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Original Article

## Performance Evaluation of NAGRIC Community-Based Animal Breeding Program on Dairy Farming in Kikatsi Sub County Kiruhura District

Ahimbisa Brian<sup>1\*</sup>, Bahame David<sup>1</sup> & Dr. Mwebembezi William, PhD<sup>1</sup>

<sup>1</sup> Bishop Stuart University, P. O. Box 09 Mbarara, Uganda.

\* Author for Correspondence Email: [ahimbisan@gmail.com](mailto:ahimbisan@gmail.com)

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**Keywords:**

*Community-Based  
Animal Breeding,  
NAGRIC-CBABP,  
Milk Production.*

Community-Based Animal Breeding Programs (CBABP) have gained considerable attention recently and are being viewed as a viable approach to increase livestock productivity in low-input and smallholder settings, particularly in Uganda's cattle corridor in general and Kiruhura district in particular. Despite the implementation of the NAGRIC community-based animal breeding program, there remains a significant gap in the comprehensive evaluation of its performance in dairy farming systems. This study therefore was intended to evaluate the performance of NAGRIC community-based animal breeding program to determine its effectiveness in achieving the desired outcomes. The study specifically aimed at assessing the level of farmer engagement and participation in NAGRIC-CBABP, analysing the influence of NAGRIC-CBABP on cattle-breed improvement and milk production and evaluating the Sustainability of NAGRIC-CBABP in Dairy Farming communities in Kikatsi sub-county, Kiruhura district. To achieve the objectives, a cross-sectional study design was adopted rooted in the quantitative approach. The study population comprises dairy farmers, government leaders, local leaders and other leaders in Kikatsi Sub County, Kiruhura district. The sample size included 59 respondents. A structured questionnaire with multiple-choice questions was used to collect quantitative data from farmers while semi-structured interviews were held with key informants in this case leaders. The collected data was analyzed by generating descriptive statistics. From the analysis, the study revealed that the level of farmer engagement and participation in NAGRIC-CBABP is still low where about 72.5% of the farmers are still reliant on natural breeding methods with limited participation in modern breeding methods such as artificial insemination. Community-Based Animal Breeding Program had a positive influence on cattle-breed improvement and milk production in Kikatsi Sub County since they are perceived by most farmers to be highly beneficial in terms of genetic improvement, increased availability of quality and improved breeds. However, there was concern among most farmers about the scarcity of highly productive breeds in terms of milk production and the lack of tick and disease-resistant breeds. Other concerns were about the high cost of semen, limited knowledge about artificial insemination and lack of semen that specifically breeds heifers. Despite the Government intervention

most dairy communities in Kikatsi Sub County have not sustainably benefitted from NAGRIC-CBABPs since utilization of services provided under this program is still low. Addressing these challenges is therefore critical to improve farmer engagement and participation in NAGRIC-CBABPs hence contributing significantly to the sustainability of these programs. The study therefore recommended Government through the NARO and MAAIF conduct thorough research into the breeds of dairy cattle that are highly productive and resistant to ticks and diseases as well as the most effective acaricides and drugs for ticks and diseases respectively. The Government should also provide subsidies on the cost of semen used in artificial insemination and train and employ more agriculture extension officers to scale up sensitization.

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## INTRODUCTION

Community-Based Breeding efforts (CBBP) are created to efficiently enable ownership and sustainability of genetic improvement efforts. Village/community-based breeding initiatives are planned, developed, and carried out by smallholder farmers alone or in collaboration with technical players to enhance the genetics of their livestock. Improvement of livestock is accomplished in developing countries by vigorous engagement of livestock owners. These farmers are frequently stigmatized and resource-poor. A Community-based Animal breeding Program was set up with an emphasis on native breeds appropriate for smallholder environments. (Kahi et al., 2005)

Community-Based Animal Breeding Programs (CBBPs) have gained considerable attention recently and are being viewed as a viable approach to increase livestock productivity in low-input and smallholder settings. (Kosgey et al., 2006, Wurzinger et al., 2021, Mueller et al., 2015). Community-based breeding initiatives are breeding operations that are planned, devised, and carried out by smallholder farmers alone or in collaboration with technical players to enhance the genetic performance of their livestock. This often applies to low-input systems with farmers sharing and improving their genetic resources in a common interest (Wurzinger et al., 2021).

Community-Based Breeding (CBB) is an established idea that has been used as a tool in agricultural research since 1970 (Grace et al., 2008).

According to Haile et al. (2010), CBB uses simple treatments to boost the production and profitability of native breeds and variations without sacrificing their resilience or genetic integrity. CBBPs have been adopted worldwide, an example in Bangladesh shows that CBBPs have been used sparingly so far. With small ruminant species and chicken, some initiatives have had more success and shown encouraging results. The scientific community has come to the conclusion and reached a broad consensus that farmers' participatory breeding programs may be a worthwhile alternative for the conservation and improvement of indigenous livestock genetic resources as a result of the lessons learned from reviewing the current breeding practices of Bangladesh. However, Bangladesh does not yet have the social, technological, or economic capacity to undertake self-sufficient breeding programs. The viability of breeding programs depends on farmers' long-term commitment, the creation of farmers' organizations, and support services provided by research organizations, government offices responsible for livestock development, cooperatives, and agribusiness representatives. (Bhuiyan et al., 2017).

A fifth of the world's cattle are raised in Africa, where there are around 300 million heads of cattle. In 2017, there were over 74.3 million cattle in West Africa alone. On the continent, cattle play important social, economic, and cultural roles. They provide a significant supply of protein (milk and meat), as well as fuel, fertilizer, and draft power for crop production. (Ouédraogo, 2021). Africa's farmers rely heavily on the production of cattle for their livelihood. Numerous breeding techniques and policies have been implemented in West Africa to increase cattle productivity. West African states, like many other emerging nations, have mostly embraced centralized breeding programs that are fully run by governments with little to no involvement from farmers. However, only a few of Sub-Saharan Africa's cattle breeding programs have been successful. (K Marshall, 2019).

East Coast fever, foot and mouth disease, brucellosis, and other livestock illnesses are difficult to control when using livestock systems like pastoralism and free-range grazing Fischer, K., & Chenais, E. (2018). Even though the cattle industry contributes significantly to Uganda's economy, it is still underdeveloped and operates at a much lower capacity. Due to limited access to high-quality breeds and improved management techniques, the farmers' production is limited. Salami et al., (2010). According to research, Uganda's adoption of better dairy breeds increases milk output by 147% (Kabunga, 2014).

According to Mustefa (2023), increasing animal productivity while reversing the trends of the ongoing potential threats to their diversity is urgently required because indiscriminate crossbreeding for increased productivity as well as natural and man-made disasters are among the identified potential threats deteriorating the diversity of small ruminant genetic resources in Ethiopia. Numerous genetic enhancement projects have been used thus far, but they have not been able to achieve the desired results because of the nation's generally low input system and the lack of community participation. The use of indigenous animals with active member engagement and decision-making from the start of the implementation period has been the emphasis of the community-based breeding program (CBBP), which was created for minimal input systems (Mustefa, 2023).

Through the genetic improvement of livestock and the preservation of regional breeds, CBBPs have been marketed as a tool for economic and livelihood development in developing nations (Kosgey et al., 2006; Haile et al., 2011). A thorough assessment of these initiatives is lacking although many case studies from the field and their achievements, obstacles, and failures have been recorded (Sölkner et al., 1998; Mueller et al., 2015). The significance of a systematic assessment of the effectiveness and impact of CBBPs is mentioned by many writers

(Dionne, 2010, Haile et al. 201; Mueller et al., 2015) to determine if the promised improvements have been made. Additionally, these authors offer broad suggestions for potential evaluation indicators, but they don't go into specifics about how such an evaluation should be conducted.

With a national herd estimated to be 49 million cattle, 25 million sheep, 22 million goats, and 9 million pack animals, Ethiopia has one of the greatest livestock resources in Africa 80% of rural residents depend on livestock for their livelihoods (Widdowson, 2018). Between 35 and 40 percent of all livestock are kept in pastoral regions, while female cattle make up around 55.5% of the national herd (Ministry of Agriculture and Rural Development, 2007). However, there is a lack of information regarding breeding practices, the significance of farmers' breeding objectives, preferences for various traits, selection criteria for dairy breeds, and mating systems as breed improvement strategies under low-input systems for smallholder dairying in the Tigray region, particularly in the central zone of Tigray (Widdowson, 2018).

Genotypes of dairy in the tropics demonstrated that hybrids of several exotic breeds performed differently at the same degree of indigenous gene inheritance, demonstrating that no particular breed, crossbreed, or crossbreeding method will have superior aggregate performance in all production conditions (Amole, 2022). Because farmers adopt and adapt genotypes to their needs and circumstances, their knowledge of and preferences for the genotypes should therefore be a key component of breed improvement efforts (Bebe et al., 2000). For instance, even though the total productivity due to reproduction and output may be poor, farmers may have a tendency to upgrade to better exotic grades and/or Friesian based on crossbreeding for higher milk yields. Additionally, in production systems like those found in Kenya, where milk is sold on a volume basis, large dairy

breeds are likely to be more popular than smaller breeds due to their high milk yields. (Bebe, 2003).

The majority of the improved cattle breeds are raised in Uganda by smallholder units that have 10 or fewer animals (Kamanyire et al., 2024). Despite the persistent efforts to upgrade the national dairy herd, animal genetic improvement offers one of the fastest and most effective ways to increase the productivity of cattle herds, but its effective exploitation has not been achieved due to the lack of a well-planned and executed breeding program. Improved cow breeds (exotics and crosses), according to the Uganda Bureau of Statistics (Uganda Bureau of Statistics, 2017), only make up 6.4% of the nation's cattle herd. Due to the ineffective utilization of the progeny of excellent dairy cattle, precious genes have been wasted. Most dairy producers have a multifaceted farming strategy, and one of those strategies includes prioritizing other livestock benefits above the value of keeping cows for their milk production. This is demonstrated by the breed selection and breeding methodology, which minimize the significance of features related to milk production. (A Mugisha, 2014).

High milk-producing cattle are favoured by market factors, especially near big cities. Land use practices have altered in certain places. By 2025, the urban market for the affluent population is expected to grow by 25%. They have favourable spending power, eating preferences, and lifestyles. (A Mugisha, 2014). Following this change in land use, breeding techniques should be used to maintain a small number of superior animals that can guarantee adequate returns. Additionally, it restricts unrestrained breeding and makes it possible to take advantage of enhanced breeding techniques. (E Ssewanyana, 2004).

At the farm level, specific qualities, features, or characteristics are desired in the semen. They are the ones that best meet the farmers' objectives or satisfy their interests. The availability and accessibility of the desired genes and their

distribution methods (breeding services) are influenced by many circumstances since the farmer is not acting in isolation but rather as a component of a production system (Kosgey, 2004). Farmers may today choose from a range of dairy breeding services, including AI and natural services. Whether the farmers can choose the service or are limited in what they can choose is a crucial factor. Access to enhanced breeding services, however essential for further dairy growth, is allegedly limited in Uganda, with rates averaging between 2% and 15% and likely being mostly focused in the central area. Low availability, high cost, and iffy reliability are the main causes of the suboptimal use of AI (Mugisha et al., 2014).

Due to the bovine spongiform encephalopathy (BSE) scandal in 1997, a two-year import restriction on animal goods and genetic resources, including semen and embryos, was put in place, necessitating the creation of local semen. The lack of progeny-tested bulls as a result of an uneven herd recording procedure, however, has made this difficult. (Ouédraogo, 2021). When carefully thought out, systematic crossbreeding programs involving tropical and temperate breeds have shown to be very beneficial (McDowell, 1985). Although crossbreeding has been practised in SSA for more than a century, the majority of dairy farmers in the smallholder dairy sector have been unable to reap the benefits. Lack of clear breeding techniques, environmental and genotype mismatches, and lack of farmer involvement in breeding program design are the main limitations. (Galukande et al., 2013).

A breeding program's assessment might have two main benefits. First, as a quality management tool for implementing institutions to track and assess ongoing CBBP operations and spot any snags in a program's implementation. Such an assessment procedure may produce a learning environment that motivates and assists people participating in the program to critically evaluate the progress, learn from errors, and provide suggestions for program improvement (Hamilton-Peach & Townsley, 2004).

Second, the assessment can operate as a roadmap for (external) funding organizations to gauge the effect on farmers' and other stakeholders' quality of life along the value chain to promote technical and financial support. (D. Lamuno, 2018).

However, various evaluation objectives call for various evaluation standards (Kamanyire et al., 2024). If the goal is profit or return on investment, Kamanyire et al., 2024) advise that breeding programs be assessed using technical criteria, socioeconomic criteria, and a cost-benefit analysis. CBBPs may be evaluated using factors that are significant at the community level, such as socioeconomic factors based on improving household food security, welfare, and income (Haile et al 2011). Due to the complexity of CBBPs in their local settings and their connections to specific socioeconomic and cultural elements, it may be extremely challenging to quantify some of the results and repercussions that go beyond basic economic criteria. Additional criteria that take into account less tangible and hard-to-quantify outputs may be used to address this (Kamanyire et al., 2024).

### **Problem Statement**

The dairy industry plays a vital role in ensuring food security and economic development, particularly in regions where dairy farming serves as the primary livelihood for small-scale farmers. To enhance dairy productivity and sustainability, community-based animal breeding programs have been introduced as a means to systematically improve the genetic potential of dairy animals, leading to higher milk yields, better disease resistance, and other desirable traits. These programs operate within the context of limited resources, varying farming practices, and diverse socio-economic conditions, making it essential to understand their impact on dairy farming within these specific contexts. A new strategy for enhancing cattle populations and owners' livelihoods is community-based breeding initiatives. These have been implemented in dairy farming systems to improve genetic traits and milk

production in dairy animals. These programs typically involve targeted interventions such as selective breeding, mating strategies, and breeding goal-setting within local farming communities. The rate of genetic improvement for milk and meat productivity from native breeds in Sub-Saharan Africa (SSA) is modest, ranging from 0% to 0.15% per year, according to an earlier study.

Native and exotic dairy and meat breeds have frequently interbred inadvertently to create a variety of cattle with various genetic make-ups. (Bowen et al., 2021). In the Ugandan context, farmers have access to a range of cattle breeding services, from natural service to artificial insemination (AI) although it is estimated that access to improved community breeding services, such as the use of AI, is low in Uganda, with rates averaging between 2% and 15% (Mugisha et al., 2014) yet they are considered crucial for long-term dairy and meat development. Despite the implementation of the NAGRIC community-based animal breeding program, there remains a significant gap in the comprehensive evaluation of its performance in dairy farming systems. Existing research often focuses on specific aspects of the programs, such as genetic improvement or milk production, without providing a holistic assessment of their overall effectiveness and impact. Additionally, there is a lack of in-depth studies that analyze the sustainability aspects of these programs, including their economic viability, social implications, and environmental consequences. This gap in knowledge hinders the development of evidence-based policies and strategies to optimize the outcomes of community-based animal breeding programs, which is crucial for supporting the sustainable development of dairy farming communities. There is therefore need to assess and evaluate the performance of the NAGRIC community-based animal breeding program to determine its effectiveness in achieving the desired outcomes.

## Objectives of the Study

### *Main Objective*

The main objective of the study is to evaluate the performance of the NAGRIC Community-based Animal Breeding Program on Dairy Farming in Kikatsi Sub County, Kiruhura District concerning its contribution to livestock breeding improvement and milk production.

### *Specific Objectives*

- To assess the level of farmer engagement and participation in NAGRIC Community-Based Animal Breeding Programs in Kikatsi Sub County, Kiruhura District.
- To analyse the influence of the NAGRIC Community-Based Animal Breeding Program on cattle-breed improvement in Kikatsi Sub County, Kiruhura District.
- To analyze the Influence of NAGRIC Community-Based Animal Breeding Programs on Milk Production in Kikatsi Sub County, Kiruhura District.
- To evaluate the Sustainability of NAGRIC Community-Based Animal Breeding Programs in Dairy Farming communities in Kikatsi sub-county, Kiruhura district.

### **Research Questions**

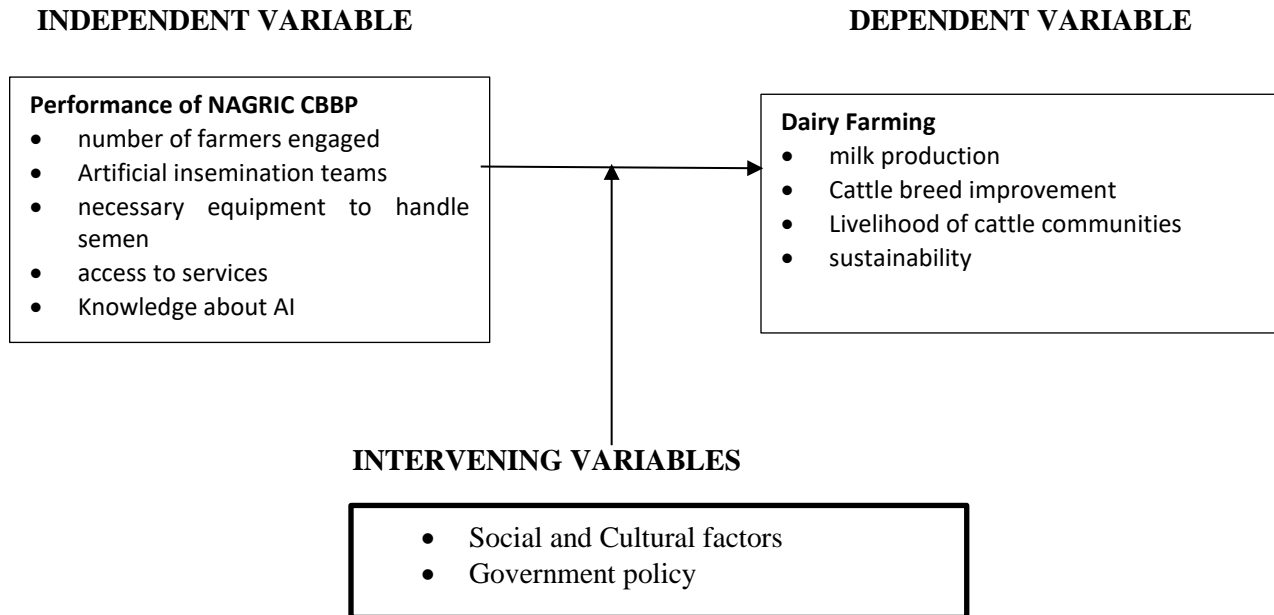
- What is the level of farmer engagement and participation in NAGRIC Community-Based Animal Breeding Programs in Kikatsi Sub County, Kiruhura District?
- What is the influence of the NAGRIC Community-Based Animal Breeding Program on cattle-breed improvement in Kikatsi Sub County, Kiruhura District?
- What is the Influence of NAGRIC Community-Based Animal Breeding Programs on Milk Production in Kikatsi Sub County, Kiruhura District?

- What is the Sustainability of NAGRIC Community-Based Animal Breeding Programs

in Dairy Farming communities in Kikatsi Sub County, Kiruhura district?

**Figure 1: Conceptual Framework Schema**

### 5 Conceptual Framework



**Source:** General Systems Theory by Von Bertalanffy (2010)

The conceptual framework is based on the general systems theory as stipulated by Von Bertalanffy (2010), this states that to fulfil a desired objective entities and individuals come together for the purpose. The conceptual framework is based on a three-factor general systems model consisting of i) independent variables, ii) dependent variables and iii) intervening variables. The independent variables consist of the activities and efforts geared at establishing the NAGRIC community-based cattle breeding programme, while the dependent variables consist of the outcomes of the NAGRIC community-based breeding program on dairy farming. The third factor, they are the conditions appearing in the environment where community breeding programmes take place which might affect the relationship between the performance of the NAGRIC community-breeding program and its effect on Dairy farming.

## RESEARCH METHODOLOGY

### Study Design

A cross-sectional study design was adopted rooted in the quantitative approach. This design has the advantage of measuring current attitudes or practices. It also provides information in a short amount of time, such as the time required for administering the survey and collecting the information. It can examine current attitudes, beliefs, opinions, or practices. This design was used because it allowed the researcher to collect data at a specific point in time and examine the relationship between exposure (in this case, the use of community-based breeding services) and outcome (factors influencing their use) (Wang, X., & Cheng, Z. 2020). In a cross-sectional study, data was collected through surveys or interviews administered to the target population, which in this case was the cattle farmers in the study area. The survey or interview questionnaire included

questions related to the farmers' utilization of community-based Animal breeding services and their perceptions, attitudes, knowledge, socioeconomic factors, and other relevant variables that may influence their decision to use these services. (Nyariki, D. M. 2009).

### Target Population

This study targeted the Kikatsi sub-county which has a good number of participants and some involved in CBABP for dairy farming. This study targeted farmers, government leaders, local leaders and veterinary professionals. Farmers were targeted because they are direct beneficiaries of NAGRIC community breeding and would provide resourceful information towards farmer engagement, cattle breed improvement and milk production. The local and government leaders were targeted because they introduced and were the direct implementers of the NAGRIC community breeding program. The study

also targeted 59 participants in the sub-county of Kikatsi.

### Sample size Determination

According to Sandelowski (1995), Sample size is defined as the number of entities in a subset of a population selected for analysis. A sample size of 59 respondents was chosen to participate in the study from a population of 70 respondents from the entire sub-county. The sample size was determined using Krejcie and Morgan's table (1970) statistical power analysis as shown below. This was done to enable the researcher to reduce the costs since studying the entire population is costly.

### Sample Selection

The sample for this study was selected using a stratified random sampling technique. The population of interest, cattle farmers in Kikatsi Sub County, Kiruhura District, was divided into strata based on administrative zones (parishes).

**Table 1: Sample size determination**

Categories of respondents	Target
Farmers	40
Government representatives	3
Veterinary professionals and representatives for dairy cooperatives	9
Local authorities	7
<b>Total</b>	<b>59</b>

From each stratum, Table 1 shows that a random sample of farmers was selected to ensure representation from different areas within the sub-county. The sample size was determined using a margin of error of 5%.

### Data Collection Methods and Tools

#### Methods

The data for this study was collected using a combination of data collection methods and tools. A survey was administered to gather quantitative data from a sample of participants, utilizing a structured questionnaire with Likert-scale and multiple-choice questions. Additionally, semi-structured interviews were conducted with a subset of participants to

obtain in-depth qualitative insights for purposes of triangulation of data.

#### Tools

Data collection tools such as standardized interview guides and survey questionnaires were utilized to ensure accuracy and consistency in data collection. The use of multiple data collection methods and tools allowed for a comprehensive approach to gathering diverse perspectives and obtaining rich data for analysis.

### Data Analysis

The collected data was subjected to thorough data analysis using a combination of descriptive

statistical methods. Descriptive statistics were calculated to summarize the key characteristics of the variables of interest. Data visualization techniques, including charts and graphs, were utilized to present the findings clearly and concisely. The data analysis process was carried out using statistical software (SPSS version 26) to ensure accuracy and facilitate efficient analysis. The in-depth data was analyzed using thematic analysis. The results of the data analysis provided valuable insights that would contribute to addressing the research objectives and research questions posed in this study.

### **Ethical Considerations**

The researcher sought ethical clearance from the Bishop Stuart University Research Ethics Committee. According to Amin (2005), ethics refers to the moral principles or ideals that often guide a person's or a group's behaviour. To protect both the privacy and the security of the farm, it was vital to take ethical considerations into account of privacy, anonymity and confidentiality of both the participants and their information. Farmers and leaders provided their consent before taking part in the research upon the researcher's explanation of the purpose of the research, benefits and risks of participating in the research. Furthermore, participants were informed of their right to withdraw from the research at any point without any compromise or threat of the loss of research benefits. The researcher endeavoured to compensate for the participants' time for participating in the research.

### **Community Engagement Plan**

Before the study, the researcher obtained permission from responsible leaders to allow him to conduct a study in the targeted area. The researcher introduced the topic to the targeted participants

explaining the importance of the study, its potential benefits, and the need for community involvement, from there he identified relevant key stakeholders such as farmers, dairy cooperatives, local authorities, veterinary professionals, and researchers who were interested or involved in dairy farming and animal breeding. The researcher reached out to them personally to discuss the study's objectives and seek their input. During the study, the researcher involved community members actively in the study and collaborated with local farmers and cooperatives to collect data, perform observations, and gather insights on the animal breeding program's performance. After the study, the researcher will share the results of the study through presentations at workshops, publishing the study's findings and outcomes and also making the results accessible and easy to understand for all community members. The researcher also discussed potential follow-up actions based on the study's results, sought community input on how to improve the animal breeding program and address any challenges highlighted by the study and lastly recognized and appreciated the community's contribution throughout the study.

## **RESEARCH FINDINGS**

### **Breeding Practices**

The study assessed whether the farmers use NAGRIC community-based animal breeding services in the study area, the breeding methods used in the livestock farming, the size of the livestock herd, whether the farmer maintains records of breeding activities, such as mating and pedigrees, number of herds that are products of community-based animal breeding services and number litres of milk got from milking NAGRIC breeds. All these are presented in Table 1 below;

**Table 2: Breeding practices**

Breeding practices	Category	Frequency	Percent
Do you have NAGRIC community-based animal breeding services in this area	Yes	38	95.0
	No	2	5.0
	<b>Total</b>	<b>40</b>	<b>100.0</b>
Whether community breeding services and resources are accessible in the area	Yes	35	87.5
	No	5	12.5
	<b>Total</b>	<b>40</b>	<b>100.0</b>
Breeding methods currently used in livestock farming activities	Natural	29	72.5
	Artificial Insemination	3	7.5
	Both	8	20.0
	<b>Total</b>	<b>40</b>	<b>100.0</b>
Size of livestock herd	Less than 10 cows should be removed	7	17.5
	10-30 cows	13	32.5
	30-50 cows	8	20.0
	Above 50 cows	12	30.0
	<b>Total</b>	<b>40</b>	<b>100.0</b>
The farmer maintains records of breeding activities, such as mating and pedigrees	Yes	11	27.5
	No	29	72.5
	<b>Total</b>	<b>40</b>	<b>100.0</b>
Number of cows that are products of community-based animal breeding services	Less than 10	38	95.0
	10-30	2	5.0
	<b>Total</b>	<b>40</b>	<b>100.0</b>
Number of litres of milk got from milking NAGRIC breeds	Less than 20	10	25.0
	30-50	20	50.0
	Above 50	10	25.0
	<b>Total</b>	<b>40</b>	<b>100.0</b>

**Source:** Field data, 2024

The results in Table 2 above indicate that the majority (95.0%) of the respondents reported that NAGRIC Community based animal breeding services are available in Kikatsi Sub County, Kiruhura District while only 5% reported that NAGRIC Community based animal breeding services are not available in the study area. This is partly attributed to the presence of services at Ruhengyere field station which is one of the breeding centres introduced by The National Animal Genetic Resources Centre and Data Bank (NAGRC&DB). The majority (87.5%) of the farmers reported that they have access to community breeding resources including improved or high-quality semen. Responses from the

interview guide also revealed that there is high accessibility of high-quality semen from Ruhengyere field station which is the nearest service station in the area. The presence of cheap semen at the Ruhengyere field station was reported among the factors that contribute to the acceptance of farmers to use community-based breeding services. In addition, the presence of a nearby service centre that is, Ruhengyere Field Station was also reported among the factors that contribute to the acceptance of farmers to use community-based breeding services in the Kikatsi sub-county.

Despite the increased availability and accessibility of improved animal breeding services in the study

area, the results of this study indicate that the majority (72.5%) of the farmers are still using natural breeding methods in livestock farming activities. Only 7.5% use artificial insemination while 20% use both natural and artificial insemination in animal breeding.

The results also indicate that only less than 10 cows are products of community-based animal breeding services for almost 95% of the farmers yet the majority (82.5%) of the farmers have more than 10 cows. Despite the limited number of cows that are products of community-based animal breeding services, the results indicate that about half (50%) of the farmers produce 30-50 litres of milk from

milking NAGRIC breeds, 25% produce less than 20 litres and the same percentage produced above 50 litres. About 72.5% (different from what is in the table above) of the farmers do not maintain records of breeding activities, such as mating and pedigrees while only 27.5% maintain records of breeding activities. While community-based animal breeding services exist in the study area.

### Perceptions and Benefits of Community-Based Breeding Initiatives

The benefits of Community-Based Breeding initiatives and characteristics prioritized when selecting semen are presented in Table 3 below;

**Table 3: Perceptions of Community-Based Breeding Initiatives**

Perceptions of Community-Based Breeding Initiatives		Frequency	Percent
Perceived benefits of community-based breeding initiatives	Genetic improvement	14	35.0
	Increased availability of quality animal products	12	30.0
	Increased production and income generation	10	25.0
	Improved community participation	4	10.0
	<b>Total</b>	<b>40</b>	<b>100.0</b>
Characteristics prioritized when selecting semen	Milk production	18	45.0
	Disease resistance	10	25.0
	Fertility and reproductive performance	3	7.5
	Growth rate	4	10.0
	Adaptability to local conditions	5	12.5
	<b>Total</b>	<b>40</b>	<b>100.0</b>

**Source:** Field data, 2024

Farmers in Kikatsi Sub County perceived Community-Based Breeding initiatives to be beneficial in terms of genetic improvement (35%), increased availability of quality animal products (30%), increased production and income generation (25%) and improved community participation (10%). When selecting semen, most farmers (45%) prioritized breeds that resulted in an increase in milk production and disease resistance (25.0%). Other farmers however prioritized adaptability to local

conditions (12.5%), growth rate (10.0%) and fertility and reproductive performance (7.5%) as the major characteristics of a good semen.

### Awareness and Knowledge of Community-Based Breeding Services

Data about the level of awareness and knowledge of community-based breeding services is presented in Table 4 below;

**Table 4: Awareness and Knowledge of Community-Based Breeding Services**

Awareness of Community-Based Breeding Services		Frequency	Percent
Period in years spent in livestock farming	1-5 years	1	2.5
	6-10 years	6	15.0
	More than 10 years	33	82.5
	Total	40	100.0
The farmer is aware of any community-based breeding services available in the area	Yes	34	85.0
	No	6	15.0
	Total	40	100.0
Have you personally ever utilized community-based breeding services for livestock	Yes	13	32.5
	No	27	67.5
	Total	40	100.0
Respondent's rating of the overall satisfaction with the community-based breeding services you have used	Very Dissatisfied	14	35.0
	Dissatisfied	12	30.0
	Neutral	9	22.5
	Satisfied	5	12.5
	Total	40	100.0
Reasons you have not utilized community-based breeding services	Lack of trust	14	35.0
	Poor results	7	17.5
	Lack of awareness	6	15.0
	Cost	6	15.0
	Lack of information	4	10.0
	Distance	3	7.5
	Total	40	100.0

**Source:** Field data, 2024

The majority (82.5%) of the farmers had spent more than 10 years in livestock farming. This is a long time to enable them to have basic knowledge of improved animal breeding methods. The results show that the majority (85%) of the farmers are aware of community-based breeding services being available in their area. Despite the high level of awareness about these services, the majority (67.5%) have never utilized community-based breeding services for livestock. Only 32.5% reported having ever utilized community-based breeding services. This is partly explained by farmers' attitudes towards these services since 35% of the farmers reported their dissatisfaction with community-based breeding services. Other reasons for not utilizing community-based breeding services include; lack of trust (35%), poor results (17.5%),

lack of awareness (15%), cost (15.0%), lack of information (10%), and long-distance (7.5%).

Responses from the interviews with key informants have also revealed a lack of trust among the reasons for not utilizing community-based breeding services. The following were some of the narratives from the local leaders, cooperative members and veterinary officials;

*“As a leader, I have made the community members aware of the services but the farmers have not trusted the services”* (respondent at, Kikatsi Ngiira dairy cooperative, 4/3/2024)

*“The farmers trust their bulls more than artificial insemination”* (respondent at Rugaaga Cooperative Society 04/03/2024)

*“The farmers are reluctant to adopt the breeding services because they don’t trust them”* respondent Kikatsi Coop 4/3/2024)

*“The farmers are still conservative as they like their bulls so much”* (. leader of a cooperative 01/03/2023)

Responses from interviews have also revealed that farmers have been reluctant to embrace community-based animal breeding services because of the poor results experienced even after adopting improved breeds. The poor results are manifested in low milk yield, high mortality rate, low conception rates and low adaptability to ticks and diseases. The following are some of the narratives backing this;

*“The Kikatsi farmers have adopted but they have not seen the increase in productivity due to the adoption”.* (Member Rugaaga Farmers Coop 04/03/2024)

*In my view much as farmers are participating in this program, the biggest setback is low levels of conception among inseminated cows which has resulted in few animals produced by the program; the newly improved breeds born don’t get better feeds/ pastures combined with*

*diseases and farmers therefore find the program’s performance on dairy farming not very successful* (Veterinary. Officer, 6/03/2024).

*Tick-borne diseases like East Coast Fever have contributed to the reluctance of farmers to adopt the services due to intolerance of the breeds to the diseases* (Veterinary Officer, Kikatsi 03/03/2024)

Lastly, the interview responses also highlighted poor infrastructure and transport as one of the factors hindering the effective utilization of improved animal breeding services as highlighted in the narratives below;

*Poor transport means like roads hinder service delivery* (member Kikoona Cooperative 3/3/2024)

*There is poor infrastructure like roads connecting to villages in Kikatsi* (LCII, Kikatsi).

### Factors Influencing the Use of Community-Based Breeding Services

The factors influencing the use of community-based breeding services are summarized in Table 5 below.

**Table 5: Factors Influencing the Use of Community-Based Breeding Services**

Factors	Not important	Somewhat important	Important	Very important
Cost-effectiveness	0(0%)	38(95.0%)	0(0%)	0(0%)
Quality and availability of semen	0(0%)	39(97.5%)	0(0%)	0(0%)
Accessible location and convenience	1(2.5%)	39(97.5%)	0(0%)	0(0%)
Trust and reputation of the service providers	1(2.5%)	39(97.5%)	0(0%)	0(0%)
Expertise and knowledge of service providers	1(2.5%)	39(97.5%)	0(0%)	0(0%)
Provision of follow-up support and guidance	1(2.5%)	39(97.5%)	0(0%)	0(0%)

**Source:** Field data, 2024

The results in Table 5 above indicate that cost-effectiveness, quality and availability of semen, accessible location and convenience, trust and reputation of the service providers, expertise and knowledge of service providers and provision of follow-up support and guidance are somewhat important factors influencing the use of community-

based breeding services as reported by over 90% of the farmers. This implies that farmers can utilize community-based breeding services if they are somewhat cost-effective, of good quality, available, accessible, convenient, and provided by trusted, reputable, knowledgeable and supportive service providers.

During interviews with local leaders, veterinary officers and cooperative members, the issues of cost, location, trust, knowledge and support/guidance were highlighted by most participants. About half (50%) of the interviewees report the availability of skilled inseminators as one of the factors affecting the use of community-based breeding services. This increases the farmers' perceived trust and reputation of the service providers knowing that the services are provided by experts and knowledgeable service providers. This also implies that farmers can be assured of follow-up support and guidance from these experts wherever and whenever they need them. The following narrations support this argument;

*The presence of skilled artificial inseminators at Ruhengyere field station who have effectively helped the farmers in service delivery has attracted the farmers to use community-based breeding services* (Secretary to LC1, Kikatsi 03/03/2024)

*“Presence of trained inseminators at Ruhengyere field station helps farmers to access quality services”* (member, Kikatsi Ngiira Dairy Coop, 4/3/2024)

*“There is training of more technicians at Ruhengyere field station to support and guide farmers on artificial insemination”* (Youth Councilor, Kayonza, 05/03/2023)

Eight (8) participants highlighted the issue of cost and availability of semen as one of the factors affecting the use of community-based breeding services. This is highlighted in the narrations below;

*“Farmers can easily accept the program if there are cheap services”* (N.D member, Kikatsi Ngiira dairy cooperative, 4/3/2024)

*“Most farmers prefer cheap semen”* (member Kikoono Coop., 2/3/2024)

*“There is cheap semen at Ruhengyere field station”* (Member Kikatsi Cooperative 4/3/2024)

*“The presence of cheap semen has increased on the acceptance of services”* (Chairperson LC1 Kayonza 03/03/2024)

*“Availability of cheap semen at Ruhengyere Field Station”* (Chairperson LC1 Kayonza 03/03/2024)

Four (4) participants highlighted the issue of accessibility to be a major factor associated with the utilization of community-based breeding services in Kikatsi Sub County. This is indicated in the following narrations;

*“Presence of nearby service centre that is, Ruhengyere Field Station assists farmers to access the services at any time”* Youth Councilor, Kayonza, 05/03/2023)

*“Poor transport means like roads hinders service delivery within the area”* (member Kikoono Coop 3/3/2024)

*“There is poor infrastructure like roads connecting to villages in Kikatsi which hinder effective delivery of breeding services”* (LC2, Kikatsi)

### Community Engagement and Support

The results pertaining to the level of community engagement and support from NAGRIC community-based breeding service providers in Kikatsi Sub County are presented in Table 6 below;

**Table 6: Community Engagement and Support**

Community Engagement and Support		Frequency	Percent
Have you received any support or training from community-based breeding service providers?	Yes	36	90.0
	No	4	10.0
	Total	40	100.0
How frequently do you participate in community meetings or workshops related to livestock breeding in a year	None	4	10.0
	Once a year	36	90.0
	Total	40	100.0
Do you think NAGRIC CBBP has been effective in meeting the specific needs of livestock farmers in your area?	Not true	2	5.0
	Somehow true	30	75.0
	True	5	12.5
	Very True	3	7.5
	Total	40	100.0

**Source:** Field data, 2024

A majority (90%) reported that they have received support or training from community-based breeding service providers. However, the frequency with which these trainings are held is very low since most farmers (90%) participated in community meetings or workshops related to livestock breeding only once a year. Nevertheless, the majority of the farmers (75%) recognized that community-based breeding services are somewhat important in meeting the specific needs of livestock farmers in the study area.

Responses from the interviews with key informants indicate significant improvements in training and awareness campaigns being provided to farmers from the Ruhengyere field station. The following narrations portray the intensity of training and sensitization in the study area;

*“Training of more inseminators is taking place in Ruhengyere field station” (member Kikoona Cooperative., 2/3/2024)*

*“There is training of more technicians at Ruhengyere Field Station” (Youth Councilor, Kayonza, 05/03/2023)*

*“My role is gathering the farmers in the sub-county to get information concerning services from the technicians” Member Rugaaga Cooperative 04/03/2024)*

*“I have played a key role in bringing service providers to the cooperative meetings to inform the farmers about breeding services” (KM 06/03/2024)*

**Table 7: Improvements or Additional Support that Farmers Would Like to See in Community-based Breeding Services**

Improvements or additional support	Frequency	Percent
I suggest farmers be sensitized on better feeding for the improved breeds	10	25.0
Increased number of inseminators	9	22.5
Experts should bring us semen that breeds heifers only	6	15.0
They introduce breeds that are tick-resistant	3	7.5
The government should look for better acaricides for ticks	1	2.5
<b>Total</b>	<b>40</b>	<b>100.0</b>

**Source:** Field data, 2024

The results in the table indicate the additional improvements or support that farmers would like to see in community-based breeding services. Ranked in their order, the following themes are developed;

### **Sensitization**

The results also indicate that most farmers (25%) need to be sensitized to the benefits of artificial insemination. Farmers also demanded sensitization about the different breeds for artificial insemination and the best quality breeds. One farmer recommended that service providers should show farmers pictures of good bulls for artificial insemination. Another farmer demanded that service providers should teach farmers about the most effective animal feeds for the animals that have been bred through artificial insemination as well as the best breeds for high milk production. Different stakeholders including local leaders, cooperative leaders and members as well as veterinary officers played a critical role in sensitization of farmers on artificial insemination and other breeding services.

*“Creating awareness among the farmers in Kikatsi Sub County” (member, Kikatsi Ngiira dairy cooperative, 4/3/2024)*

*“Extending awareness to the cooperative members” (member Kikoona Coop., 2/3/2024)*

*“I have involved youth in the awareness programmes concerning breeding services” (Youth Councilor, Kayonza, 05/03/2024)*

*“As a leader, I have made the community members aware of the services” (Chairperson LC1 Kayonza 03/03/2024)*

*“I am an adopter as I have already started benefiting from the services also. Therefore, I have played a role of informing and extending awareness of the services to the entire Kikatsi community” (Chairman Kayonza cell, 06/03/2024).*

### **Increased Number of Inseminators**

It is revealed that most (22.5%) farmers demand the service providers to increase the number of inseminators. This implies that while farmers would be willing to adopt the services provided under the

NAGRIC community-based breeding program, most of them have a limited number of inseminators. This implies that if the number is increased, then most farmers will embrace the services. During interviews, the local leaders and cooperative leaders confirmed that there is more training being undertaken at Ruhengyere field station as narrated below;

*“Training of more inseminators is taking place in Ruhengyere field station” (K.J., member Kikoona Coop., 2/3/2024)*

*“There is the training of more technicians at Ruhengyere Field Station” (A.G Youth Councilor, Kayonza, 05/03/2023)*

### **Need for Heifers**

Farmers (12.5%) also require service providers under the NAGRIC community-based breeding program to bring semen that breeds heifers only. This is geared by the high demand for improved milk production which is the main source of income in the study area. This means that farmers can easily utilize community-based breeding services if they are sure that they will breed heifers instead of bulls.

### **Tick Resistant Breeds**

There is also dire need for breeds that are tick-resistant as reported by 7.5% of the farmers. Most farmers fear the improved breeds because of their high mortality rate due to ticks compared to the local breeds. This implies that if farmers can be sure that the breeds provided under community-based breeding services are tick-resistant, then they can utilize these services. One farmer demanded that the government should look for better acaricides for ticks which are the main causes of mortality among improved breeds. During interviews with veterinary officers, it was revealed that most animal breeds provided under the NAGRIC community-based breeding program are subject to tick infestation.

*Tick-borne diseases like Theileriosis (ECF) have contributed to the reluctance of farmers to*

*adopt the services due to intolerance to the diseases* (T.C Vet Officer, Kikatsi 03/03/2024)

### Information and Communication

This section highlights the methods and means through which farmers in Kikatsi Sub County, Kiruhura district receive information about

community-based breeding services, their belief about the need for improved communication and information dissemination of community-based breeding services and their overall satisfaction with the current availability and quality of community-based breeding services. The results are shown in Table 7 below;

**Table 8: Means through which Farmers in Kikatsi Sub-County, Kiruhura District Receive Information about Community-based Breeding Services**

Information about Community-based Breeding Services			
Information and Communication		Frequency	Percent
Means of receiving information about community-based breeding services	Word-of-mouth	27	67.5
	Farmer groups/associations	7	17.5
	Radio/TV	5	12.5
	Social media	1	2.5
	Total	40	100.0
The farmer believes there is a need for improved communication and information dissemination on CBBS	Yes	30	75.0
	No	10	25.0
	<b>Total</b>	<b>40</b>	<b>100.0</b>

**Source: Field data, 2024**

The majority (67.5%) of the farmers reported that they received information about community-based breeding services through word of mouth while 17.5% received this information through farmer groups/associations. Only 12.5% of the farmers received information about community-based breeding services from radio or television while 2.5% received information from social media. Generally, most (75%) of the farmers believed there is a need for improved communication and information dissemination on community-based breeding services. During interviews with key informants, it was revealed that face-to-face meetings were indeed the most common form of information dissemination about NAGRIC community-based breeding services. These were held at the village level and the cooperative level. However, some interview participants reported incidences where they would engage with the local community and farmers on social media, radio, television and direct phone calls to promote the use of community-based breeding services but on a small scale.

### CONCLUSIONS

There is a low level of farmer engagement and participation in the NAGRIC Community-Based Animal Breeding Program. Addressing the key issues associated with limited farmer engagement and participation such as cost-effectiveness, quality and availability of semen accessibility and convenience, trust and reputation of the service providers, best feeding, expertise and knowledge of service providers and provision of follow-up support and guidance is key to improving farmer engagement and participation in NAGRIC Community-Based Animal Breeding Programs as well as their utilization.

Community-Based Animal Breeding Program had a positive influence on cattle-breed improvement in Kikatsi Sub County since they are perceived by most farmers to be highly beneficial in terms of genetic improvement, increased availability of quality and improved breeds. However, most farmers still have a lower number of cows that are products of community-based animal breeding

services which justifies the need for more sensitization and support to farmers to empower them to improve on the cattle breeds.

NAGRIC Animal Breeding Programs had a positive influence on milk production in Kikatsi Sub County since over half of the farmers who had benefited from NAGRIC Animal Breeding Programs produced over 30 litres of milk from milking NAGRIC breeds. There is however concern among most farmers who urged service providers to sensitize them about the most effective animal breeds and feeding for high milk production and to bring semen that breeds heifers only to improve milk production.

Most dairy communities in Kikatsi Sub County have not sustainably benefitted from NAGRIC Community-Based Animal Breeding Programs since the utilization of services provided under this program is still low. This is attributed to a lack of knowledge about artificial insemination, low conception rates, poor feeding, lack of semen that breeds more heifers and low resistance to ticks among improved breeds compared to local breeds. Sustainability in this case can be ensured by supplying breeds with high adaptability to local conditions, high conception rates, high tick and disease resistance, high growth rate and high fertility and reproductive performance and ensuring that the price of semen is reduced to a level that every dairy farmer can afford.

### Recommendations

Based on the findings, the following recommendations have been made;

- The government through the NARO, NAGRIC and MAAIF should provide good /high-quality dairy breeds to farmers
- The government through the NARO, NAGRIC and MAAIF should supply high-quality semen from proven tested breeds
- The study therefore recommended Government through the NARO and MAAIF conduct thorough research into the breeds of dairy cattle that are highly productive and resistant to ticks and diseases as well as the most effective acaricides and drugs for ticks and diseases respectively.
- The Government should also provide subsidies on the cost of semen used in artificial insemination and train and employ more agriculture extension officers to scale up sensitization.

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