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Technological Innovation and Performance of Informal Dairy Enterprises in Kenya: A Product Diversification Perspective

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Abstract Technological innovation is a key driver of product diversification and change in the dairy industry. However, evidence suggests that in Kenya and Africa at large, small and medium enterprises' adoption of technology is slow, with most of them operating at low levels of technology and efficiency. The effect of technological change in both the small formal and informal businesses has suggested low performance according to previous studies. This paper presents empirical evidence on the extent to which level of technological innovation in relation to product diversification influences performance of Small Scale Milk Vendors (SSMVs) in Kiambu County, Kenya. The empirical results indicated that level of technological innovation in the form of machinery and equipment was positively associated with performance of informal dairy enterprises. Based on the findings, the paper discusses the strategy, policy as well as the research implications for the informal dairy sector in Kenya.

Keywords: *dairy, informal, performance, product diversification, technological innovation*

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1. Introduction

Technological innovation has been identified by various researchers as a key driver of product diversification and change in the agricultural sector, the dairy industry specifically [1,2] as well as a driver of organizational changes within the firm [4,5,6]. However, technological innovation remains a big challenge in the production of a variety of milk products in Kenya. For instance, only New KCC and Brookside have the technological facilities required to process milk to milk powder, with costs of production being high and profit margins being very low [7,8]. According to Kamundi [8], a newly drafted dairy policy acknowledges the role played by the informal dairy sector collectively referred to as Small Scale Milk Vendors (SSMVs) in Kenya in dairy production and advocates measures such as development of low cost appropriate technologies, training on safe milk handling and establishment of a supportive certification system to support the sector. New lower cost technologies have become available allowing the dairy sector to increase productivity, quality and food safety [3]. As such, SSMVs such as milk bars in Kenya have been adopting technological innovation in the form of advanced equipment such as ECL machines and milk ATMs that are used in dispensing and packing milk and yoghurt.

The informal dairy sector enterprises or SSMVs range from smallholder dairy farmers, milk bars, mini-dairies to cottages paying an annual license fee of between $10 and $50 [9]. Among the major challenges that have been identified as traditionally affecting the Small and Medium Enterprises (SMEs) with regard to strategic management of technological innovation include: their lack of managerial skills, lack of enough attention being placed on technology as a strategic variable, reduced scope of their niche markets, lack of information on technological opportunities, lack of finances and difficulty in obtaining information necessary to assess one's own competitive situation which hinders them from performing strategic planning [10]. Various studies have suggested that employing new technologies to meet user demand and developing new technologies to produce and deliver goods will help firms to generate innovations that outperform competitors and increase market share as well as profitability [3,4,5].

Increasing evidence indicates that in Africa, small and medium enterprises' adoption of technology is slow and specifically in Kenya, most of them operate at low levels of technology and efficiency [6,8]. Furthermore, the effects of technological change in both the small formal and informal businesses have not been impressive [11].

Specifically, Lundavall, Joseph, Chaminade and Vang [12] called for more investigation as to the barriers to technology diffusion in the informal sector. This paper is a response to these calls and seeks to investigate the extent to which SSMVs in Kenya have adopted technology and the extent to which technological innovation for product diversification has affected performance of these enterprises. It is based on an empirical investigation of informal dairy enterprises in Kiambu County, Kenya. It also seeks to provide policy recommendations on strategies that can enhance adoption of technological innovation by SSMVs to diversify their product range which will result in improved performance of their enterprises. The paper is structured as follows; first is a review of the theoretical framework. Second is a review of literature on technological innovation in relation to product diversification and the effect on performance of business enterprises. Third is the methodology employed in the study. Finally, based on the review of literature, the paper gives recommendations for future research.

2. Literature Review

Technological innovation refers to ideas that may not be new and may have been around but never vigorously pursued in the form of machinery and equipment [13]. Technological innovation has also been argued to encompass product and process innovation [5]. This paper focuses attention on product innovation which is the introduction of goods and services that are new or significantly improved with respect to intended use or specifications [5]. Various researchers have tested the relationship between technological innovation and diversification and the resulting effect on performance of organizations. However, conflicting viewpoints have emerged. There is a strand of knowledge that argues that technological innovation does indeed positively influence the level of diversification in organizations [14,15,16,17,18]. A different perspective was advanced by Hitt *et al.* [19] who found that product innovation and diversification were inversely related. Specifically, Baysinger and Hoskisson [20] in their findings reported that there was less research and development intensity in firms that had diversified in less related industries. The preceding arguments indicate that researchers have found conflicting evidence on the relationship between technological innovation and diversification of firms underscoring the need for carrying out research based on specific industries, countries and even sectors.

2.1. Theories on Technological Innovation

The Five Generations of Innovation Models has been used to explain the evolution of technological innovation. The theory was put forward by Rothwell [21] who argued that the evolution of innovation moves along five generations: First generation innovation (technology push concept)-1950s to mid-1960s which argued that more research and development resulted in more products that were pushed on to the market, second generation innovation (market pull)-mid 1960s to early 1970s where new products were produced mainly based on existing technologies, supply and demand were in balance and large and highly efficient companies fought for market share, third generation innovation (coupling model)-early 1970s to mid-1980s which was characterized by high rates of inflation and demand saturation and companies were forced to adopt strategies of rationalization and consolidation. Successful innovation was based on a portfolio of wide ranging systematic studies covering many sectors and countries, fourth generation innovation (integrated model)-mid 1980s to early 1990s where there was an increased strategic emphasis on technological accumulation, new focus on manufacturing strategy, rapid growth in strategic alliances between companies and shortening of product life cycles [21]. Lastly was the fifth generation innovation (networking model)-from 1990s where firms strive towards better integrated product and manufacturing technologies. The ability to control product development speed is therefore seen as an important core competence to firms [21]. The central argument in this theory is that technological innovation has advanced over the years to encompass a move from developing more quantities of technological innovations for the market to a move to developing quality technological innovations that are efficient. The theory also argues on the importance of firms having the ability to be first in the market to launch a new product which would give them an edge in the market.

The Innovation Systems Approach has also been suggested by Lundvall *et al.* [12] as a useful concept in explaining the bridging role of multinational corporation (MNC) subsidiaries with regard to technological upgrading (technological innovation) in developing countries. Lundvall *et al.* argued that subsidiaries in the developing countries adopt technological innovation based on two key factors which include the degree to which the subsidiaries are connected to the parent companies and their local initiative or entrepreneurial attitude. Lundvall *et al.* drew the conclusion that the MNC subsidiaries should concentrate on knowledge transfer based on the fact that internal sources of knowledge are not enough to catch up with developed countries, due to rapid evolution of increasingly complex technologies in the world and that there should be flow of information from all possible directions. The central argument underlying this perspective is that MNC subsidiaries have a key role to play in adoption and diffusion of technological innovations by developing countries in order for them to catch up with the rest of the world and that the latter cannot do it on their own. These models however do not offer any plausible explanation on the extent of adoption and diffusion of technological innovation strategies and the resulting performance on the informal sector which is very dominant in Africa. In Kenya for instance, about 80 per cent of the milk consumed in the domestic market is produced by small-scale producers and marketed through informal channels [22].

2.2. Technological Innovation, Product Diversification and Firm Performance

Numerous strands of knowledge have been advanced in order to understand the relationship between technological innovation, product diversification and performance

of firms. One perspective holds that firms that had diversified in technologically advanced industries earned significantly higher profit rates in all time periods and enjoyed lower relative variability in profit rates compared to firms that had diversified in industries with less technological opportunities. In contrast, no such significant differences were observed for non- diversified firms indicating that non-diversified firms do equally well in their specialized field [14]. These findings were corroborated by Porter [13] who argued that companies achieve competitive advantage through acts of innovation including both new technologies and new ways of doing things. Porter proposed that innovation can be in terms of a new product design, a new production process or a new marketing approach. Porter reported that innovation is incremental, depending more on cumulation of small insights and advances rather than on a single, major technological breakthrough. Porter also reported that domestic rivalry creates pressure on companies to innovate and improve with local rivals pushing each other to lower costs, improve quality and service, and create new products and processes. Support for these findings were reinforced by Ebrahim *et al.* [23] who asserted that innovative development of existing products is required in order to stay ahead of competitors. Specifically, Terziovski [24] indicated that technological innovation can create an exclusive market for a new product through patent protection, with his study indicating that one of the performance excellence indicators in organizations is value innovation which intimately links customer value with technology innovation. The underlying argument behind these propositions seems to suggest that technological innovation in diversified firms is likely to result in superior performance.

A different perspective was advanced by Grant *et al.* [25] who seemed to allude to the fact that a firm whose product divisions are linked by common customers, distribution channels or technologies was likely to enjoy economies of scope than a diversified firm where such links were absent. However, firms can better exploit economies of scope in intangible assets such as technological innovations, brand reputation and production know-how through multinational diversification than through product diversification [26]. Support for these findings were reinforced by Hitt *et al.* [19] who argued that international diversification contributed to higher levels of innovation as it provided larger markets that helped firms reap the returns of innovation. However according to Hitt *et al.*, product diversification was negatively related to Research and Development (R & D) intensity and that these negative effects of product diversification partially reduced the positive effects of international diversification on innovation. Hitt *et al.,* attributed these negative effects of product diversification on innovation to tighter strategic and financial controls in product diversified firms, resulting in managers having fewer incentives to invest in R& D to produce innovation. Hitt *et al.,* continued to argue that product diversification would be best in internationally diversified firms where innovation was not very important taking care not to over-diversify internationally as this would result in negative returns. These arguments lend credence to the question on whether technological innovation in relation to product diversification actually results in superior business performance or the relationship is in fact the reverse.

Evidence contained in literature suggests that, in emerging markets, subsidiaries that are well capitalized and have technological capabilities are able to exploit their resources in existing markets (related diversification) and in new markets (unrelated diversification) [26]. These findings were corroborated by a report by OECD [27] which cited a positive relationship between diversification through technological and non-technological innovation and comparative advantage with other countries which also indicated that, companies in the better performing sectors of emerging economies possess a stock of technological knowledge. The report also indicated that at the macro level, differences in per capita income and growth are due to differences in total factor productivity which is mainly driven by technological development and innovation with a strong influence on research and development (R & D), while at the micro level, in all sectors of activity, from high-technology to the more traditional resource-based industries, innovative firms exhibit better performance and create more and better jobs [27]. On the other hand, Jeong [28] reported that in less industrialized countries, firms lack the resources needed to develop innovative products and tend to manufacture goods on the basis of low cost labour based on imported technologies and processes. Jeong continues to postulate that larger firms have access to human, financial and technological resources which they can use to acquire new technologies and also have access to a variety of technological sources across markets internationally compared to smaller firms. Jeong also reported that less industrialized countries develop me-too products rather than true innovations for a targeted premium market segment based on technology imported from abroad; as such these countries are heavily inclined towards product development innovations that can sustain their competitive advantage for a longer time horizon. The central argument underlying these propositions is that the level of economic development of a country has a strong influence on the level of technological innovation adopted as well as the ability to produce diverse products which influences the technological innovation strategy adopted in order to enhance and sustain its performance. Based on the arguments presented, it is hypothesized that:

Hypothesis: Level of technological innovation influences performance of dairy enterprises.

3. Methodology

The study was conducted in Kiambu County in Kenya and has 12 sub-counties namely: Gatundu South, Gatundu North, Ruiru, Thika, Githunguri, Kiambu, Limuru, Kikuyu, Lari, Juja, Kiambaa and Kabete. Milk in the informal channel is sold at farm level and through mobile milk traders and milk bars. Milk sold through milk bars includes both producers and non-producers of milk with Kiambu County being dominated by milk bars and small scale mobile traders [29]. Milk bars therefore formed the basis of the investigation. The milk bars were mainly

targeted in this study as they have a business premises and therefore have the potential to undertake value addition to milk hence adopt technological innovation. As small scale milk vendors (SSMVs) are not easily tracked and statistics in the informal dairy sector are not available, to obtain data one has to rely on the use of recall information [29]. The milk bars do not keep dairy records and therefore information obtained from the respondents was based on recall information. The study population was milk bars/milk traders which are estimated at approximately 1,138 [30].

Mugenda [31] suggested the following formula for estimating sample sizes in social surveys:

$$n = \frac{Z^2 pq}{d^2}$$

Where: n is the desired sample size if the target population > 10,000.
Z is the standard normal deviate at the required confidence level. Confidence level at
95per cent (standard value of 1.96).
p is the proportion in the target population estimated to have the characteristic (raw milk= 80%, value added products=20%)

$$q = 1 - p$$

d is the level of statistical significance or α= 0.05

$$n = \frac{1.96^2 * 0.20 * 0.80}{0.05^2} = 246$$

Since the population size was less than 10,000, the following formula was used to determine the final sample size:

$$n_f = \frac{n}{1 + n/N} = 246/(1 + 246/1138) = 202.27$$

which is approximately 203.
Where: n_f is the desired sample size if the target population < 10,000
n is the desired sample size if the target population > 10,000.
N is the population size = 1138
Number of respondents in each sub-county was therefore determined by dividing the sample size with the number of clusters which were 12 to obtain the number to be within each cluster assuming equal sizes.
203 ÷ 12 = 16.92 which is approximately 17 respondents.

As a pre-condition, to be included in the sample, the dairy enterprise must have been operating in the informal dairy sector during the study period.

3.1. Data Collection Procedure and Analysis

A semi-structured questionnaire was used as the data collection instrument which contained closed-ended as well as open-ended questions. The questionnaire was divided into three parts, namely; dairy entrepreneur's background designed to capture basic information about the target entrepreneur, level of technological innovation, intended to capture information relating to the level of technological innovation in relation to product diversification and dairy enterprise performance, intended to collect data on variables to be used as measures of performance. The questionnaire was administered to respondents through personal interviews as well as drop and pick method. Because likert scales were used, Cronbach's alpha test of reliability was used to measure the internal consistency of items in the questionnaire; when a measure is internally consistent, all of the individual questions or items making up that measure should correlate well with the others [32]. A high coefficient implies that there is high consistency among the items in measuring the concept of interest. The questionnaire was pre-tested with 33 respondents to ensure that quality data was collected. The selection of the sample dairy enterprises to be pre-tested depended on the proximity and willingness of the respondents to participate in the exercise. The questionnaire was discussed with the respondents to identify any shortcomings in the instrument. Information arising out of the pre-testing exercise was used to make the necessary adjustments before undertaking the main data collection exercise.

To measure level of technological innovation, structured questions were used to find out the machinery and equipment adopted and used while a five point likert scale ranging from "strongly disagree" to "strongly agree" was used to assess the perceptions of the dairy entrepreneurs toward level of technological innovation used in diversification. Semi-structured questions were also used. To measure dairy enterprise performance, which is the dependent variable, a five point likert scale ranging from "strongly disagree" to "strongly agree" was used to determine dairy entrepreneur's perceptions on the performance of their products over the last three years in terms of profits and sales. Analysis of data collected was done using descriptive statistics including mean and standard deviation. Hypothesis testing was done using Pearson's correlation coefficient to determine the relationship between the independent variable and the dependent variable and is used in bivariate relationships [33]. Pearson's correlation coefficient was suitable because likert scales were used in this study. According to Levin *et al.* [33] likert scales are interval scales and where interval scales are used in a study, Pearson's correlation coefficient is the most appropriate tool for data analysis. Data is presented using tables.

4. Presentation and Discussion of Findings

The objective of the study was to investigate the extent to which level of technological innovation in form of machinery and equipment influences performance of dairy enterprises. A response of 250 filled questionnaires was generated. The Cronbach alpha test performed on the questions used to measure level of technological innovation generated a score of 0.730 as shown in Table 1. According to Field *et al.* [34], a value of 0.7 is an acceptable value for Cronbach's alpha while values substantially lower indicate an unreliable scale. The score therefore indicates that there was a high level of internal consistency of the individual questions.

Table 1. Results of the Cronbach's Alpha Test

TecIn					**0.730**
	TecIn 1	4.065	0.730	.503	
	TecIn 2	3.567	0.885	.617	
	TecIn 3	2.599	0.995	.278	
	TecIn 4	3.364	1.002	.585	
	TecIn 5	3.785	0.910	.613	
	TecIn 6	1.498	0.748	.237	

TecIn: Technological Innovation.

The SSMVs had adopted the use of machinery and equipment at varying degrees. As shown on Table 2, the equipment that was owned by majority of the enterprises was a freezer with 78.4% of the respondents having one in their business, next was a lactometer at 44%, a refrigerator at 29.2% and a thermometer at 18%. This indicates that the SSMVs appreciated the need to adopt technology in an effort to preserve the highly perishable milk as well as test the quality of milk. This also signifies that the SSMVs can produce quality milk products and that there is an increased level of awareness on the need to produce high quality dairy products. This in line with the findings by Kurwijila and Bennet [3] that the need to innovate and use improved systems for milk handling and processing by SSMVs had become an important driver of change in the dairy industry in East Africa with regard to quality improvement.

Table 2. Use of Equipment and Machinery

Equipment and Machines	**Response**	**Frequency**	**Percent**
Used a thermometer	Yes	45	18
	No	205	82
Used a lactometer	Yes	110	44
	No	140	56
Used a refrigerator	Yes	73	29.2
	No	177	70.8
Used a freezer	Yes	196	78.4
	No	54	21.6
Used a boiler	Yes	2	0.8
	No	248	99.2
Used an ECL machine	Yes	1	0.4
	No	249	99.6
Used a packaging machine	Yes	1	0.4
	No	249	99.6

On the extent to which technology affects the decision to produce diversified dairy products, 29.2% of the respondents indicated that technology affects the decision to produce diversified dairy products to a large extent, 26.7% indicated that it had a moderate effect while 27.2% indicated that it had little effect. The findings indicate that to a certain extent, technology had an influence on the decision to produce value added dairy products. A few that is 4.5%, indicated that technology had no effect on the decision to produce diversified dairy products. Some, that is, 6.6% indicated that it had led to improved sales due to access to diversified markets and had opened new markets for milk products as shown on Table 3. This corroborates the view by Terziovski [24] that value innovation is a better strategy to pursue, with the focus being on value and creation of new customers and to a lesser extent on the competition, where managers should go beyond incremental improvements on products and pursue new ways of doing things. A paltry 1.6% indicated that it had led to higher production, while 0.8% indicated that it had led to quality products with a similar number indicating that online learning leads to knowledge on how to produce more dairy products.

Table 3. Effect of Technology on the Decision to Produce Diversified Dairy Products

Extent to which technology leads to diversification	**Frequency**	**Percent**
Has developed new ways of milk preservation	4	1.6
Has opened new markets for milk products	2	0.8
Has improved sales due to access to diversified markets	14	5.8
Moderately	65	26.7
It affects to a great extent	71	29.2
No effect	11	4.5
Little effect	66	27.2
Quality products	2	0.8
Higher production	4	1.6
Lack of knowledge for using technology	2	0.8
Lack of funds to acquire technology	1	0.4
Online learning helps to learn how to produce more dairy products	2	0.8

4.1. Test of Hypothesis

H_{01}: Level of technological innovation does not influence performance of dairy enterprises.

H_{a1}: Level of technological innovation influences performance of dairy enterprises.

Table 4 shows the results of correlations on level of technological innovation in relation to performance of the dairy enterprises. A linear regression F-test using ANOVA was carried out to test whether level of technological innovation influences dairy enterprise performance. The linear regression model on level of technological innovation against performance was found to be significant ($F(1,248) = 41.24$, $p < 0.001$) at 5% degree of significance. The null hypothesis was therefore rejected and the alternative hypothesis that level of technological innovation influences performance of the dairy enterprises was accepted. The resulting goodness of fit was $R^2 = 0.143$ indicating that 14.3% of the variability in Y is explained by level of technological innovation index while R= 37.8%. This indicates that there is a moderate relationship between level of technological innovation and dairy enterprise performance. There was no multicollinearity in the model because the Variance Inflation Factor (VIF) = 1.00. The regression equation was:

Y= 1.18 +0.58 level of technological innovation

where; Y= Dairy enterprise performance.

Table 4. Regression Analysis between Level of Technological Innovation and Performance of Dairy Enterprises

Table 4a: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.378[a]	.143	.139	.82113	.143	41.243	1	248	.000
a. Predictors: (Constant), X2									

Table 4b: ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	27.808	1	27.808	41.243	.000[a]
	Residual	167.215	248	.674		
	Total	195.023	249			
a. Predictors: (Constant), X2						
b. Dependent Variable: performance						

Table 4c: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.175	.288		4.074	.000		
	X2	.578	.090	.378	6.422	.000	1.000	1.000
a. Dependent Variable: performance								

4.2. Discussion of Findings on the Relationship between Level of Technological Innovation and Dairy Enterprise Performance

Level of technological innovation had a positive linear effect on dairy enterprise performance in the study group. The results were significant when technological innovation was measured in terms of machinery and equipment. The findings were corroborated by Grant *et al.* [25] who found that technology and learning in diversified firms increased effectiveness and efficiency resulting to increased profitability in organizations. This is supported by Terziovski [24] whose findings indicated that technological innovation can create an exclusive market for a new product resulting in improved performance. Further support is provided by Kurwijila and Bennet [3] who found that technological upgrading (Technological innovation) in the form of introducing new machinery and improving technological capabilities drives success in the dairy industry and that the need to innovate and use improved systems for milk handling and processing by SSMVs had become an important driver of change in the dairy industry in East Africa. Additional support was provided by Karanja [35] who indicated that adoption of technologies that add value to raw milk increased performance of dairy enterprises. Adoption of technology by SSMVs in the dairy sector will accelerate the achievement of the Science, Technology and Innovation Strategy for Africa 2024 and Agenda 2063 of the African Union which have prioritized sustained investment in new technologies and continuous innovations for alleviation of hunger, enhanced food security, sustained growth, competitiveness and economic transformation in Agriculture [36]. It is also in line with the agro processing strategy of the government of Kenya that seeks to support value addition to agricultural produce such as milk across the value chain and which requires adoption of technological innovation by dairy enterprises in order to create additional 200,000 jobs and wealth for Kenyans [37]. The value of R^2 was low (14.3%). This indicates that level of technological innovation for use in product diversification influences dairy enterprise performance for the SSMVs only to a limited extent. This is in line with Kurwijila and Bennet [3] assertions that modern technology requires substantial financial input that is not accessible to small scale dairy operators.

5. Conclusion

Technological innovation is crucial in firms seeking to produce various products with dairy enterprises being no exception. Technological innovation as identified in literature increases effectiveness and efficiency while creating an exclusive market for a new product resulting in improved performance in a business firm. The findings of this study revealed that level of technological innovation had a positive linear effect on dairy enterprise performance in the study group. The results were significant when technological innovation was measured in terms of machinery and equipment. The results also indicated that technologies that were used to add value to raw milk resulted in increased performance of dairy enterprises. The SSMVs had adopted the use of machinery and equipment at varying degrees. Majority of the SSMVs acquire only the machinery and equipment that is essential for milk preservation and ensuring that they have quality milk such as a freezer, a lactometer and a thermometer. This indicates that the SSMVs appreciated the need to adopt technology in an effort to preserve the highly perishable milk as well as test the quality of milk. However, it was noted that very few respondents had embraced the use of modern equipment such as an ECL machine that is used to dispense and pack low viscosity

liquids such as milk, yoghurt and fermented milk. The value of R^2 was low indicating that level of technological innovation for use in product diversification influences dairy enterprise performance for the SSMVs only to a limited extent. Conclusion can therefore be made that technological innovation through introducing machinery and equipment which leads to improvement of technological capabilities drives success in the dairy enterprises to a limited degree.

5.1. Recommendations

Assistance should be given to the SSMVs to procure simple equipment for the processing of products like cheese. The traders can also be assisted to acquire advanced equipment like yoghurt dispensers and milk ATMs which ensure that quality dairy products are offered to consumers. This can be done at individual level or by clustering the traders into groups, with the equipment being owned jointly by the group. Processing of the value added products can then be done at group level with government and key stakeholder support. This will contribute to the achievement of the sustainable development goal (SDG) on Industry, Innovation and Infrastructure as the dairy enterprises adopt technological innovations that enhance efficiency and quality control of the processed products. However, success in undertaking value addition to milk and hence adoption of technological innovation by dairy enterprises must be pegged on creating consumer awareness on the need to diversify their diets from just consuming milk and on key nutrients found in products like yoghurt and cheese. Promotion of informal dairy processing ability through innovative and affordable technologies should therefore be promoted by stakeholders in the dairy sector in Kenya. The government of Kenya and key actors in the dairy sector in an effort to boost the economy and create employment especially in the informal sector, have a major role to play in helping the SSMVs find markets for their value added dairy products in order to encourage more of them to add value to milk and hence adopt technological innovations.

5.2. Suggestions for Further Research

The study was conducted in Kiambu County which has the advantage of close proximity to Nairobi, the capital city of Kenya. This may make it have an advantage over other counties due to high demand for dairy products and better prices in the market. A study covering other counties known to be large producers of milk such as Nyandarua, Nakuru and Eldoret in Kenya as well as other countries in Africa, to find out the level of technological innovation by dairy enterprises in the informal sector, in order to have a holistic picture of the continent is recommended. Specific and targeted strategies can then be formulated and implemented based on specific outcomes.

Further research should be carried out to find out the effect of new technological innovations, such as ECL machines and milk ATMs that are gradually gaining acceptance by SSMVs, on performance of dairy enterprises in Kenya and Africa at large. At the time this study was carried out, the technology was new in the market and only 2 respondents representing 0.8% had adopted the new technology.

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