Project Design and Sustainability of Dairy Goat Projects for Livelihood Improvement in Kenya

Reuben Wambua Kikwatha, Dorothy Ndunge Kyalo, Angeline Sabina Mulwa, and Raphael Ondeko Nyonje

Abstract — The debate around sustainability of development projects is intriguing, emerging as a contemporary development paradigm. Nevertheless, empirical literature insinuates that sustainability of development projects is seldom realized. Perhaps because the sustainability drivers are not well articulated at the project design stage making sustainability uncertain. This paper calls for a decisive paradigm shift in dairy goat project designs for sustainability. The paper is based on a study conducted in Tharaka Nithi County, Kenya, to investigate the influence of project design factors on the sustainability of dairy goat projects. Design factors considered for this study are the Project Beneficiary Selection Process, Community Capacity, Institutional Linkages and Project Infrastructure. The study was anchored on the structural-functional theory, diffusion of innovations theory and collective action theory. The sample size was 196 respondents sampled using sequential and stratified random sampling. Purposive sampling was used to sample 13 key informants. Further, six focus group discussions each with 8 participants were conducted. Questionnaires, interview guide and FGD guide were used respectively to collect data. Descriptive statistics were computed for all variables and frequencies, percentages, arithmetic mean and standard deviation. Pearson’s Product Moment Correlation (r), simple regression, multiple regression and stepwise regression (R squared), F-tests were used to test hypotheses. Hypothesis (H0) that the combined project design factors have no significant influence on the sustainability of dairy goat projects was tested. Results: r = 0.389 implying a positive slope between project design and sustainability. R-Squared = 0.152, that 15.2% of the variation in sustainability was explained by variation in project infrastructure, community capacity, project beneficiary selection process, and institutional linkages. ANOVA indicated the model was statistically significant at (F (1,183) = 8.176) and the p-value = 0.000<0.05, shows that there exists a positive correlation and the slope of the population regression line is not zero. Therefore, H0 was rejected. The study concludes that combined project design factors are critical and important in enhancing project sustainability and recommends that dairy goat project design should incorporate authentic project beneficiary selection Process, their capacities developed and the project linked to supportive institutions as well as promoting the requisite infrastructure. The study found a gap in literature on the social economic contribution of dairy goats to the community livelihoods, as a measure of sustainability and recommends further study on this area.

Index Terms — Dairy Goat Initiatives, Livelihoods Project Design, Sustainability.

I. INTRODUCTION

Livestock production remains a critical sector in the agricultural economy of developing countries. Among the livestock production systems, dairy goat production has increasingly gained popularity as a significant contributor to this important sector. This is especially so in smallholder farming systems and in high potential areas due to increasing human population density and subsequent reduction in land size as a result of fragmentation [1].

Innovation and adoption of new technologies such as the promotion of dairy goat production, improvement of indigenous goats for better production is poised to make an even bigger contribution. This is in particular to the newly adopted agenda for sustainable development focused to eliminate poverty, inequality, just as well as tackling climate change by the year 2030. Dairy goats contribute largely to the livelihoods of livestock keeping households of low and medium input farmers [2]. Nevertheless, dairy goat productivity in sub-Saharan Africa is on the decline and that this becomes a major bottleneck to the continent’s livestock development [3], [4].

Globally, the higher producers of dairy goat milk by 2010 were India, Bangladesh, Sudan, Pakistan, France, and Spain, with 62.2% of the goat milk produced in the world. The main goat-producing countries in West Africa Region are Nigeria, Niger, Mali, Mauritania and Senegal [5], while locally key dairy goat producers are Sudan, Somalia, Kenya, Ethiopia and Tanzania [6]. Total global goat milk production was estimated at 18.7 million tonnes in 2017 It increased 62% from 1993 to 2013, from just 2007 to 2017, production increased by 16% [7].

Kenya did not lag behind in the development of dairy goat sub-sector which picked up in the 1980s and 90s and has since taken the lead. Dairy goats were first introduced in Kenya in 1950s by British settler farmers in the highlands of Kenya [8]. Goat milk consumption accounts for a small but growing percentage of the Kenyan dairy market. Over 70% of the milk that is sold in Kenya originates from dairy cows with only 0.02% from dairy goats [9]. Unlike in dairy cow milk where markets are organized, markets for dairy goat milk are dispersed with remote markets lacking price information.

Evidently, dairy goat farming has several benefits such as enhanced nutrition from the consumption of milk [10], the creation of jobs through provision of animal health, breeding, and water management services and improved household

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income from the sale of weaners, culls and breeding stock [11]. Further, social economic usefulness of dairy goats cannot be underestimated [12]. Therefore, profound concern on the success and sustainability of dairy goat project is critical. Projects lead to the production of goods and services to address specific community needs that require to be in consonant with the social and environmental context [13].

The global dairy goat population has been rising dramatically since the 1960s, due to changing incomes and food preferences in human populations (Miller & Christopher 2019). [14]. In this sense, therefore, it is essential for dairy goat project designs to adhere to sustainability criteria so that they pass the sustainability test. This paper looks at the relationship between project design factors (project beneficiary selection process, community capacity, institutional linkages and project infrastructure).

A. Statement of the Problem

Livestock production systems in Kenya play an important role in supporting livelihoods for many people. However, the declining dairy goat’s productivity in Kenya remains a major concern. There exists gaps poor documentation, poor decision making, inadequate knowledge and skills as major gaps in dairy goat projects [4]. Others gaps includes access to markets, services, financial performance, enterprise viability, nutrition and breeding practices [15]. A good understanding of the requirements for the dairy goats is a prerequisite for designing successful dairy goat breeding projects [16]. These studies have not directly investigated the relationship between project design factors and the sustainability of dairy goat projects. Reviewed literature shows that there is inadequate information on relationship of project design factors with the sustainability of dairy goat projects. It is against this backdrop that this paper addresses this gap.

B. Objectives of the Study

This study sought to investigate the extent to which the combined project design factors (project beneficiary selection process, community capacity, institutional linkages and project infrastructure) influence the sustainability of dairy goat project in Tharaka Nithi County.

II. LITERATURE REVIEW

A. Sustainability of Dairy Goat Projects

Evidence on the sustainability of development projects shows that sustainability is seldom achieved. A review of the literature that has sprung up around the concept of sustainability of projects indicates, however, a lack of consistency in its interpretation. Divergent views on what constitutes and or indicates achievement of sustainability have been advanced. Sustainability is a process of change, by projects that ensure the utilization of resources, investment options, the focus of technological advancement and institutional capacity are all aligned to trigger the capability of the projects achieving both current and future needs [17]. Based on the literature, even though the general and common definition of sustainability exist, to a large extent, sustainability is context specific. Projects lead to the production of goods and services to address specific community needs that require to be consonant with the social and environmental context [13]. In this sense, therefore, dairy goat projects need to adhere to these sustainability criteria to pass the test of sustainable projects. Key indicators of dairy goat project sustainability are the multiplier effect component, community ownership, project resilience, social- economic and environmental viability and breeding plans and strategies.

B. Project Design Factors and Sustainability of Dairy Goat Projects Design

Project design is the starting point that involves systematic and theoretical conceptions, tried primary assumptions, and credible information that which enable the delivery of a project within a specified timeline. Due to the complexity and uniqueness of projects it is important to carefully select the most appropriate design method, tools, and techniques to apply in a specific project [18] and that projects need to remain sensitive to key variable that might affect smooth implementation [19].

C. Project beneficiary selection process Sustainability of Dairy Goat Projects

Projects are designed, and implemented to achieve a predefined goal. Nevertheless, community diversity in social, political and economic alignment impede the smooth achievement of the anticipated outcomes of such projects. Targeting dynamics in project beneficiary selection revolving around beneficiary needs, gender inclusion and beneficiary composition, special needs consideration, capacity to sustain coupled with the attributes of motivation, self-drive and focus to sustain are critical in this process. This is as a result of the divergent needs orientation that emerge as a result of involvement of different project beneficiaries with different priority needs.

One of the essential considerations in project beneficiary selection is the beneficiary needs without which the beneficiary selection process may be meaningless. Importantly, participatory beneficiary needs analysis is requiring to be driven by the people who experience the need and not by outsiders. Projects are motivated by a specific need that must be clearly outlined as a prerequisite to proper project design [20]. This therefore calls for a rigorous beneficiary assessment as a way of selecting the right group to be involved in the development project. In addition, different groups of people may be concerned about different needs or that may have different perceptions about the same needs and in this case, grouping becomes necessary [21].

Beneficiary selection can be authentic if conducted within the democratic framework particularly through a participatory process. Therefore, appropriate selection is beneficial in the sense that it lowers the cost of administration and attracts the right project beneficiaries [22]. In this case therefore, the use of appropriate beneficiary engagement tools and technics is key to project success. This demands for the project design experts, to modify the design tools to make them usable for in each step of the process. For instance, that seeking the opinion and views of the project beneficiaries can greatly make easy the planning and design processes and bring understanding among beneficiaries [23].

Community participation in need analysis is important as the needs are collectively conceived and prioritized paving
the way for the process of addressing them [24]. A study done by Düvel (2002) on comparative evaluation of some participatory needs assessment methods in extension revealed that needs are time-specific, which emphasizes the importance of remaining sensitive to changing needs as situations change [25]. People are not going to rally together around needs that have been identified by some expert and that do not match or support their own needs [21]. Therefore, needs identification is a prerequisite before any action; it should be the first undertaking before a project commences.

Participation in project design process may not be a panacea if inclusiveness is not observed where men, women, youth are involved. This is of ultimate importance in enhancing democracy in development projects. Men and women are challenged differently as relates to livestock production system, therefore, when designing resource use plans, it is critical to consider the gender perspective in order to achieve optimal results. In this sense, gender issues in dairy goat production is crucial and need to be addressed. Context-specific, up-to-date knowledge of gender roles and power relations in daily life is critical to the design of livestock-focused development projects [26].

D. Project Beneficiary Capacity Sustainability of Dairy Goat Projects

Project design therefore require to embed sustainability drivers for such project to remain relevant to the people and create the expected impacts. Some of the indicators suggested in dairy goat project sustainability includes the multiplier effect component, community ownership, project resilience, social-economic and environmental viability and breeding plans and strategies.

Sustainability of dairy goat projects can seldom be achieved without the primary beneficiaries being actively involved in decision making and more so their capacity developed to enable progressive execution of the decisions. Tested precursor to such situation involves establishment of sustainability structures such as community self-help groups, associations and strong social networks. It is through these structures that the capacity is built as a set of assets and attributes that propel communities to self-emancipation. In this case therefore, sustainability is achieved when the level of human capital, capacity to harness resources for the project and ability to maintain strong social ties and networks is promoted. Capacity building helps to develop the capabilities that are useful in propelling the economic growth and development. Noting that dairy goat production system and the respective projects in Kenya is purely human labor supported, it is very crucial to develop the necessary human capital for its sustainability [27].

A study by Lubungu, Chapoto and Tembo revealed that level of education is very critical in enabling families to use market information and take advantage of the market opportunities.[28]. Households with higher education had the likelihood of increasing the dairy product consumption. Access of amenities, services and key facilities, infrastructure and advanced technology has been a major problem to many rural communities. Generally, dairy goat sector in developing nations needs a strategic and well-organized system of production and management where husbandry, health, and breeding technologies are properly assembled. This arrangement provides for maximum utilization of resources, increased productivity and capacity to mitigate risks.

E. Project Institutional Linkages Sustainability of Dairy Goat Projects

Adequate linkage and involvement of relevant key actors and institutions in a project at a different level are very significant. This is considered directly proportional to the success of development projects [29]. A study in Narok Kenya on health service provision and results indicated a serious challenge in linkage to health services [30]. Similarly, efforts by farmers to promote livestock production is affected by inaccessibility to crucial services such as veterinary services and breeding services [11]. Further, linkages to markets is equally important for sustainability of dairy goat’s projects. For instance, dairy goat milk consumption accounts for a small but growing percentage of the Kenyan dairy market. Advancement in livestock production and linkage to markets by smallholder farmers in Africa provides a good opportunity for poverty eradication for many families.

There is a clear interplay between market institutions and the social networks and institutions. Social networks are connections that link people and have the influence of the dissemination of information and adoption of technology [31]. Therefore, social networks are organized type of social capital formed through linkages among individuals and organizations. Social networks are key to information and innovation transfer as well as enabling communication and coordination within the network [32]. Functional social networks provide the necessary conduits for social learning to livestock producers, a situation that fastens the adoption of technology [33].

F. Project Infrastructure and Sustainability of Dairy Goat Projects

Empirical literature points out that rural infrastructure, where most of the development agricultural projects are implemented plays key role in improving agricultural productivity in developing economies. Infrastructure is simply the structures, systems, and facilities necessary for any economy to function. Infrastructure is a pre-condition for development and that better Infrastructure lead to improvement in livestock sector development. Infrastructure is “the physical constituents of connected systems that offer goods and services necessary to maintain a societal livelihood [34]. Evidence on the significance of infrastructure is found in early studies and recent ones. They studied the relationship between project infrastructure and development and found a positive and significant relationship [35], [36]. Therefore, infrastructural development is seen as a pre-requisite to sustainable development is all sectors including production, mining, agricultural, livestock and other sectors that support development. Infrastructural development settings have a great importance in developing countries because they can enhance the living standard of the local population and help them to have access to scarce resources like water or education.

A study by IFAD found that project infrastructure is important in the linkage between isolated rural communities and the external world thus making transaction cost lower in the agricultural economies [37]. Another study confirms that productivity increase in agriculture, which is an effective

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driver of economic growth and poverty reduction, depends on good rural infrastructure, well-functioning domestic markets, appropriate institutions, and access to appropriate technology [38]. Consequently, infrastructural development for dairy goat production is of paramount importance to promote sustainability of dairy goat projects. In fact, inadequate infrastructure has been cited as the contributing factor in the inefficiency of livestock development projects [39].

The dairy goat production system is an even more complex system as compared to other livestock thus require appropriate infrastructure. This implies that dairy goat management requires specialized tools and infrastructure. A good understanding of the requirements for the dairy goats is a pre-requisite for designing successful breeding projects. This consideration is important and assembling all the necessary equipment's, tools, structures like proper housing, and other support infrastructures like roads is key to the sustainability of dairy goat projects [16].

A study conducted by Aklihu in 2008 found that in places where livestock infrastructure was in place, most they were dilapidated or nonexistent and no system was put in place to make them self-financing for maintenance or upgrading [39]. Another study by Zewdie and Welday in 2015 found that lack of infrastructure leads to dairy goats generally being walked for long distances to markets without adequate feed and water [16]. This suggests that project design should consider infrastructure as a key consideration to promote success and sustainability of dairy goat projects. Where infrastructure like roads, communication, housing, feeding and breeding and market facilities are available, the survival rate of dairy goats is high. Reduction in transaction costs, improved diffusion of technology, a new combination of input and output all realized through infrastructure development.

G. Theoretical framework

Structural-Functional Theory and the Diffusion of innovations Theory theories are relevant in explaining the relationship between project design factors and the sustainability of dairy goat projects. Structural Functionalism advanced by Herbert Spencer 1968 explains how society functions focusing more on the linkages between different social institutions that form the society. This theory posits that a society is similar to a human body where different parts of the body perform different assigned functions and healthy body is determined by how well the organs function. Spencer argues that society's existence relies upon tasks performed by similar ‘organ-type’ institutions. For example, in a modern community, access to clean water, food, infrastructure, and healthcare may well be essential to survival of its citizens. Thus, we could view institutions engaged in such activities as 'functional' organs serving a need. Therefore, Spencer’s argument would imply that a community, being a self-contained system, has needs of its own; separate from the needs of individuals. Structural functional theory views society as a complex, but interconnected system, where each part works together as a functional whole to promote solidarity and stability. This theory becomes relevant to this study in the sense that institutions in a society serve a certain purpose but they are interlinked and well connected with each other to perform optimally.

This theory developed by Rogers in the year 1962 remains relevant for this study in the investigation of the behavior and practices of users in adopting new technological innovation. Rogers says that an innovation is any knowledge or anything seen as new by an individual. When the paramount decision is absolute utilization of an innovation, adoption is said to have taken place. Rogers see diffusion when different channels are involved in propagating the innovation within a social set up. In a societal set up, different institutions and structures aid this diffusion of innovation. This theory gives five stages in the decision innovation process.

Fig. 1. A Model of Five Stages in the Innovation - Decision Process.

According to Rodgers, an innovation may not be new since it was invented long time ago however, if it is new to an individual, it remains an innovation. Knowledge, Persuasion, and Decision process are the three main steps related to innovation which are threatened by uncertainty. Accepting or rejecting an innovation may bring along unexpected outcomes leading to uncertainty [40]. To reduce the uncertainty, Rodgers advises that individuals must seek the right information about the innovation so that they make informed decisions.

H. The Conceptual Framework

| Independent Variable | Dependent Variable |
|----------------------|--------------------|
| **Project Design Factors** | **Sustainability** |
| • Project beneficiary selection process, | • Level of project resilience |
| • Community capacity, | • Level of project ownership |
| • Project institutional linkages | • Level of project Multiplier effect |
| • Project Infrastructure | • Level institutional support |

Fig. 2. Conceptual framework.

III. METHODOLOGY

This study adopted a pragmatic paradigm integrating both positivism and interpretivism/poststructuralist philosophical foundation. Consequently, descriptive cross-sectional survey and correlational research designs were used supported by the mixed mode approach. This complementarity capability of mixed mode builds the strength of this study by allowing descriptive explanations while showing the relationship among variables through inferential analysis. A sample size of 196 dairy goat farmers was sampled using a combination of multiphase or sequential sampling, stratified random
sampling technique. 12 key informants were sampled purposively from government departments. Questionnaires were administered to the respondents and variables measured by providing respondents with statements rated on a five point Likert scale ranging from Strongly Disagree (SD) 1<SD<1.5; Disagree (D) 1.5<D<2.5; Neutral (N) 2.5<N<3.5; Agree (A) 3.5<A<4.5; and Strongly Agree (SA) 4.5<SA<5.0. The mentioned scales give an equidistance of 0.5. Validity was enhanced through experts opinion, and conducting a pilot study. Based on the result of the pilot test, Content validity was achieved according to representativeness by examining objectives and comparing them to the content of instruments. To ensure reliability, the researcher used the test and retest method at an interval of three weeks. A Cronbach α (Alpha) reliability coefficient that ranges between 0 and 1 was generated to measure the reliability. For the purposes of this study, where α< 0.7, the research instrument was revised. This study used a mixture of descriptive and inferential data analysis techniques. Descriptive statistics such as measures of central tendency, dispersion, percentages and frequency distributions were used to analyze the scores distribution, while inferential statistics tested the hypotheses. Simple linear regression was adopted in establishing the nature of the relationship between variable under study. The following correlation and regression models guided the data analysis with the variables and the indicators denoted as follows:

Sustainability of dairy goat projects = f (Project beneficiary selection process, Project beneficiary capacity, Project Institutional linkages, Project infrastructure)

\[ Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon \]

IV. FINDINGS AND DISCUSSIONS

The demographic profiles in terms of gender, age group, duration in groups, and dairy goat farming experience was collected and results tabulated.

| TABLE 1: DISTRIBUTION OF RESPONDENTS BY GENDER |
|-----------------------------------------------|
| Gender | Frequency | Percentage |
|--------|-----------|------------|
| Male   | 107       | 56.9       |
| Female | 81        | 43.1       |
| Total  | 188       | 100        |

Distribution by gender indicated that 107 (56.9%) of the respondents were male while 81 (43.1%) were female implying that men are the one mostly involved dairy goat keeping. The findings agree with Kosgey who found that gender imbalance may be due to the fact that women normally shy away from livestock rearing. [41]. This representation of both male and female was important for this study as it ensured that information was gathered from both genders.

| TABLE 2: DISTRIBUTION OF RESPONDENTS BY AGE |
|---------------------------------------------|
| Age bracket | Frequency | Percentage |
|----------------|-----------|------------|
| Below 30 years | 2         | 1.1        |
| 30-39 years    | 27        | 14.4       |
| 40-49 years    | 79        | 42.0       |
| 50 years and above | 80       | 42.6       |
| Total          | 188       | 100.0      |

Majority of respondents 80 (42.6%) were 50 years and above, 79 (42%) were between 40-49 years, 27 (14.4%) were between 30-39 years while only a small number of 2 (1.1%) were below 30 years. This implies that the youth aged below 30 years did not actively participate in the dairy goat keeping. This finding concur with findings by Chenyambuga and Lekule who found that dairy goat projects are implemented by men and women who are mature and with a property like land against which the dairy goats can be kept and fed [12].

| TABLE 3: DISTRIBUTION OF RESPONDENTS BY DURATION IN THE GROUP |
|---------------------------------------------------------------|
| Duration in the group | Frequency | Percentage |
|-----------------------|-----------|------------|
| 1 and below 2 years   | 14        | 7.4        |
| 1-2 years             | 2         | 1.1        |
| 2-3 years             | 11        | 5.9        |
| 3-4 years             | 17        | 9.0        |
| 4-5 years             | 12        | 6.4        |
| 5 years and above     | 132       | 70.2       |
| Total                 | 188       | 100        |

Majority 132 (70.2%) had been in self-help group for a duration 5 years and above, 17 (9%) were between 3-4 years, 14 (7.4%) indicated 1 year and below, 12 (6.4%) indicated between 4-5 years, 11 (5.9%) indicated between 2-3 years, while only 2 (1.1%) indicated between 1- year and below. This finding confirms that the respondents had the necessary knowledge and experience to help in assessing project sustainability. Hussain and Sanders, confirms that projects beneficiaries need to have participated in the project for a long duration, need to remain sensitive to the history and culture of the community where the project is implemented for the project sustainability to be realized [19].

A. Descriptive Analysis for Sustainability of Dairy Goat Projects

Measure of sustainability was established through a descriptive analysis. Results indicate that the mean score was 3.2521 with a Standard Deviation of 0.764. This indicate a moderate extent of dairy goat project sustainability. This measure of sustainability (dependent variable) was then correlated with the Independent Variables to establish their relationship and level of influence.

B. Correlational Analysis for Project Design Factors and Sustainability of Dairy Goat Projects

Multiple correlational analysis using Pearson’s product moment technique was done to determine the relationship between project design factors (project beneficiary selection process, Community capacity, institutional linkages and project infrastructure) and the sustainability of dairy goat projects.

Correlation results indicate that there is a significant positive relationship between project beneficiary selection process and sustainability of dairy goat projects (r = 0.000). This implies that there is a very strong association between project beneficiary selection process and the sustainability of dairy goat projects which is significant. The findings also reveal that there is a significant positive relationship between community capacity and sustainability of dairy goat projects (r = 0.563, p-value < 0.05), thus implying that community capacity has a positive and significant relationship with the sustainability of dairy goat projects. On institutional linkages, the findings indicated a significant positive relationship.
between institutional linkage and sustainability of dairy goat projects \((r = .591, p\text{-value} < 0.01)\) thus, depicting that institutional linkages have a significant positive relationship to the sustainability of dairy goat projects. The findings also show a significant positive relationship between project infrastructure and sustainability of dairy goat projects \((r = .526, p\text{-value} < 0.01)\) thus, depicting that project infrastructure has a significant positive relationship to the sustainability of dairy goat projects.

The following hypothesis was formulated and tested:

**Hypothesis H_a:** The combined project design factors have no significant influence on the sustainability of dairy goat projects in Tharaka Nithi County.

The hypothesis was tested using the following linear regression model

\[
\text{Sustainability of dairy goat projects} = f \left( \text{Project beneficiary selection process, Community capacity, Institutional linkages, Project infrastructure} \right)
\]

\[
Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \epsilon
\]

Data was analyzed and the regression results for the influence of project design factors on the sustainability of dairy goat projects is presented in Table 4.

**C. Multiple Regression Results of Project Design Factors and Sustainability of Dairy Goat Project**

Multiple Regression Results of Project Design Factors and Sustainability of Dairy Goat Project shows that \(r = 0.389\) implying a positive slope between the independent variables (Project infrastructure, Community capacity, Project beneficiary selection process, Institutional Linkages and Project infrastructure) and the dependent variable (Sustainability of dairy goat projects). The R-Squared was 0.152 meaning that 15.2% of the variation in the sustainability of dairy goat projects was explained by variation in the project infrastructure, community capacity, project beneficiary selection process, and institutional linkages. The other factors explained 84.8%. The ANOVA results indicated that the model was statistically significant at \((F(1,183) = 8.176)\).

The results indicate that the \(p\text{-value} = 0.000\leq0.05, R = .389\) and \(r\text{ square}=0.133\). Overall F statistics was \((F(1,183) = 8.176)\) shows that there exists a positive correlation and the slope of the population regression line is not zero. Hence based on these findings we reject the null hypothesis that the combined project design factors have no significant influence on the sustainability of dairy goat projects in Tharaka Nithi County and accept the alternative hypothesis that the combined project design factors have a significant influence on the sustainability of dairy goat projects in Tharaka Nithi County. Using the statistical findings, the regression model

\[
Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \epsilon
\]

can then be substituted as follows;

\[
Y = 1.870 + 0.133X_1 + 0.031X_2 + 0.119X_3 + 0.283X_4 + \epsilon
\]

The beta value implies that for a one-unit increase in the project beneficiary selection process, the sustainability of dairy goat project increases by 0.133. A one-unit increase in community capacity, the sustainability of dairy goat project increases by 0.031. A one-unit increase in institutional linkage, the sustainability of dairy goat project increases by 0.119 and one-unit increase in project infrastructure, the sustainability of dairy goat project increases by 0.283. This, therefore, confirms that combined project design factors have a significant influence on the sustainability of dairy goat project.

Findings indicates that the Project design factors are key determinants for the sustainability of the dairy goat projects. This agrees with earlier studies [18], who observed that the use of appropriate project beneficiary engagement process is key to project success, and that community participation in need analysis is important as the needs are collectively conceived and prioritized paving the way for the process of addressing them [24]. Further, key actors play a crucial role in linking projects and providing channels for knowledge sharing [42]. Finding of this study agrees with earlier studies that functional social networks provide the necessary conduits for social learning to livestock producers, a situation that fastens adoption of technology [31, [33]. On market linkages, that efforts by farmers to promote livestock production are affected by inaccessibility to crucial markets and that dairy goat markets are dispersed with remote markets lacking price information [11].

Capacity building is very critical as the current study findings show. This is in line with previous studies that found that capacity building help to develop the capabilities that are useful in propelling project success and sustainability [24]. participation in livestock extension programs depends on the capacity of the livestock farmers [43]. Another study by Khwaja (2004) found that projects where beneficiaries made either cash or in-kind contribution registered high level of success than those without [44]. Likewise, community cash contributions help reduce dependency on external support, promote community confidence and ownership, ensure community priority needs are addressed and that genuine beneficiary are targeted [45].

**V. CONCLUSION AND RECOMMENDATIONS**

The study sought to establish the influence of the project design factors on the sustainability of dairy goat projects. From the findings, it can be concluded that project beneficiary selection process, community capacity, Institutional linkages and the project infrastructure has a significant influence on the sustainability of dairy goat projects and there is a strong correlation. This study concludes that proper combination of sustainability drivers is important to promote sustainability of dairy goat projects. The study recommends that there is need to adequately conduct authentic beneficiary selection process before any project is started. Community capacity is very crucial for managing dairy goat projects and should be integrated into the project design from the initiation stage. This will ensure that all the community ability is incorporated into project activities and budgeted for to ensure adequacy throughout the implementation period. This study recommends that proper
analysis of stakeholders and supporters as a crucial project design component should be done. This will ensure that the project takes stock of the probable institutions that will work with the project and clearly show how the linkages with these institutions will be enhanced. Project designers should consider project infrastructure that supports project implementation as an important component of design projects.

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