Influence of Access to Credit on Milk Productivity Among Small-Scale Dairy Farmers in Njoro Sub-County, Nakuru County

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Abstract

This study examined the influence of access to credit on milk productivity among small-scale dairy farmers in Njoro Sub-County, Nakuru County, Kenya. A total of 120 respondents were chosen using simple random and proportionate sampling methods. Descriptive statistics determined the frequencies and percentages of credit access, amounts borrowed in Kenyan Shillings (KES), and the purposes of borrowing. The findings revealed that 57.5% of small-scale dairy farmers had access to credit, with the majority (60.9%) borrowing through table banking via farmer groups. Most farmers (40%) borrowed between KES 10,000 and KES 20,000, mainly to purchase animal feeds, which accounted for the largest share of credit utilization (40%), followed by parasite and disease control (19%). Simple linear regression revealed a significant positive relationship between credit access and milk productivity ($p < 0.05$). The scope for credit is broad, but the capital actually obtained remains inadequate for large-scale investment. Significantly, "table banking" by farmer groups emerged as the main driver of credit accessibility. The analysis highlights feed costs, disease management, and parasite control as the most crucial financial burdens from the perspective of operational constraints. However, there is a strong latent demand for breed improvements to increase output. The study recommends that table banking should be formalized and scaled up among farmer groups for optimal productivity. Policy interventions should also prioritize subsidies for high-quality feeds, for resilient dairy breeds, and for strengthening localized veterinary extensions to reduce the costs of disease and parasite management.

Keywords: Access To Credit, Milk Productivity, Small-Scale Dairy Farmers, Table Banking, Njoro Sub-County

Introduction to the Study

Globally, agriculture serves as a major source of livelihood, employing over one billion people (Ogola et al., 2023; Workie et al., 2020). It also drives most economies by alleviating poverty and boosting food security for the ever-growing human population (Isaga, 2018). However, if we do not implement appropriate measures to boost production, food insecurity may arise with this increase. Waaswa et al. (2022) reveal that the global human population is likely to grow by thirty percent by 2050, which necessitates the implementation of agricultural financial reforms and adjustments by farmers to produce a sufficient amount to meet nutritional demands. Over the last 25 years, most developing countries have created commercialization opportunities for small-scale livestock producers, who have remained invariably less productive across Africa (Kamara et al., 2019; Mapiye et al., 2021). Consequently, developing countries must increase small-scale farmers' milk production, as a significant portion of them consistently struggle to achieve sufficient yields. Compounding the problem of the rising population globally, there is a close relationship between ensuring food security for communities and reducing poverty.

Milk, a food that is widely consumed, has remained low in most developing countries, while in developed countries such as the USA, the average annual milk production is approximately 99,082 thousand tonnes, compared to Africa's 48,074 thousand tonnes (Food and Agriculture Organization of the United Nations [FAO], 2021). Within Africa, the top-producing countries are Kenya (5,528.9 thousand tonnes), Egypt (4,645.8 thousand tonnes), and Sudan (4,623.0 thousand tonnes) (FAO, 2021). Despite Kenya ranking highly in milk production, productivity per cow is low, as indicated by 5.46 liters/cow/day raised by small-scale dairy farmers, which is below the possible over 12 liters/cow/day (Maina et al., 2020). Likewise, most developing nations experience low milk yield per cow, emphasizing the necessity of taking various measures to enhance productivity. One of the ways to do so is to access capital that can address the challenge and help farmers expand their operations to optimize productivity.

Access to financial capital is a fundamental driver for small-scale farmers seeking to expand agricultural enterprises and enhance livelihood resilience (Bahşi & Çetin, 2020). Credit enables farmers to invest in high-quality inputs, suitable and efficient equipment, and climate-adaptive technologies that help increase yields and market competitiveness (Lydiah et al., 2023; Mashizha, 2019). Although farmers have the possibility to move along a continuum of more formal and less formal sources, such as banks, SACCOs, microfinance institutions, and community-based farmer organizations, the intent to acquire is most frequently inhibited. High interest rates, strict collateral conditions, and lack of financial information asymmetry, especially in the case of female farmers, continue to threaten acquisition (Kimatu, 2017; Waweru et al., 2019). Thus, despite the availability of various credit products, the structural barriers described continue to limit the capacity of small-scale dairy farmers to use formal credit to boost their dairy output.

The dairy sector in Kenya makes a significant contribution to economic growth and nutritional stability. Livelihoods for millions of Kenyans rely on dairy farming, where small-scale farmers produce 80% of the nation's milk, which significantly boosts national Gross Domestic Product (King'ori, 2022). Small-scale dairy farming has significantly contributed to poverty reduction, rural development, and employment opportunities. Additionally, the dairy sector is vital for improving nutrition and ensuring food security, especially among low-income households (Isaga, 2018). However, the farmers regularly face several

economic challenges, which include limited access to capital, hampering their capacity to make investments in vital assets necessary for milk production, that include modernized equipment, high-quality feed, and veterinary care required for the animals. This problem is particularly acute in rural areas, where access to credit is limited due to inadequate infrastructure, limited financial knowledge, and the absence of collateral, which is a requirement for most financial institutions (Ma et al., 2019; Masara & Nyamira, 2026; Nyamira et al., 2024). Limited accessibility of credit negatively impacts small-scale farmers' production and profitability, ultimately affecting their livelihoods and food security for the nation.

Njoro, as a sub-county, remains a key hub for dairy farming, largely contributed to by the Rift Valley region's favorable climate that supports livestock farming (Wadeya et al., 2020). However, milk production remains low, as indicated by the sub-county's production of 18.5 million liters per annum, which is below its potential of 39 million liters per year (Smollo et al., 2016). Credit access has improved milk production and income in African countries like Sudan and Tunisia (Wadeya et al., 2020). However, there is a need to continuously contribute to the existing literature on how access to credit affects milk productivity among small-scale dairy farmers in Kenya because there are social, economic, and climatic change factors that continuously impact milk production dynamics. Consequently, this study sought to answer the question: How does access to credit facilities influence milk productivity among small-scale dairy farmers in Njoro Sub-County, Nakuru County, Kenya? The study's objective was to determine the influence of access to credit on milk productivity among small-scale dairy farmers in Njoro Sub-County, Nakuru County, Kenya. The hypothesis that the study sought to test was whether there is a statistically significant influence of access to credit on milk productivity among small-scale dairy farmers in Njoro Sub-County, Nakuru County, Kenya.

The Significance of the Study

The findings might potentially contribute to policy decision-making on how to help small-scale dairy farmers access affordable and sustainable financial assistance to boost milk production in Njoro Sub-County by various stakeholders, such as the government, financial institutions, Non-Governmental Organizations, and private investors. The dairy farmers within the Sub-County will also benefit from the findings, as will other small-scale dairy farmers facing similar challenges countrywide. Future research can build on the generated insights by investigating other factors that affect milk production among small-scale farmers in Njoro Sub-County and elsewhere.

Literature Review

Formal and Informal Credit Sources for Small-Scale Dairy Farmers

Access to credit plays a pivotal role in dairy farming. However, the global demand for credit among small-scale farmers was 450 US dollars in 2025, and only 3% of this demand was met (Kiarie, 2025). Following this supply challenge, small-scale dairy farmers have diversified their credit sources. Olumba et al. (2025) stated that small-scale dairy farmers access credit through formal and informal institutions. Formal credit is founded on institutional policies and the Banking Act and is legally binding between lenders and borrowers, while informal credit relies mainly on social ties and social sanctions between lenders and borrowers (Ullah et al., 2024; Wadeya, 2022). Formal credit sources include commercial banks and

microfinance institutions, while informal sources include SACCOs, farmer cooperatives, Rotating Savings and Credit Associations (ROSCAs), friends, relatives, and farmer groups (Olumba et al., 2025).

Most small-scale farmers prefer informal credit over formal credit. This preference is attributed to formal credit institutions' strict collateral requirements, lenders' poor credit histories, high interest rates, and strict loan repayment timelines that farmers struggle to honour (Ghannam, 2026; Ullah et al., 2024; Wilkes et al., 2022). The access of small-scale farmers to formal credit facilities from formal financial institutions like commercial banks is very difficult due to the high risk associated with agriculture, unpredictable weather, a lack of technical and managerial skills of many farmers, and high default rates of borrowers. This makes the banks more inclined to lend to large farmers with adequate collateral and loan repayment ability. This bias reduces smallholder farmers' access to credit and other financial resources for investing in improved technologies, quality inputs and productivity-enhancing practices, which in turn slows agricultural growth and rural economic development (Kiarie, 2025; Mehmood et al., 2018). Small-scale farmers are therefore compelled to form informal financial groups to which they commit weekly or monthly payments and leverage during financial emergencies (Kiarie, 2025). Small-scale dairy farmers also prefer acquiring loans via cooperatives since they provide 'in-kind' credit through artificial insemination, feeds, milk marketing and deworming in exchange for milk, thereby reducing farmers' transaction costs (Kiarie, 2025; Wilkes et al., 2018).

Credit Borrowing and Utilization among Small-Scale Dairy Farmers

The amount of credit acquired by small-scale dairy farmers determines the extent to which their agricultural needs are met. The amount of credit acquired can potentially elevate dairy farmers from subsistence farming to sustainable dairy enterprises. However, most small-scale dairy farmers grapple with credit rationing, which refers to the acquisition of loans below what they applied for due to credit supply exceeding demand in most financial institutions (Kofarmata & Danlami, 2019). Credit rationing thus impedes dairy farmers' productivity potential by limiting resource acquisition (Mehmood et al., 2018). Credit amounts are also determined by small-scale dairy farmers' collateral, whereby small-scale dairy farmers with high collateral fetch higher amounts and vice versa (Kaviku et al., 2024). Financial adequacy improves milk productivity since it facilitates the acquisition of feeds, artificial insemination, deworming, and access to advisory services (Okello et al., 2021; Wilkes et al., 2022).

Regarding credit utilization, small-scale dairy farmers borrow credit for varying reasons. According to Odhong' et al. (2019), a study conducted in Kenya to determine credit utilization patterns among small-scale dairy farmers revealed that small-scale farmers mainly utilized credit in purchasing animal feeds, accessing breeding and veterinary services, preparing fodder, and improving cattle housing.

Theoretical Framework

The study was informed by the theory of access. In the context of this theory, access refers to individuals' ability to benefit from objects, resources, or other individuals (Ribot & Peluso, 2003). The theory also explains who benefits from resource access, how, and under what conditions. According to the theory, access is often predetermined by specific individuals and institutions based on their institutional policies and obligations (Ribot & Peluso, 2003). This study therefore identifies the facilitators and barriers to credit access by examining small-scale dairy farmers' access to credit and its influence on milk productivity.

Understanding these dynamics informs the future design of interventions for improved credit access and a subsequent increase in milk productivity.

The theory of access also encapsulates that access is dynamic and that the factors influencing small-scale farmers' access to credit change depending on the environmental and socio-economic dynamics of Njoro Sub-County. Appreciating how access evolves helps capture the nexus between credit access and milk productivity.

According to Ribot and Peluso (2003), the merits of the theory include its comprehensive attributes that incorporate credit beneficiaries, its processes, and its dynamism over time. Furthermore, the theory also highlights the influence of history, for instance, an individual's previous credit history, and economic and social factors, which fit the socio-economic context of most farmers in Njoro Sub-County.

The theory's demerits include subjectivity, whereby understanding and determining access and how people benefit from it are prone to individual biases and judgments. Additionally, despite understanding the dynamics and shortcomings of access, the theory does not guide how to navigate the prevailing inequalities and improve people's access to resources (Ribot & Peluso, 2003).

Overall, the theory of access fits this study by providing a framework that helps determine the influence of access to credit on milk productivity among small-scale farmers in Njoro Sub-County, Nakuru County, Kenya.

Conceptual Framework

Figure 1 reveals how the independent and dependent variables are connected for this study. Access to credit was the independent variable and included sources such as commercial banks, Savings and Credit Cooperatives (SACCOs), mobile loan services, table banking through farmer groups, and the Agricultural Finance Corporation (AFC). The study examined the amount of money borrowed by small-scale dairy farmers and the specific purposes for which the funds were used to assess dairy resources. The dependent variable was milk productivity, which is expressed as the average daily milk yield in litres per dairy cow.

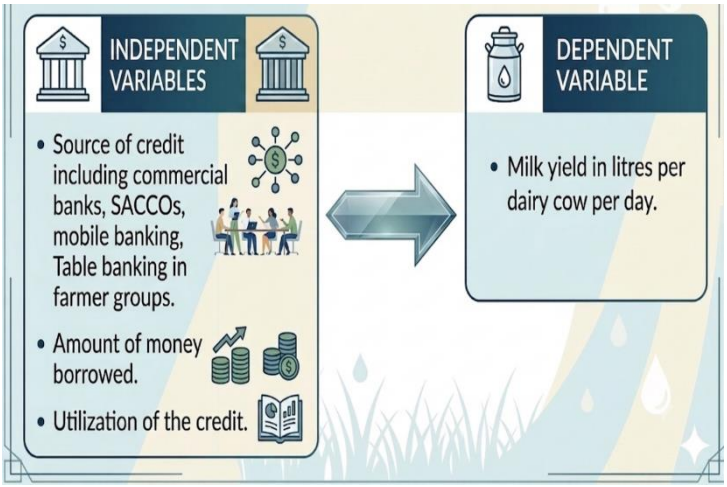

Figure 1: Conceptual Framework

Research Methodology

The study was based in NjoroSub-County, Nakuru County, Kenya, which consists of six Wards: Njoro, Kihingo, Mauche, Mau Narok, Nessuit, and Lare (Figure 2). It is located between latitudes 0º 15" 0 and 0º 42" 30 South and longitudes 35º 45" 0 and 36º 10" 0 East, covering 713.3 square kilometres in size. According to the Kenya National Bureau of Statistics (KNBS, 2019), the Sub-County has a population of 238,773 persons living within. Its headquarters is located in Njoro Town. The geographical location is approximately 1,800m above sea level and receives an average annual rainfall of 1,700 mm (KNBS, 2019). Farming activities in the area include the cultivation of barley, maize, wheat, potatoes, dairy, and horticulture as the primary agricultural activities. Among these, dairy farming stands out as the most economically significant livestock enterprise, both in terms of its value and the number of households involved. Owing to its prominence and widespread adoption among small-scale dairy farmers, Njoro Sub-County was selected as the study area for this research (Smollo et al., 2016) because of the likelihood of providing dependable data on the challenges that small-scale dairy farmers are likely to face elsewhere in the country.

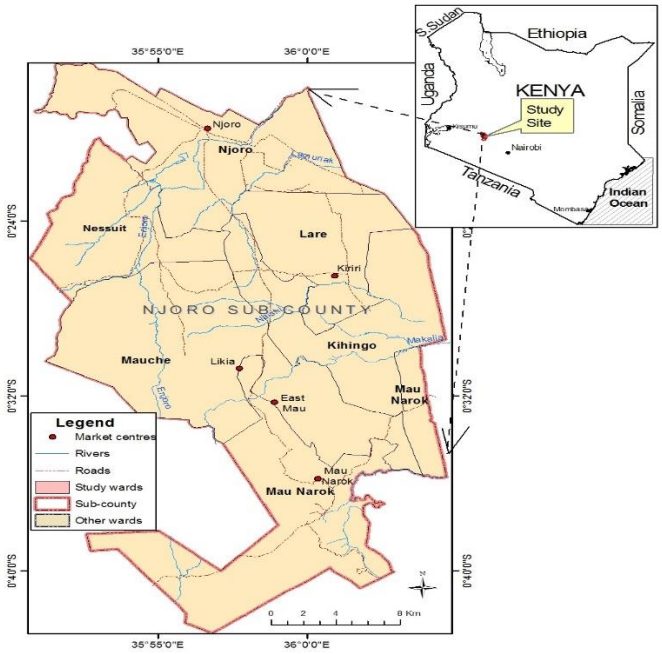

Figure 2: Map of Kenya showing the study area

Study Population

The Sub-County has an approximate total population of 17,000 small-scale dairy farmers distributed across all six Wards. Small-scale dairy farmers were defined as those owning a maximum of three dairy cows, a threshold consistent with regional patterns of zero-grazing and family-labor-dependent production systems for this study. Since the study sought to cover all small-scale dairy farmers in the Sub-County, the target population was regarded as being equivalent to the population. Table 1 presents a breakdown of farmers' distribution by ward, showing their geographical spread in the study area.

Table 1: Distribution of Small-Scale Dairy Farmers by Wards (Farmers, N=17,000)

Wards	Number of Small- Scale Dairy Farmers	Proportion of Dairy Farmers Population	Farmers Sample Sizes
Mau Narok	3,258	19.16	23
Mauche	3,131	18.42	22
Kihingo	2,447	14.40	17
Nessuit	1,240	7.29	9
Lare	1,643	9.66	12
Njoro	5,281	31.10	37
Total	17,000	100.0	120

Sampling Procedure and Sample Size

Sample size for the small-scale dairy farmers was determined using Nassiuma's coefficient of variation formula (Nassiuma, 2000).

$$n = \frac{NC2}{C2 + (N - 1)2}$$

Where: **n**: required sample size, **N**: number of accessible population (Dairy farmers), **C**: coefficient of variation, and **e**: standard error value.

The ideal range for error is between 0.02 and 0.05, while the appropriate coefficient of variation for calculating a sample size usually falls between 0.21 and 0.30 (Nassiuma, 2000). A coefficient of variation of 0.21 and a standard error of 0.02 were used to ensure reliable and precise sample size estimation. To capture a representative sample of small-scale dairy producers, these values were chosen to establish a balance between accuracy and usefulness. Based on this formula, the sample was calculated as follows:

$$n = \frac{NC2}{C2 + (N - 1)2}$$

$$n = \frac{17{,}000x\ (0.21)2}{(0.21)2 + (17{,}000 - 1)0.022}$$

$n = 109$

Therefore, the study sample was 109 small-scale dairy cow farmers. Kathuri and Pals (1993) argue that sample sizes above 100 are acceptable for survey studies. Therefore, the sample size was sufficient. Mubangizi et al. (2019) Recommend increasing sample sizes to cater to attrition and non-responses. A final sample of 120 small-scale farmers was obtained by adding 10% to the initial number of 109 to adjust for sample size. As indicated in Table 1, the sample was then distributed among the wards proportionately to the number of dairy producers in each.

Data Collection and Analysis

Structured questionnaires were used to ensure consistency in responses across all participants (Kyambo, 2014). The questionnaire's validity was assessed through a literature review and experts drawn from the

Departments of Agricultural Education & Extension and Environmental Science at Egerton University. They evaluated research objectives and instruments, and their input was used to improve the questionnaire. The questionnaire's layout, readability, language clarity, formatting uniformity, and general ease of comprehension were all evaluated as part of face validity (Taherdoost, 2016).

Pilot research was conducted using 30 participants randomly chosen from small-scale dairy farmers from Molo Sub-County in Elburgon Ward, who had socio-economic characteristics close to those of the study population, in order to evaluate reliability (Nyaguthii et al., 2019). According to Kathuri and Pals (1993), a pilot sample size of 25–50 is appropriate for surveys. The assessment was done using the Cronbach's Alpha scale, which yielded a coefficient of 0.864 (Figure 3), above the acceptable threshold of 0.70 (Fraenkel et al., 2012), and the results were as presented below.

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.864	39

Figure 3: Pilot Study Reliability Results

Data Analysis Involved

Cleaned and organized data were analyzed using IBM Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics were used to determine the frequency and proportion of small-scale dairy farmers who accessed credit from various sources, the total amounts borrowed, and the purposes for which the loans were used. To assess the effect of credit access on milk production, simple linear regression analysis was applied.

To facilitate statistical testing, a composite credit access index was constructed by aggregating three indicators: credit sources, amount borrowed, and how the credit was used. The amount borrowed was measured on a weighted seven-point scale from 0 (none) to 6 (above KES 50,000), while credit access and use were treated as binary variables (1 for "Yes," 0 for "No"). This method makes sure that the independent variable includes the availability, scale, and specific use of financial resources. A systematic weighting process was used to figure out the composite scores. To determine the average credit sources and use, we multiplied the number of "Yes" answers by a unit value and then averaged them across their categories. The assigned scale values and the number of respondents were used to weight the borrowing ranges. Then, the total was divided by the six range categories to make them all equal. For the final analysis, these individual scores were averaged to yield a single mean score for each respondent.

The study created a complete measure of financial inclusion by combining these dimensions into one index. The composite score was then used to see if it was related to milk productivity in order to test the research hypothesis.

Findings and Discussion

This section highlights the findings and discussion for a study that sought to determine the influence of access to credit on milk productivity among small-scale dairy farmers in Njoro Sub-County. The section highlights small-scale dairy farmers' access to credit, their sources, the amounts borrowed in Kenyan shillings (KES), and utilization purposes. This section also provides the regression, model summary, and Analysis of Variance (ANOVA) outputs between credit access and milk productivity in Njoro Sub-County, Nakuru County, Kenya.

Small-Scale Dairy Farmers' Access to Credit

From the data presented in Table 2, the small-scale dairy farmers who received credit from various sources were 69, representing 57.5% of the farmers, while 51 farmers, equivalent to 42.5%, did not receive credit from any source.

Table 2: Access to Credit by Small-Scale Dairy Farmers (n=120)

Farmers Receiving Credit	Frequency	Percent
Did not access credit	51	42.5
Accessed credit	69	57.5
Total	120	100.0

Small-Scale Dairy Farmers' Sources of Credit in Njoro Sub-County

Descriptive statistics generated the frequencies and percentages for the various sources from which the respondents acquired their credit. According to the results in Table 2, out of 120 respondents, 57.5% accessed credit. The financial institutions from which the small-scale dairy farmers borrowed money were commercial banks, SACCOs, mobile banking, table banking via farmer groups, and the Agricultural Finance Corporation (AFC), and their distribution is highlighted in Table 3.

Table 3: Sources of Credit for Small-Scale Dairy Farmers

Credit Sources	Frequency	Percent
Commercial banks	6	8.7
Savings and Credit Co-operatives Organisations	8	11.6
Mobile banking	12	17.4
Farmer groups table banking	42	60.9
The Agricultural Finance Corporation (AFC)	1	1.4
Total	69	100.0

The credit source analysis (Table 3) indicates that the finance source is largely dependent on informal and semi-formal systems. The most predominant source was farmer group table banking, which was used by most of the respondents (60.9%), and the least used source was AFC, which was used by only 1.4%. The

reason behind the high adoption of table banking is its accessibility and good terms, i.e., a competitive interest rate of 10 percent and a flexible time of 3 months to settle them. These informal systems successfully circumvent the so-called collateral gap that can often leave small-scale farmers, especially women, out of formal credit markets. This is consistent with the results reported by Gichuki and Mulu-Mutuku (2018), who concluded that farmer groups are critical sources of information on alternative financing. On the other hand, the low interactions with formal institutions such as commercial banks (8.7%) and AFC highlight the high barriers to entry, such as high interest rates and collateral requirements. Although mobile banking (17.4%) is growing owing to convenience and bank-telecom associations such as KCB M-PESA (Parlasca et al., 2022), it remains a long way behind communal lending. These findings support the credit access hierarchy found by Ahmed and Nesfin (2017), in which community-based organizations tend to overshadow the commercial banks in fulfilling the urgent liquidity requirements of rural farmers.

Due to registration requirements, the majority of farmers were unable to borrow from SACCOs because they were non-members. This contrasts with the findings of Ahmed and Mesfin (2017), who reported that SACCO membership improved small-scale farmers' access to credit in Eastern Ethiopia. Similarly, Wilkes et al. (2020) stated that SACCOs were the most preferred source of loans for most farm households borrowing through formal financial institutions. SACCOs often use their funds and sometimes partner with commercial banks, building strong relationships that facilitate payments for milk, farm inputs, and other related services. Compared to commercial banks, SACCOs provide a more accessible lending option, offering flexible repayment terms and lower interest rates. The Agricultural Finance Corporation (AFC) was inconvenient for small-scale dairy farmers because it required collateral and prohibited group borrowing. High default rates recently led the AFC to limit group-based lending, which further reduced farmers' interest in borrowing from the company (Maleko et al., 2018). As a result, many farmers were discouraged from borrowing loans from the AFC or SACCOs since they were not members. This contrasts with the findings of Ahmed and Mesfin (2017), who reported that SACCO membership improved small-scale farmers' access to credit in Eastern Ethiopia. Similarly, Wilkes et al. (2020) stated that SACCOs were the most preferred source of loans for most farm households borrowing through formal financial institutions. SACCOs often use their funds and sometimes partner with commercial banks, building strong relationships that facilitate payments for milk, farm inputs, and other related services. Compared to commercial banks, SACCOs provide a more accessible lending option, offering flexible repayment terms and lower interest rates. The AFC was inconvenient for small-scale dairy farmers because it required collateral and prohibited group borrowing. High default rates recently led the AFC to limit group-based lending, which further reduced farmers' interest in borrowing from the company (Maleko et al., 2018). Consequently, the AFC discouraged many farmers from borrowing loans.

The Amount of Money Borrowed by Small-Scale Dairy Farmers in Njoro Sub-County

As part of the study (Table 4), participants were asked to specify the range of amounts they had borrowed from different credit sources.

Table 4: Amount of Money Borrowed by Small-Scale Dairy Farmers in Njoro Sub-County

Amount of Money Borrowed in Kenyan Shillings (KES)	Frequency	Percent
None	51	42.5
1 to 10,000	28	23.3
10,001–20,000	20	16.7
20,001–30,000	3	2.5
30,001–40,000	1	0.8
40,001–50,000	4	3.3
Above 50,000	13	10.8
Total	120	100.0

These results show that, although over fifty percent of the respondents (57.5%) had accessed credit, most of the loans were in small denominations. In particular, the most frequent borrowing range was that of KES 10,000 or less (23.3% of the total sample). Combined with the 16.7% of farmers who borrowed between KES 10,001 and 20,000, it can be seen that credit is taken up on a dramatically skewed basis of low-value and short-term liquidity, rather than large-scale capital investment. This trend of "micro-borrowing" suggests a cautious approach to debt among small-scale farmers. According to Wilkes et al. (2018), this behavior is sometimes motivated by the absence of traditional collateral and a deep-seated risk aversion based on the fear of auctioning property in case of default. Moreover, poor milk production may cause farmers to be reluctant to take long repayment terms, and as a result, they will only borrow to meet their immediate operational expenses, but not long-term enhancements. A unique 10.8% of farmers borrowed amounts exceeding KES 50,000. Although these respondents are a smaller portion, this level of credit is noteworthy because it creates the financial ability to move out of subsistence to commercial practices, e.g., buying high-quality feeds, improving the breed of cattle, or investing in new veterinary care.

The high amounts of money were likely borrowed by progressive farmers or a group of risk-taking farmers since they tend to borrow large sums to try out new technologies or anything that can improve their animals' productivity. The aspect of farmers' socio-economic statuses influencing borrowing patterns is evident in India, as people from certain castes are often considered more trustworthy for loans than others (Kumar et al., 2017). Similarly, borrowers intentionally eliminated some farm households, particularly low-income people, when lending to a group of farmers. These lending practices tend to favor specific members of the group in order to avoid including individuals who are likely to default (Jumpah et al., 2019). Such aspects therefore explain the differences in the observed borrowing patterns, with very few farmers being eligible for high amounts of money.

Utilization of Credit by Small-Scale Dairy Farmers in Njoro Sub-County

The utilization of credit among small-scale farmers is primarily driven by immediate operational needs rather than long-term infrastructural investment (Table 5). The most common use of credit was to purchase animal feeds, which 40 percent of respondents mentioned. This is then succeeded by parasite and disease control (19.2%). Conversely, long-term investments like water provision and cowshed building were the least frequently given as reasons to borrow, possibly because of the capital requirement and payback periods of these investments. This emphasis on feed purchase is congruent with the high financial cost of dairy

production; animal nutrition is central to milk production and may represent up to 70 percent of the total production expenses. These results are consistent with Sharma et al. (2021), who have noted that whether it is expensive or not, farmers are usually forced to borrow to keep animals healthy and maximize milk production. Credit access is therefore a crucial linkage, as farmers can afford high-quality supplements and dairy meals, which they could not otherwise afford using cash flow (Ordofa et al., 2021).

Table 5: Utilization of Credit by Small-Scale Dairy Farmers in Njoro Sub-County

Utilization of Credit	Yes		No	
	Frequency	%	Frequency	%
Purchasing animal feeds	48	40.0	72	60.0
Parasite and disease control	23	19.2	97	80.8
Improving the cow breed	15	12.5	105	87.5
Artificial Insemination (AI)	14	11.7	106	88.3
Cowshed construction	9	7.5	111	92.5
Water provision	4	3.3	116	96.7

This paper draws a line between Artificial Insemination (AI) and enhancing cow breeds in order to draw the line between the particular process from the overall goal. Manual breeding a cow using high-quality semen from superior bulls is known as AI and provides farmers with access to elite genetics at a fraction of the cost of having a bull. Conversely, the process of breed improvement is the general objective of improving the overall quality of the herd, e.g., purchasing high-yielding pedigree heifers. When the two are followed separately, we can see that the same proportion of farmers are borrowing money to engage in the technical service of AI (11.7%) as in general breed upgrades (12.5%), which proves that farmers are ready to spend money on obtaining better genetics.

Farmers also used credit for parasite and disease control (19.2%), cow breed improvement (12.5%), and artificial insemination services (11.7%). These findings are consistent with earlier studies indicating that access to credit enables farmers to invest in animal health interventions (vaccines), improve breeds, use AI services, and implement risk management measures such as parasite and disease prevention (Sharma et al., 2021). In contrast, a relatively smaller proportion of credit was allocated to cowshed construction (7.5%) and water provision (3.3%). This limited investment in animal housing and welfare may reflect financial constraints as well as farmers' perception that animal comfort has a minor influence on milk productivity. Villettaz et al. (2019) made similar observations, noting that in many African settings, animal housing is mainly built to keep animals safe from rain and sun, with little thought given to drainage, hygiene, or overall comfort. Such practices persist, particularly when milk productivity remains low, which reduces incentives for farmers to invest in improved housing infrastructure.

Water provision was not a significant expense that would attract loans since only 3.3 % of the small-scale dairy farmers utilized their loans for this purpose. This was because most small-scale dairy farmers acquired water for their dairy cows from the well or boreholes at home or nearby rivers, as is a common practice in most African peri-urban settings. In addition to this, Moges et al. (2019), in Ethiopia, investigated the difficulties of dairy production in urban and peri-urban settings where water supplies were springs and rivers, and few people bought water from vendors during the dry season. AI attracted loans for 11.7% of

the small-scale dairy farmers for breed improvement. Most farmers have shifted to AI and are avoiding bull mating to limit the spread of diseases, low conception rates, and instances where one bull services several cows in a specific area (Yousuf, 2022).

Regression Analysis between Access to Credit and Milk Productivity

The association between credit access and milk productivity was examined by applying a composite credit index that incorporates credit sources, quantities borrowed, and utilization patterns. Table 6 presents the results of the statistical significance test for credit access and its effect on milk productivity and reveals that there is a statistically significant positive effect of credit access on milk productivity ($p < 0.05$).

Table 6: Regression Analysis between Access to Credit and Milk Productivity among Small-Scale Dairy Farmers in Njoro Sub-County

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	12.163	.535		22.720	.000
Access to credit	0.001	0.000	.359	4.173	.000
$p < 0.05$					

Table 7: A Model Summary Analysis Summary on the Influence of Access to Credit on Milk Productivity among Small-Scale Dairy Farmers in Njoro Sub-County

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	.359[a]	.129	.121	5.401	.129	17.410	1	118	.000

a. Predictors: (Constant), Access to credit

b.

Table 7 shows a simple linear regression output between access to credit and milk productivity. The R value obtained (0.359) shows that there is a low but positive relationship between access to credit and milk productivity among the small-scale dairy farmers in Njoro Sub-County. The access to credit has an impact on 12.9% of milk productivity (R square = 0.129); the remaining 87.1% of milk productivity is attributed to other factors. The value of $p < 0.05$; therefore, the relationship between credit access and milk productivity is statistically significant.

Table 8: ANOVA Results on the Influence of Access to Credit on Milk Productivity among Small-Scale Dairy Farmers in Njoro Sub-County, Nakuru County

Table 8: ANOVA Results

ANOVA						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	507.856	1	507.856	17.410	.000[b]
	Residual	3442.011	118	29.170		
	Total	3949.867	119			
a. Dependent Variable: Milk productivity per day						
c. Predictors: (Constant), Access to credit						

The ANOVA results in Table 8 indicate that the relationship between credit access and milk productivity in Njoro Sub-County is statistically significant since the *p-value* is less than 0.05. Consequently, the null hypothesis (H_{01}), which suggested no significant influence, is rejected. This significant finding indicates that as farmers gain better access to financial resources, their capacity to optimize dairy production increases. The results align with studies by Chenaa et al. (2018) and Okello et al. (2021), who argued that credit acts as a catalyst for agricultural intensification. In Njoro Sub-County, credit specifically empowers small-scale dairy farmers to bridge the "liquidity gap," allowing for the timely purchase of high-quality feeds and superior genetic stock. Furthermore, the data suggest that credit does not merely provide "more" money, but rather enables the adoption of specific high-impact technologies. For instance, farmers with higher credit scores were more likely to utilize Artificial Insemination (AI) and professional veterinary services, which directly correlate with improved herd performance and higher milk yields (Isaga, 2018). Thus, financial inclusion remains a critical prerequisite for transitioning small-scale dairy systems from subsistence levels to profitable, market-oriented enterprises.

Conclusion

The study concludes that while credit access in Njoro Sub-County may be easy, it is mostly for short-term survival and not for long-term growth. Farmers' significant dependence on table banking for microloans indicates their preference for low-risk and manageable loans. While these loans are designed to provide quick cash, the quantities are usually not adequate to finance the size of capital investments necessary to move from subsistence to commercial enterprises in the dairy industry, which requires larger and more sustainable funding options to support growth and development.

Additionally, the reliance on credit for farm activities like animal feed and disease treatment indicates the need for better fodder availability and livestock health management. In this context, credit is an important safety net that helps maintain milk production on a day-to-day basis. The inadequate investment in vital infrastructure, such as better water sources and cow sheds, however, demonstrates that continued financial caution and problems are still causing a lack of animal welfare and farm productivity.

To go beyond the protectionist nature of borrowing, it is necessary to create financial products that combine the convenience of informal lending groups with the larger capital base of formal financial institutions. Empowering small-scale farmers to engage in more investment in high-value technologies and

infrastructure that enable productivity gains could be achieved by enhancing the connection between community-led lending programs and agricultural development programs.

Recommendations

The study recommends promoting table banking through farmer groups, as this is the most utilised and accessible form of credit; development agencies and county governments should strengthen these groups by providing financial literacy training and facilitating legal registration. Supporting group-based lending models can improve credit uptake, especially among women and resource-constrained farmers. Additionally, improving farmers' access to quality and affordable feeds as well as training on supplementary feeding can boost milk productivity. Training on dairy cow parasites and disease management can enhance animal health and improve milk productivity and overall well-being.

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Appendices

Disclosure of Conflict of Interest

There is no conflict of interest declared by the authors regarding the findings of this research.

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Ethical Approval

The protocol was approved by the National Commission of Science, Technology and Innovation, reference number (NACOSTI/P/21/14424). The protocol was also approved by the Egerton University Research Ethics Committee (EUREC) guidelines. Further, clearance was received from local administrators in the study area.

Consent to Participate/Informed Consent

Informed consent was obtained from all respondents before they participated in the study. Participation was voluntary, and all data collected were kept confidential and used exclusively for research purposes.

Consent to Publish

Authors confirm that they have read and approved the final version of the manuscript and consent to its publication.

Data Availability Statement

Data on the findings of this study can be obtained on request from the corresponding author.

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Authors' Contributions

Prisca Akinyi Ogola (A) – Conceptualization, Investigation, Data curation, Writing – original draft, Methodology, Validation, Visualization, Project administration, Writing – review & editing, Resources

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