.692

Source: Research Data (2023)

From the study the findings revealed that 38% of the respondent strongly agreed that milk processing firms conducts market research which aids in demand forecasting for better distribution performance, 52% of the respondents agreed that milk processing firms conducts market research which aids in demand forecasting for better distribution performance, 2% were undecided, 8% disagreed that milk processing firms conducts market research which aids in demand forecasting for better distribution performance (mean=4.244, SD=0.950). The study findings are in line with those of Kaguongo and Kimenyi (2019) who found that conducting market research is a valuable practice for milk processing firms, as it aids in demand forecasting and contributes to better planning of the procurement process.

In addition, 49% of the respondents strongly agreed that market research provides information about various suppliers, their capabilities, and reputation in the market, 41% agreed that market research provides information about various suppliers, their capabilities, and reputation in the market, 2% were undecided, while 8% disagreed (mean=4.107, SD=1.016). This implies that market research provides information about various suppliers, their capabilities, and reputation in the market. Moreover, 35% of the respondents strongly agreed that the milk processing firms share sales plans with suppliers which helps in joint planning hence improving distribution performance, 3% were undecided, 10% disagreed while 7% disagreed that milk processing firms share sales plans with suppliers which helps in joint planning hence improving distribution performance (mean=3.869, SD=1.023). This implies that milk processing firms share sales plans with suppliers which helps in joint planning hence improving distribution performance. According to Collins, 2018) sharing sales plans with suppliers is a beneficial practice for milk processing firms, as it facilitates joint planning and improves performance. Collaborative efforts between milk processing firms and suppliers lead to better alignment of demand and supply, more efficient procurement processes, and overall business growth

From the findings 29% of the respondent strongly agreed that milk processing firms have sales plans which helps in managing inventory hence improving distribution performance, 41% of the respondents agreed that milk processing firms have sales plans which helps in managing inventory hence improving distribution performance, 12% were undecided 10% disagreed while 8% strongly disagreed that milk processing firms have sales plans which helps in managing inventory hence improving distribution performance (mean=3.631, SD=1.152). This implies that milk processing firms have sales plans which helps in managing inventory hence improving distribution performance. The study findings further revealed that 39% of the respondents strongly agreed that the sales plans provide valuable insights into customer requirements which enhances distribution performance., 43% agreed, 2% were undecided, 9% disagreed while 7% strongly disagreed with (mean=3.735, SD=1.134). According to Tough, (2015) sales plans provide valuable insights into customer requirements, and this, in turn, enhances performance for milk processing firms. Understanding customer demand is essential for optimizing procurement strategies and ensuring that the right products are available at the right time.

Further 38% of the respondents strongly agreed that milk firms analyzes historical sales data which helps to identify seasonal demand fluctuations and long-term trends, 52% agreed that milk firms analyzes historical sales data which helps to identify seasonal demand fluctuations and long-term trends, 2% were undecided while 8% disagreed that milk firms analyzes historical sales data which helps to identify seasonal demand fluctuations and long-term trends with a mean score of 4.351 and standard deviation of 0.767. This implies that milk firms analyze historical sales data which helps to identify seasonal demand fluctuations and long-term trends. From the findings 34% of the respondents strongly agreed that historical sales data serves as a valuable benchmark for evaluating the accuracy of demand forecasts, 50% agreed that the historical sales data serves as a valuable benchmark for evaluating the accuracy of demand forecasts, 12% were undecided, 2% disagreed while 2% strongly disagreed. This implies that historical sales data serves as a valuable benchmark for evaluating the accuracy of demand forecasts with a mean of 4.345 and standard deviation of 0.692. The study findings are in line with those of Mhlanga and Dube (2018) who found that historical sales data is an invaluable tool for evaluating the accuracy of demand forecasts in the milk processing industry or any other business. By comparing past sales data with actual demand, companies can assess the effectiveness of their forecasting methods and make improvements for more accurate predictions in the future.

From the findings, some of the customers revealed that "*milk processing firms meets our demands, the milk processing aims to meet customer demands to the best of their abilities. Meeting customer demands in the dairy industry involves ensuring a stable and reliable supply of fresh and pasteurized milk products that fulfill consumers' needs and preference*"

Distribution performance of Milk Processing Firms

The study sought to establish distribution performance of milk processing firms in Uasin Gish County. Kenya. The findings is shown in Table 2

Table 2 :Distribution performance of Milk Processing Firms

Statements onDistribution performance	SA (%)	A (%)	N (%)	D (%)	SD (%)	Mean	Std
Milk processing firms delivers products on time	49	39	10	2	0	4.333	.893

Milk processing firms delivers products to the market in good condition	48	39	6	4	3	4.534	.831
Milk processing firms have minimized the operation costs for the past two years	38	44	4	9	5	3.994	.989
Milk processing firms are able to meet customer demands on time	32	52	3	10	3	3.375	1.176

Source: Research Data (2023)

From the study the findings revealed that 49% of the respondent strongly agreed that the milk processing firms delivers products on time, 39% of the respondents agreed that milk processing firms delivers products on time, 17% were undecided, 10% disagreed that milk processing firms delivers products on time (mean=4.333, SD=0.893). In addition 48% of the respondents strongly agreed that milk processing firms delivers products to the market in good condition, 39% agreed that milk processing firms delivers products to the market in good condition, 13% were undecided, while 5% disagreed (mean=4.534, SD=0.831). This implies that milk processing firms delivers products to the market in good condition. According to Tshivhase, and Ngwenya, (2020) ensuring that milk processing firms deliver their products to the market in good condition is of paramount importance. The quality and safety of dairy products, including milk, are critical factors that directly impact consumer confidence, brand reputation, and overall business success

Moreover, 38% of the respondents strongly agreed that milk processing firms have minimized the operation costs for the past two years, 4% were undecided, 9% disagreed while 5% strongly disagreed that milk processing firms have minimized the operation costs for the past two years (mean=3.994, SD=0.989). This implies that milk processing firms have minimized the operation costs for the past two years. From the findings 32% of the respondent strongly agreed that milk processing firms are able to meet customer demands on time, 52% of the respondents agreed that milk processing firms are able to meet customer demands on time, 3% were neutral, 10% disagreed while 3% strongly disagreed that milk processing firms are able to meet customer demands on time (mean=3.375, SD=1.176). This implies that milk processing firms are able to meet customer demands on time. The study findings are in line with those of Brindisi, (2015) who found thatmeeting customer demands on time is a crucial aspect of the operations of milk processing firms. Ensuring timely delivery of milk and milk products is essential for maintaining customer satisfaction, building brand loyalty, and establishing a competitive edge in the market.

Correlation Analysis

The study conducted a correlation analysis between demand forecasting and distribution performance of milk processing firms in UasinGishu County, the findings were as shown in Table 3

Table 3: Correlation between Demands Forecasting on Distribution performance

		Demand Forecasting
Distribution performance	Pearson Correlation	.619*
	Sig. (2-tailed)	.023
	N	115

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Research Data (2023)

The findings show that there is a strong positive and significant relationship between accessibility of demand forecasting and distribution performance of milk processing firms in UasinGishu County (r=0.619 and P=0.023). The findings imply that demand forecasting and distribution performance of milk processing firms in UasinGishu County. The study findings are in line with those of Wamoto, Kwasira and Ndolo (2022) who established significant influence of

maintained inventory level as demand forecasting practice on operation performance of stores functions (β=-0.223, p=0.018<0.05).

Multiple Regression Coefficients

Table 4: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	2.026	.420		4.824	.000
	Demand Forecasting	.201	.145	.297	1.386	.003

Dependent Variable: Distribution performance of milk processing firms in UasinGishu County.

Source: Research Data (2023)

The study also conducted a regression analysis to establish the regression coefficients connecting the independent and dependent variable as illustrated by the equation illustrated below:

$Y = \beta_0 + \beta_1 X_1$

Whereby Y represents distribution performance of milk processing firms in UasinGishu County, X_1 represents demand forecasting. β_0 represents Constant which defines the value of distribution performance of milk processing firms in UasinGishu County without the inclusion of predictor variables. From the results in Table 4.21 the given equation was answered by the values of Unstandardized Coefficients (β) and all of them were statistically significant since their p values (Sig. <0.05) were less than 0.05. The results indicate that demand forecasting have a positive relationship with the distribution performance of milk processing firms in UasinGishu County. Thus,

$Y= 2.026+ 0.201X_1$

The value of distribution performance of milk processing firms in UasinGishu County without the effect of the predictor variables is 2.026. This explains that, at any given time, distribution performance of milk processing firms in UasinGishu County will be 2.026 holding other factors constant at 0. The results also illustrate that, a unit change in demand forecasting would result to 0.201 times increase in the distribution performance of milk processing firms in UasinGishu County.

V. DISCUSSION

In summary, the study findings revealed that milk processing firms conducts market research which aids in demand forecasting for better planning of procurement process. The study findings also revealed that market research provides information about various suppliers, their capabilities, and reputation in the market. Moreover, the study further revealed that milk processing firms share sales plans with suppliers which help in joint planning hence improving distribution performance. The study also revealed that milk processing firms have sales plans which help in managing inventory hence improving distribution performance. The stud also revealed that sales plans provide valuable insights into customer requirements which enhance distribution performance. Milk firms analyze historical sales data which helps to identify seasonal demand fluctuations and long-term trends. The study also revealed that historical sales data serves as a valuable benchmark for evaluating the accuracy of demand forecasts. According to Tough, (2015) sales plans provide valuable insights into customer requirements, and this, in turn, enhances distribution performance for milk processing firms. Understanding customer demand is essential for optimizing procurement strategies and ensuring that the right products are available at the right time. The study findings are in line with those of Mhlanga and Dube (2018) who found that historical sales data is an invaluable tool for evaluating the accuracy of demand forecasts in the milk processing industry or any other business. By comparing past sales data with actual demand, companies can assess the effectiveness of their forecasting methods and make improvements for more accurate predictions in the future.

VI. CONCLUSIONS AND RECOMMENDATIONS

The study concluded that sales plans provide valuable insights into customer requirements which enhances distribution performance. Milk firms analyzes historical sales data which helps to identify seasonal demand fluctuations and long-term trends. The study also concluded that historical sales data serves as a valuable benchmark for evaluating the accuracy of demand forecasts. The study further concluded that t there is a strong positive and significant relationship

between accessibility of demand forecasting and distribution performance of milk processing firms in UasinGishu County (r=0.619 and P=0.023). The findings imply that demand forecasting and distribution performance of milk processing firms in UasinGishu County. The study findings are in line with those of Wamoto, Kwasira and Ndolo (2022) who found that the study established significant influence of maintained inventory level as demand forecasting practice on operation performance of stores functions.

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