

Animal Husbandry Agrarian Interventions and Food Security in Refugee Settlements in Uganda; A Case of Nakivale Refugee Settlement

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Abstract

The study examined the effect of animal husbandry agrarian interventions on food security in refugee settlements in Uganda; a case of Nakivale Refugee Settlement. It specifically focused on; assessing the effects of animal husbandry agrarian interventions on food availability in Nakivale Refugee Settlement, assessing the effects of animal husbandry agrarian interventions on food accessibility in Nakivale Refugee Settlement and assessing the effects of animal husbandry agrarian interventions on food quality in Nakivale Refugee Settlement. The study was carried out using a cross sectional survey research design where both quantitative and qualitative research approaches were also used. The data was collected using questionnaires, interviews and observations and during data collection; both purposive and simple random sampling methods were used. A sample size of 400 respondents who are refugees in Nakivale Refugee Settlement and 7 key informants was also used in the study. The study findings revealed that animal husbandry agrarian interventions in Nakivale Refugee Settlement significantly improved food security by enhancing food availability, accessibility, and quality. Livestock distribution, improved breeds, veterinary services, training, and market-linkage programs increased year-round supply, dietary diversity, income generation, and safe, nutritious animal products. Pearson's correlation confirmed strong positive relationships between these interventions and food outcomes: food availability ($r = 0.656, p < 0.05$), food accessibility ($r = 0.623, p < 0.05$), and food quality ($r = 0.644, p < 0.05$), demonstrating that strengthened animal husbandry programs directly bolster household and community-level food security. Finally, the study recommended the need for expanding livestock distribution and improved breeds, strengthening training in animal husbandry, enhancing veterinary services, promoting market-linkages for livestock products, and institutionalizing monitoring and evaluation mechanisms to sustain livestock productivity, improve food quality and accessibility, increase household income, and ensure long-term food security in Nakivale Refugee Settlement.

Keywords: Animal Husbandry, Agrarian Interventions, Food Security, Refugee Settlements, Uganda

Introduction

1.0 Introduction

Agrarian interventions in animal husbandry play a crucial role in enhancing food security in refugee settlements, as these practices offer sustainable methods to meet dietary needs and boost economic opportunities within displaced communities (Jaspars, 2021). Specifically, animal husbandry initiatives,

such as improved livestock management and training in refugee contexts like Nakivale, provide significant benefits by promoting food self-sufficiency and reducing dependence on external aid (Vos et al., 2020). Studies indicate that integrating agricultural practices in refugee settings not only strengthens food systems but also fosters resilience and self-reliance among refugees, creating more stable livelihoods (Pace et al., 2023). Furthermore, the alignment of these interventions with environmental sustainability and socio-economic empowerment reflects their potential to drive food security and economic stability across refugee populations (Morales-Muñoz et al., 2020).

Therefore, this study aims at examine the effect of agrarian interventions on food security in refugee settlements in Uganda; a case of Nakivale Refugee Settlement. This chapter therefore presents the background of the study, the problem statement, the purpose of the investigation, particular objectives, research questions, the hypothesis, the conceptual framework, the significance of the study, the justification, and defining operational terminology.

Background of the study

This section considered historical background, theoretical background, conceptual background and contextual background.

Historical background

Food security in refugee settlements has evolved significantly across the globe. In Europe and the USA, post-World War II refugee crises prompted coordinated efforts to address food insecurity, leading to the establishment of organizations like the UNHCR, which played a critical role in developing food assistance programs for displaced populations (Nisbet et al., 2022). Over time, these interventions spread to Africa, where conflict-induced displacements intensified food insecurity challenges, as seen in Sudan and Somalia (Osman & Abebe, 2023). Uganda's progressive refugee policies, especially in settlements like Nakivale, have incorporated agrarian interventions to enhance refugees' livelihoods and promote food self-reliance, building on decades of food security strategies (Muhangi et al., 2022).

The history of animal husbandry agrarian interventions reveals an evolution from traditional livestock practices in early European and American agrarian societies to systematic approaches aiming to improve food security and economic stability (Mastrorillo et al., 2022). In Europe and the United States, early innovations included selective breeding and enhanced livestock management, which served as foundational models for modern animal husbandry interventions (George & Adelaja, 2022). In Africa, these practices were adapted to local contexts, where livestock was both a food source and a central part of the economic and social fabric, contributing to resilience against food insecurity and socio-economic disruptions (Osman & Abebe, 2023). In Uganda, especially within refugee settlements like Nakivale, animal husbandry has been increasingly incorporated as an agrarian intervention strategy to bolster food security and support refugee self-reliance, responding to the need for sustainable livelihood options amidst protracted displacement (Sanni, 2024).

Theoretical background

This study was guided by the Sustainable Livelihoods Framework (SLF), developed by the UK Department for International Development (DFID) in the late 1990s. The SLF is rooted in the concept that individuals' livelihoods are determined by their access to resources, institutions, and strategies to cope with risks in their environment. It identifies five primary assets human, social, physical, natural, and financial capital that shape sustainable livelihoods by ensuring access to income, food security, and resilience against vulnerabilities and external shocks (George & Adelaja, 2022). In development contexts,

the SLF is often applied to evaluate how these various types of capital enhance the well-being of marginalized groups, such as refugees, by supporting their resilience and adaptive strategies.

The SLF's core principles highlight that individuals' livelihoods depend on their access to assets, the vulnerability context (such as external shocks, trends, and seasonality), and institutional processes that influence their survival strategies. The framework presumes that improved access to assets and reduced vulnerability can enhance well-being and resilience (Sanni, 2024). In this study, the SLF provides a foundation for analyzing how animal husbandry agrarian interventions in refugee settlements, like Nakivale, can improve food security by enhancing refugees' access to natural capital (land and livestock), human capital (skills and labor), and financial capital (income from agricultural activities). By strengthening these assets, animal husbandry interventions can aid refugees in building sustainable livelihoods, fostering food self-sufficiency, and addressing food insecurity within the settlement.

Conceptual background

Animal husbandry agrarian interventions refer to organized efforts to enhance livestock management, health, and productivity as a means of supporting food security and economic resilience, particularly among displaced populations (Osman & Abebe, 2023). According to Pace et al. (2023), such interventions are essential for addressing food security in areas impacted by environmental changes and migration, as they provide sustainable sources of food and income. In this study, animal husbandry agrarian interventions are defined as strategic efforts to improve livestock resources and skills within refugee settlements to increase food access and enhance livelihood resilience. This study focuses on three primary dimensions of these interventions: livestock provision, veterinary services, and capacity building (Muhangi et al., 2022).

On the other hand, the dependent variable is food security in refugee settlements. Food security is commonly defined as the state in which all individuals, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs for an active and healthy life (Jaspars, 2021). Similarly, Vos et al. (2020) describe food security as the availability, accessibility, and utilization of food that ensures people can meet their food preferences and dietary requirements. For this study, food security was defined as the capacity of refugee households in Nakivale Refugee Settlement to access, afford, and consume nutritious food regularly. The dimensions of food security in this study included food availability, food accessibility, and food quality (Kamugisha et al., 2024).

Contextual background

Uganda is renowned for its inclusive refugee policies, allowing refugees to engage in economic activities, such as agriculture, which is central to their livelihoods (Sanni, 2024). Nakivale Refugee Settlement, located in Isingiro District, is Uganda's oldest refugee settlement and currently shelters over 135,000 refugees from multiple countries, including the Democratic Republic of Congo, Burundi and Somalia (Pace et al., 2023). Refugees in Nakivale are provided plots of land for agriculture, a practice aligned with Uganda's efforts to promote refugee self-reliance, although challenges persist in achieving food security due to insufficient resources and agricultural inputs (Osman & Abebe, 2023). Despite Uganda's progressive approach, studies show that only a fraction of refugee households in Nakivale are food secure, underscoring the need for enhanced agrarian interventions (Mastorillo et al., 2022).

Animal husbandry has emerged as a crucial agricultural intervention to address food insecurity in Nakivale, providing refugees with a sustainable source of nutrition and income (Muhangi, Ainamani, & Opio, 2022). Refugees are encouraged to raise livestock, such as cattle, goats, and poultry, which contribute to dietary diversity and mitigate dependency on external food aid (Steine, 2024). However, the

limited availability of veterinary services, high disease incidence, and inadequate training hinder the productivity and sustainability of livestock activities within the settlement (Kamugisha et al., 2024). To address these gaps, organizations have implemented training and resource support to build refugees' capacity in animal husbandry, though more is needed to improve outcomes and reach the most food-insecure households (George & Adelaja, 2022).

The integration of refugees into Uganda's agricultural systems has been shown to foster self-reliance and enhance food security, yet the full potential of animal husbandry remains untapped due to resource constraints and logistical challenges (Morales-Muñoz et al., 2020). Nakivale offers a unique opportunity to study the impact of agrarian interventions on refugee food security, especially as animal husbandry gains traction as a viable intervention (Jaspars, 2021). Given the protracted nature of displacement in Nakivale, more sustained investments in animal husbandry could help bridge the food security gap, supporting a more resilient refugee community in Uganda's settlements (Meixner Vasquez, 2021).

Problem statement

Ideally, refugee settlements like Nakivale in Uganda aim to ensure adequate food security for all inhabitants through animal husbandry and other agrarian interventions, alongside external assistance (Muhangi et al., 2022). However, the reality is far from this ideal. Food insecurity remains a significant issue, with deteriorating trends in food availability, accessibility, and quality (World Food Programme, 2023). For instance, agricultural productivity in Nakivale has declined due to limited access to quality livestock breeds, poor veterinary services, and changing weather patterns, all of which directly impact animal husbandry (Office of the Prime Minister Report, 2023). Over 60% of households report insufficient access to food, with food quality often compromised by nutrient deficiencies (Kamugisha et al., 2024). Despite interventions, refugees in Nakivale continue to face food insecurity, driven by a lack of sustainable agricultural inputs, limited livestock market access, and inadequate technical support for animal rearing (Mastrorillo et al., 2022).

If left unaddressed, this persistent food insecurity could exacerbate malnutrition, economic marginalization, and heighten tensions between refugee and host communities (Pace et al., 2023). While existing studies have explored the role of agriculture and food assistance in refugee settlements, gaps remain in understanding the specific impact of animal husbandry interventions on food security dimensions, such as availability, accessibility, and quality (Steine, 2024). Previous research has largely focused on general challenges of food insecurity without in-depth analysis of how livestock value chains or specific husbandry interventions are affecting these key dimensions (Sanni, 2024; Mastrorillo et al., 2022). This study sought to fill this gap by examining the effect of animal husbandry agrarian interventions on food security in refugee settlements in Uganda, with a focus on Nakivale Refugee Settlement.

Purpose of the study

The purpose of this study was to examine the effect of animal husbandry agrarian interventions on food security in refugee settlements in Uganda; a case of Nakivale Refugee Settlement.

Specific objectives

1. To assess the effects of animal husbandry agrarian interventions on food availability in Nakivale Refugee Settlement.
2. To assess the effects of animal husbandry agrarian interventions on food accessibility in Nakivale Refugee Settlement.
3. To assess the effects of animal husbandry agrarian interventions on food quality in Nakivale Refugee Settlement.

LITERATURE REVIEW

Theoretical review

The study was underpinned by the Sustainable Livelihoods Framework (SLF) and this was further discussed below according to the different scholars.

Sustainable Livelihoods Framework (SLF)

The Sustainable Livelihoods Framework (SLF), developed by the UK Department for International Development (DFID) in the late 1990s is rooted in the concept that individuals' livelihoods are determined by their access to resources, institutions, and strategies to cope with risks in their environment. It emphasizes that people do not simply exist in isolation; their livelihoods are influenced by a complex interplay of factors, including social structures and economic systems. The framework identifies five primary assets human, social, physical, natural, and financial capital that shape sustainable livelihoods by ensuring access to income, food security, and resilience against vulnerabilities and external shocks (George & Adelaja, 2022). In development contexts, the SLF is often applied to evaluate how these various types of capital enhance the well-being of marginalized groups, such as refugees, by supporting their resilience and adaptive strategies.

The SLF's core principles highlight that individuals' livelihoods depend on their access to assets, the vulnerability context such as external shocks, trends, and seasonality and institutional processes that influence their survival strategies. Vulnerability context can encompass numerous challenges faced by refugees, including economic instability, environmental changes, and social exclusion. The framework presumes that improved access to assets and reduced vulnerability can enhance well-being and resilience (Sanni, 2024). In refugee settings, where food insecurity is often prevalent, the SLF serves as a crucial tool to analyze how interventions can effectively leverage available resources to create sustainable solutions for food security.

In this study, the SLF provides a foundation for analyzing how animal husbandry agrarian interventions in refugee settlements, like Nakivale, can improve food security by enhancing refugees' access to various types of capital. By focusing on natural capital, the study examines how access to land and livestock can significantly impact food production and nutritional outcomes for refugee households. Additionally, the framework considers human capital by assessing the skills and labor available within the refugee community, which is essential for implementing effective agricultural practices. These elements work in tandem to improve productivity and resilience, ultimately contributing to enhanced food security.

Moreover, financial capital plays a vital role in the SLF, as it reflects the income generated from agricultural activities, which can empower refugees to invest in their livelihoods and improve their quality of life. By strengthening these assets through targeted animal husbandry interventions, the framework suggests that refugees can build sustainable livelihoods, foster food self-sufficiency, and address food insecurity within the settlement. This holistic approach enables a comprehensive understanding of the multiple dimensions of livelihoods, allowing policymakers and practitioners to design more effective programs that cater to the specific needs and challenges faced by refugee populations.

Effects of animal husbandry agrarian interventions on food availability in refugee settlements

Muhangi et al. (2022) examined the contribution of animal husbandry agrarian interventions to refugee livelihoods in Nakivale Settlement and found that such interventions significantly enhanced food availability for refugees. Their findings showed that refugees who participated in livestock programs reported higher levels of food security and greater access to diverse food types, helping them reduce dependence on food aid. Similarly, Pace et al. (2023) conducted a baseline analysis of agricultural value

chains in refugee settings in Uganda, highlighting that animal husbandry interventions improved not only food availability but also economic resilience among refugees. The study emphasized the role of livestock programs in increasing food production, which in turn made food more accessible and affordable for refugee households.

Bashaasha et al. (2021) evaluated Uganda's progressive refugee policy, particularly its impact on food security. They found that agricultural interventions, including animal husbandry, played a crucial role in improving food availability for both refugee and national households. Refugees who were given access to livestock and veterinary services experienced better food security outcomes compared to those who did not have these resources. Similarly, Betts et al. (2020) explored the Kalobeyei settlement model in Kenya, where refugees are encouraged to become self-reliant through farming and animal husbandry. The study reported that agrarian interventions significantly improved food availability, as refugees were able to raise their own livestock, which reduced the pressure on food aid systems.

Osman and Abebe (2023) explored rural displacement and its effects on livelihoods and food insecurity in Somalia, finding that agrarian interventions aimed at displaced communities improved food availability by providing displaced people with the means to raise livestock for food production. Similarly, in Sudan, Jaspars (2021) examined protracted crises and food security, concluding that animal husbandry programs designed to increase livestock production in refugee communities contributed significantly to improving food availability. The research highlighted that these interventions helped refugees become less dependent on external food sources and more resilient to food shortages.

Nabulsi et al. (2020) focused on Syrian refugees in Lebanon's Beqaa region and showed that agrarian interventions involving animal husbandry enhanced food availability by enabling refugees to participate in livestock production activities. The study found that refugees who engaged in animal husbandry were able to secure food more consistently than those who relied solely on food aid. Similarly, Morales-Muñoz et al. (2020) reviewed the impact of environmental changes on food security in migration contexts, finding that agrarian interventions that leveraged local environmental resources for livestock farming were key to improving food availability for refugee populations.

Steine (2024) in Northern Uganda examined how agricultural collaboration between refugee and host communities improved food security for both groups. Agrarian interventions, including animal husbandry, not only increased food availability in the settlements but also fostered unity and knowledge sharing among refugees and host communities, which led to improved agricultural productivity. Bernard et al. (2022) similarly found that refugee settlements in Uganda's West Nile region contributed to land use changes that, through proper management, improved food availability for refugees. The interventions provided refugees with the tools and knowledge necessary to raise livestock and cultivate previously underutilized land, boosting food production.

Mastrorillo et al. (2022) investigated the role of cash and food assistance in enhancing refugees' self-reliance in Uganda. Their research revealed that while direct food aid was essential in the short term, agrarian interventions that promoted self-reliance through livestock farming ultimately had a more sustainable impact on food availability. Refugees who participated in animal husbandry programs were able to supplement their diets with fresh produce and animal products, improving food availability and quality. Similarly, Alam et al. (2020) examined the relationship between displacement and food insecurity in Bangladesh, concluding that agrarian interventions, particularly those focused on livestock, were critical for improving food availability in displaced populations, particularly in rural areas.

Meixner Vasquez (2021) evaluated the impacts of seed and livestock programs on food security among small-scale farmers in Uganda and found that refugees who were provided with livestock and other agricultural inputs experienced significant improvements in food availability. These findings were echoed by Kamugisha et al. (2024), who investigated food insecurity in Rhino Camp Refugee Settlement in Uganda. Their research highlighted the importance of agrarian interventions, including animal husbandry, in reducing food insecurity by improving refugees' ability to raise livestock and access food within the settlements.

Effects of animal husbandry agrarian interventions on food accessibility in refugee settlements

Nisbet et al. (2022) highlight that food security interventions tailored for refugees can significantly improve food accessibility in various settings. Their scoping review of global interventions indicates that targeted agricultural programs not only enhance food production but also promote access to nutritious foods. The findings reveal that when refugees are equipped with agricultural skills and resources, they become more self-sufficient, reducing reliance on external aid. This self-sufficiency is critical in refugee settlements, where traditional food supply chains are often disrupted. Additionally, Vos et al. (2020) provide insights into integrating displaced communities into local food systems, emphasizing that participatory agricultural initiative can enhance food accessibility. They argue that such interventions foster cooperation between refugees and host communities, which is essential for stabilizing local food systems and ensuring that refugees have consistent access to food.

Muhangi et al. (2022) investigate the contribution of agriculture to the livelihoods of refugees in the Nakivale settlement. They found that the implementation of agricultural training programs significantly improves food accessibility by enabling refugees to cultivate their own food. The study highlights that agricultural interventions not only meet immediate food needs but also provide a sustainable source of income through surplus production. This increase in food production directly correlates with improved dietary outcomes among refugee households. Similarly, Pace et al. (2023) focus on agricultural value chains in refugee settings and report that well-structured agricultural interventions can enhance food accessibility. They note that creating connections between farmers and markets helps improve the availability of diverse foods, thus increasing dietary variety and accessibility for refugees.

Osman and Abebe (2023) discuss the implications of rural displacement on food insecurity and highlight how agrarian interventions can mitigate these challenges. Their research indicates that integrating refugees into local agricultural systems not only boosts food accessibility but also improves their overall livelihoods by creating jobs and income opportunities. They emphasize that successful agricultural interventions in refugee contexts often rely on collaboration with local stakeholders to enhance integration and accessibility. Another study by Jaspars (2021) critiques the resilience strategies employed in Sudan, asserting that food security initiatives must go beyond mere access to food. Jaspars argues that fostering sustainable agricultural practices is essential for long-term food accessibility, especially in protracted crisis situations, as these practices help refugees establish stable food sources and livelihoods.

Mastorillo et al. (2022) examine the role of cash and food assistance in enhancing the self-reliance of refugees in Uganda. Their findings indicate that providing refugees with both cash and agricultural resources leads to increased food accessibility, as recipients are able to purchase seeds and other inputs necessary for cultivation. This dual approach not only addresses immediate food needs but also empowers refugees to take charge of their food production systems. Furthermore, George and Adelaja (2022) highlight the relationship between armed conflict, displacement, and food security in host communities. They assert that agrarian interventions aimed at integrating refugees into the local food economy can

significantly enhance food accessibility. The study emphasizes that such interventions must consider the unique challenges posed by conflict to ensure that food systems are resilient and inclusive.

Bashaasha et al. (2021) investigate Uganda's progressive refugee policy and its impact on food security among refugee households. They found that when agricultural policies are inclusive and considerate of refugee needs, they can lead to significant improvements in food accessibility. Their research highlights that access to land and agricultural inputs is crucial for refugees to enhance their food security. In parallel, Kamugisha et al. (2024) conducted a study on food insecurity in the Rhino Camp Refugee Settlement, revealing that refugees engaged in agricultural activities reported better food accessibility. The findings suggest that targeted agricultural interventions can effectively address food shortages in refugee contexts, thus promoting food stability and reducing reliance on aid.

Steine (2024) explores the dynamics of intercommunity relationships and their influence on agricultural innovation in refugee-host communities in Adjumani, Uganda. The study indicates that fostering collaboration between refugees and host communities through agrarian interventions not only improves food accessibility but also promotes social cohesion and knowledge sharing. This collaborative approach ensures that food systems are more robust and adaptable to the needs of both communities. Finally, Meixner Vasquez (2021) analyzes the impact of seed security programs on food security in Uganda, noting that such initiatives significantly enhance food accessibility among small-scale farmers, including refugees. The study underscores the importance of ensuring that refugees have access to quality seeds and agricultural training to improve their food production capabilities.

Effects of animal husbandry agrarian interventions on food quality in refugee settlements

Nisbet et al. (2022) highlight the role of food security interventions in enhancing food quality among refugees globally. Their research emphasizes that integrating refugees into local food systems through agricultural interventions can significantly improve food quality. By providing refugees with training in sustainable farming practices, they not only gain access to better-quality food but also improve their nutritional status. This intervention helps to build resilience against food insecurity, which is often exacerbated in refugee settings. Moreover, the authors found that enhancing agricultural capacity leads to greater self-reliance among refugees, contributing positively to their overall well-being (Nisbet et al., 2022).

Vos et al. (2020) corroborate these findings by exploring how integrating displaced communities into local food systems can improve food quality. They note that refugees often face challenges in accessing high-quality food due to disruptions caused by conflicts and displacement. However, when agricultural interventions are implemented, such as providing access to quality seeds and training on agronomic practices, refugees can produce healthier food options. This access not only enhances food quality but also promotes dietary diversity, which is crucial for combating malnutrition (Vos et al., 2020).

Muhangi et al. (2022) focus specifically on Nakivale Settlement in Uganda, revealing the transformative effects of agricultural interventions on food quality for refugee populations. Their research indicates that community-based agricultural programs have significantly increased the availability of diverse and nutritious foods. These programs empower refugees to cultivate their gardens, thereby improving their access to fresh fruits and vegetables. The authors emphasize that these interventions have led to improvements in dietary quality and nutritional intake among refugee households (Muhangi et al., 2022).

Pace et al. (2023) further support this assertion by highlighting the importance of agricultural value chains in refugee settings. Their baseline analysis in Uganda shows that when refugees are integrated into agricultural value chains, there is a notable increase in food quality and safety. By facilitating access to

markets and improving supply chains, refugees can sell their produce, which incentivizes them to invest in quality enhancements. The study emphasizes that these value chain interventions not only improve food quality but also enhance the economic stability of refugee households (Pace et al., 2023).

Osman and Abebe (2023) examine the implications of rural displacement on livelihoods and food quality in Somalia. The findings indicate that agrarian interventions aimed at displaced communities have the potential to enhance food quality significantly. The authors argue that when refugees are provided with agricultural resources and training, they can grow nutrient-rich crops, which are vital for improving food quality. Their study underscores the importance of tailored agricultural support in fostering sustainable livelihoods and improving the overall food quality of displaced populations (Osman & Abebe, 2023).

Jaspars (2021) focuses on the protracted crisis in Sudan, illustrating how agricultural interventions can address food quality issues among refugees. The research highlights that without adequate agricultural support, refugees often rely on low-quality food sources, which exacerbates their vulnerability to malnutrition. The author argues that targeted agricultural interventions can lead to significant improvements in food quality by enabling refugees to grow their food. This empowerment not only enhances food quality but also fosters social cohesion within refugee communities (Jaspars, 2021).

Mastorillo et al. (2022) provide evidence that cash and food assistance can also play a crucial role in improving food quality among refugees. Their research suggests that when refugees receive cash assistance alongside agricultural support, they are better positioned to purchase high-quality food items. This combination of support increases the overall quality of food available to refugee households, thereby improving their dietary diversity and nutritional intake (Mastorillo et al., 2022).

Kamugisha et al. (2024) on food insecurity in Rhino Camp Refugee Settlement in Uganda found that agricultural interventions significantly affect food quality and availability. The researchers noted that when refugees are involved in agricultural programs, there is a marked improvement in the quality of food produced, which leads to reduced food insecurity. The study emphasizes that enhancing agricultural practices not only improves the food quality available to refugees but also contributes to their overall well-being and resilience (Kamugisha et al., 2024).

Summary and gap in the literature

The literature review extensively discusses the Sustainable Livelihoods Framework (SLF) as a theoretical foundation for understanding how animal husbandry agrarian interventions can enhance food security among refugees, particularly in settlements like Nakivale. It emphasizes that access to five key types of assets human, social, physical, natural, and financial capital plays a crucial role in improving food availability, accessibility, and quality. Studies cited demonstrate that animal husbandry agrarian programs significantly enhance food security by increasing food production, improving access to diverse foods, and fostering self-reliance among refugees, thereby reducing dependency on food aid. However, a notable gap exists in the literature regarding the long-term sustainability of these animal husbandry agrarian interventions and their impact on community dynamics, particularly how integrating refugees with host communities influences the effectiveness of food security initiatives over time.

METHODS

Research design

According to Robson, (2002), research design is defined as planning the strategy of conducting research. This study used a cross-sectional research design where data from respondents was collected at a single point in time without repetition from the representative population. The design was chosen because of

being economical to conduct in terms of time (Barley, 2007). It was also used because it helped the researcher to capture information based on data gathered for a specific point in time. The data gathered was from a pool of participants with varied characteristics and demographics known as variables. Age, gender and education are all examples of variables. More so, through the use of the cross-sectional research design, the research findings helped in removing assumptions and replaced them with actual data on the specific variables studied during the time period accounted for.

The mixed-method research combining quantitative and qualitative research approaches was also used during the study (Creswell, 2012). The quantitative study was conducted using questionnaires among the selected refugees in Nakivale Refugee Settlement since they are the ones facing the challenges of conflicts. Qualitative study was conducted using interviews where the settlement commandant from the Office of the Prime Minister (OPM)-Department of Refugees and the welfare refugee council one, two and three consisting of elected members from the refugee population, particularly the chairperson and the UNHCR Livelihood Officer were used as key informants in order to get an in-depth analysis about the topic and these were also considered as K.Is since they had the relevant knowledge about the effect of animal husbandry agrarian interventions on food security in Nakivale Refugee Settlement.

Study area

The study was conducted in Nakivale Refugee Settlement located in Bukanga county, Isingiro district, South Western Uganda about 50km south of Mbarara city. Nakivale Refugee Settlement was chosen as the case for this study due to its status as one of Uganda's largest and oldest refugee settlements, facing chronic food security challenges despite ongoing agrarian interventions.

Study population

A population refers to all people or items with the characteristic one wish to understand which may be tangible or intangible. According to the records from the refugee settlement commandant, there are a total of 171,387 refugees of different nationalities i.e.; Democratic Republic of Congo, Burundi, Somalia, Rwanda, Ethiopia, and Eritrea. These refugees live in the three camps of the refugee settlement which are; Juru, Basecamp and Rubondo and these were included in the study as the target population. The study population also included; the settlement commandant from the Office of the Prime Minister (OPM)-Department of Refugees and the welfare refugee council one, two and three consisting of elected members from the refugee population, particularly the chairperson, the District Agricultural Officer (DAO), the UNHCR Livelihood Officer and two field coordinators from The Food and Agriculture Organization of the United Nations (FAO) totaling to 10 who were involved in the study as the key informants.

Inclusion and exclusion criteria

The inclusion criteria for this study require participants to be refugees residing in the Nakivale Refugee Settlement who are actively engaged in animal husbandry activities and have lived in the settlement for at least one year, ensuring they have sufficient experience with agrarian interventions affecting food security. Additionally, participants were a must to be over 18 years of age to provide informed consent. The exclusion criteria omitted individuals who were not directly involved in livestock activities or have resided in Nakivale for less than one year, as well as minors under the age of 18, to ensure that data is collected from those most directly affected and knowledgeable about the impact of animal husbandry on food security within the settlement.

Sampling procedure and sample size

The sample size was computed basing on the Slovin's (1970) method of calculation of sample size. The formula and computation are presented below;

$$n = \frac{N}{1 + N(e^2)}$$

Where n= sample size, N= population and e = margin of error/0.05

$$n = \frac{171,387}{1 + 171,387(0.05)^2}$$

$$n = \frac{171,387}{1 + 171,387(0.0025)}$$

$$n = \frac{171,387}{1 + 428.4675}$$

$$n = \frac{171,387}{428.4675}$$

$$n = 400$$

Therefore from the table above, the sample size was 400 respondents got from a total population of 171,387 refugees from the three zones in Nakivale Refugee Settlement.

Furthermore, the settlement commandant from the Office of the Prime Minister (OPM)-Department of Refugees and the welfare refugee council one, two and three consisting of elected members from the refugee population, particularly the chairperson and vice chairperson, the District Agricultural Officer, the UNHCR Livelihood Officer and two field coordinators from FAO totaling to 7 were included in the study as the key informants for qualitative data.

Table 1: Population and Sample Size

Category	Total population	Sample size	Sampling method
Refugees	171,387	400	Simple random sampling
Settlement commandant	1	1	Purposive sampling
Refugee council chairpersons and their assistants	5	5	Purposive sampling
UNHCR Livelihood Officer	1	1	Purposive sampling
District Agricultural Officer	1	1	Purposive sampling
Coordinators from FAO	2	2	Purposive sampling
TOTAL	171,397	410	

Source: Nakivale Refugee Settlement (2024)

Sampling technique and method

The researcher used both purposive and simple random sampling methods. Purposive sampling was used to select the key informants who were the settlement commandant from the Office of the Prime Minister (OPM)-Department of Refugees and the welfare refugee council one, two and three consisting of elected members from the refugee population, particularly the chairperson, the District Agricultural Officer, the UNHCR Livelihood Officer and two field coordinators from FAO since they are the ones responsible for ensuring food availability, accessibility and quality in the refugee settlement. The reason why purposive sampling was used for this category of respondents was because of their knowledge on the effect of animal husbandry agrarian interventions on food security in Nakivale Refugee Settlement, these individuals also had special qualification and therefore these categories of respondents were expected to provide in-depth information about the topic under study.

The refugees in Nakivale Refugee Settlement were selected using simple random sampling given that these were big in number and using this method eased their selection and gave each person to participate in the study, simple random sampling was preferred because its procedure is unbiased and prevents bias in their work and makes research on large populations more practical.

Sources of data

Primary source: Primary data are important for all areas of research because they are accurate information about the results of an experiment or observation. Primary data from the field was obtained through personal interviews and self-administered questionnaires to selected respondents in order to get their opinions. Primary data helped the researcher in collecting information for the specific purposes of their study. The researcher collected the data himself, using questionnaires and interviews.

Secondary source: Secondary data refers to handling, collecting and possibly processing data by people other than the researcher in question. For the purposes of a historical research project, secondary sources are generally scholarly books and articles. This source was used to collect data from already written literature for example e-books, journals, published articles and periodicals. And documentary resources were classified in order to facilitate the data collection and textual analysis (Mubazi 2008).

Data collection instruments

Three types of data collection instruments were used in the study. These included questionnaires, interview and observation guides which were briefly explained in the following subsection.

Questionnaires

Self-administered questionnaires were used to collect quantitative data from the refugees in Nakivale Refugee Settlement. Self-administered questionnaires were used for this category of respondents to save on time because their number is big to interview. According to Mugenda and Mugenda (2003), the self-administered questionnaires have self-administered questions in form of structured or closed ended questions. The standard questionnaire contains a list of possible alternatives from which respondents selected the answer that best suits the situation. The questionnaire was used to collect numerical data on the effect of animal husbandry agrarian interventions on food security in Nakivale Refugee Settlement to generalize the findings of the sample to the population. The researcher used close-ended questionnaires, which enabled coding data during analysis. The questionnaires were measured using a Likert scale where 5 (Strongly Agree), 4 (Agree), 3 (Not sure), 2 (Disagree) and 1 (Strongly Disagree).

Interview guide

According to Ahuja (2009), an interview is a two-person conversation initiated by the interviewer for the specific purpose of obtaining research-related information. The tool of data collection here was an interview guide which refers to a set of structured questions in which answers were recorded by the interviewer himself. This tool was used to collect information that could not be directly observed and that was good for the research problem which only depended on documented data and respondents' opinions. It was also good because it gave the research control over the line of questioning hence time saving. Data obtained during the interview supplemented that obtained through the questionnaire. Interviews were conducted with the settlement commandant from the Office of the Prime Minister (OPM)-Department of Refugees and the welfare refugee council one, two and three consisting of elected members from the refugee population, particularly the chairperson, the DAO, the UNHCR Livelihood Officer and the field coordinators from FAO since they are the ones responsible for ensuring food availability, accessibility and quality in the refugee settlement.

Observation guide

Observation guide was employed as a data collection instrument to complement the questionnaires and interviews in this study. This tool involves systematically watching and recording the behaviors, activities, and conditions related to animal husbandry agrarian interventions and their impact on food security within Nakivale Refugee Settlement. The researcher observed practices such as livestock handling, animal health care, and the storage and distribution of animal products to assess their effectiveness and alignment with food security goals. Observation was used because it allows for firsthand, unbiased data collection, capturing practical realities and subtle details that respondents may not disclose or may overlook in questionnaires and interviews. This method ensures a holistic understanding of the interventions' implementation and outcomes.

Validity and Reliability for Quantitative Research

Validity was done in order to find out whether the questions are capable of capturing the intended data (Cohen et al., 2007). Experts in research reviewed the questions to see whether they were capable of capturing the intended response. A Content Validity Index (CVI) was calculated in order to establish the validity of the research instrument. The researcher used the following formula to establish validity of the research instruments as seen below.

Content validity Index (CVI) = $\frac{\text{Relevant items by all judges as suitable}}{\text{Total number of items judged.}}$

The validity results were exhibited below as follows;

Table 2: Content Validity Index (CVI)

Variables	No. of Questions	No. of Valid	CVI
Animal husbandry agrarian interventions	6	6	0.96
Food availability	6	5	0.85
Food accessibility	6	5	0.85
Food quality	6	6	0.96
Overall CVI	24	22	0.90

Source: Primary data

From table 3 above, it is obvious that the overall variables were valid as their CVI exceeded 0.70. This means that the tool was valid as highlighted by Amin (2005), as validity test gave in an average index of 0.90 (90%).

On the other hand, reliability of the questionnaire instrument was assessed using Cronbach's coefficient alpha (Mugenda and Mugenda, 2003). A pilot study was carried out on 10 respondents and the reliability results were computed using the Statistical Package for the Social Sciences (SPSS). The following formula was used to calculate the Cronbach's coefficient alpha;

$$\alpha = \frac{k}{K-1} \left(1 - \frac{\sum SD_i^2}{\sum SD_t^2} \right)$$

Where α = coefficient alpha

$\sum SD_i^2$ = sum variance of items

$\sum SD_t^2$ = sum variance of scale

Table 3: Reliability test using Cronbach alpha values

Variables	Cronbach alpha values
Animal husbandry agrarian interventions	.954
Food availability	.953
Food accessibility	.944
Food quality	.910

Source: *Primary data*

Table 3 assessed the level of reliability of the research, in case of the questionnaire which was used to gather data sets from the field. From the results of the reliability levels using Cronbach alpha values can be viewed in respect to the acceptable levels. It can be seen that all the values are above the recommended 0.70 meaning that the questionnaire was reliable enough.

Validity and Reliability for Qualitative Research

To ensure validity and reliability in qualitative research for this study, a multi-faceted approach was employed. Validity was enhanced through methods such as triangulation, where data from various sources or methods is compared to confirm findings, and member checking, where participants review and validate the accuracy of their responses. Reliability was addressed by maintaining a consistent data collection process, using clear and well-documented procedures, and ensuring researcher reflexivity to recognize and mitigate personal biases. Additionally, detailed documentation of the research process and regular peer reviews supported the robustness and dependability of the study's findings.

Procedure of data collection

After successful proposal defense, the researcher obtained an introductory letter from the University, after which he sought for permission from the commandant of Nakivale Refugee Settlement to use as a case study. The researcher then approached various respondents to conduct interviews and distribute the questionnaires after the respondents had consented. The researcher was assisted by selected and trained research assistants who were well versed with the languages of all the refugee populations in Nakivale Refugee Settlement during the process of data collection for easy communication and understanding of the questions asked.

Analysis of quantitative data

This was done through classification of respondents into categories called codes. It involved sorting, editing questionnaires and coding responses after which data was tabulated and analyzed using a computer program known as Statistical Package for Social Sciences (SPSS) version 25. It was used because it provides a wide range of tools from basic tabulation to sophisticated multivariate analysis. It is widely used to analyze quantitative data, meaning that data in form of tables and figures. It is also commonly used in both academic and commercial spheres (Mubazi, 2008). This software was also used by the researcher because it saves time of analyzing and it interprets complicated figures. The process of data processing involved editing in order to check for errors and omissions, coding was employed to reduce the data to a meaningful pattern of responses and tabulation of the findings were done in order to prepare data, analyze and compile the research report.

Data editing: This requires the researcher to edit the data by examining the collected raw data to detect errors and omissions. Therefore, the researcher undertook careful scrutiny of the completed questionnaires. Editing was of help to ensure that the data was accurate, consistent with other facts gathered, uniformly entered, and well arranged to facilitate coding and tabulation.

Coding refers to the process of assigning numerals or other symbols to answers so that responses can be put into a limited number of categories or classes. The researcher ensured exhaustiveness and mutual exclusiveness (a specific answer is placed in only one cell in a given category set). Coding was necessary for the efficient analysis, as several replies were reduced to a small number of classes, which contain critical information required for analysis.

Analysis of qualitative data

Deeper comprehension of the information given was required in qualitative data analysis. Data analysis developed into a continuous process involving ongoing reflection on the data gathered, asking analytical questions, and creating notes during the course of the study, which was finally included in the final report (Yin, 2002). The process of qualitative data analysis begun with the data management phase and move through the generative phase, interpretative phase, representational phase, and theorizing phase. A six-step process was used, starting with organizing and getting the raw data ready for analysis. To clarify and triangulate the audio records that the lead researcher would find to be unclear, he referred to field notes she took while conducting interviews and reviewing documents. The field notes, audiotapes, and transcription that were used during the interview process were all documented. Transcription was done every evening for the interviews conducted each day. In order to preserve memory, the researcher also typed up all of their field notes after each outing.

Furthermore, in the qualitative data analysis process, coding was employed to systematically organize and categorize raw data, transforming it into meaningful units. Through an iterative approach, initial codes were developed, refined, and organized into broader categories, capturing key themes and patterns within the data. Thematic analysis was then utilized to identify overarching themes that encapsulate the essence of the qualitative information. This methodological approach ensured a rigorous and systematic exploration of the data, allowing for the extraction of nuanced insights and patterns that contribute to a comprehensive understanding of the phenomena under investigation.

Measurement of variables

In this study, variables were measured using a combination of quantitative and qualitative methods to ensure comprehensive data collection. The key independent variables agrarian interventions (such as; livestock provision, veterinary services and capacity building) were operationalized through structured questionnaires using Likert scales. These scales captured the effectiveness and availability of agrarian interventions in Nakivale Refugee Settlement. The dependent variable, food security, was also measured using Likert scale items designed to assess food availability, food accessibility, and food quality. Data was systematically coded and analyzed to identify patterns and relationships between agrarian interventions and food security, ensuring alignment with the research objectives and providing reliable and valid results.

RESULTS

Response rate

Table 4: Response rate for questionnaires

Response Rate	Sample Size	
	Frequency	Percentage (%)
Received	400	100.0%
Non Response	00	0.0%
Expected Response	400	100.0%

Source: *Primary data*

According to table 4 above a total of 400 (100%) respondents who are selected refugees from the refugees from the three zones in Nakivale Refugee Settlement were expected to be involved in the study and all the respondents gave their response giving a response rate of 100%. The reason for the high response rate was due to the fact that the researcher had enough time to collect the data himself and given that the respondents were in one area which is the refugee settlement and they were easily mobilized by zone leaders through authorization from the Refugee Settlement Commandant.

Findings on demographic characteristics of respondents

The background information of respondents solicited data on the samples and this has been presented below categorized into; gender, age, highest level of education, nationality and period the refugees have spent living in Nakivale Refugee Settlement.

Table 5: Descriptive statistics on the bio data of respondents

Item	Description	Frequency	Percentage (%)
Gender	Male	177	44.3
	Female	223	55.7
	Total	400	100.0
Age	Below 20 years	49	12.3
	21-30 years	136	34.0
	31-40 years	113	28.2
	Above 40 years	102	25.5
	Total	400	100.0
Education level	Primary	122	30.5
	Secondary	90	22.5
	Tertiary	72	18.0
	Others (no education)	116	29.0
	Total	400	100.0
Refugees' nationalities	Congolese	142	35.5
	Eritreans	100	25.0
	Somalis	77	19.2
	Burundians	46	11.5
	Rwandese	35	8.8
	Total	400	100.0
Period spent living in the refugee settlement	Less than 5 years	69	17.3
	6-10 years	102	25.5
	11-15 years	140	35.0
	Above 15 years	89	22.2
	Total	400	100.0

Source: Primary data

From table 5 above, the findings indicate that the majority of the participants were female represented by 55.7%, in contrast to male respondents who were represented by 44.3%. This indicates that women were over-represented among the study group in comparison to men, thus women-headed households could

have had higher participation or engagement in agrarian intervention in animal husbandry among Nakivale Refugee Settlement.

The findings also revealed that most of the respondents were aged 21–30 years represented by 34.0%, followed by 31–40 years represented by 28.2%. Older than 40 years old accounted for 25.5%, while the smallest category was less than 20 years represented by 12.3%. The above shows that the highest number of the respondents was young adults and people in their youth, an age bracket that would be more active in animal husbandry activities than the aged and the younger ones.

Furthermore, most of the respondents with the highest proportion have at least attained primary education represented by 30.5%, while those with no education were at 29.0%. The respondents with secondary education accounted for 22.5%, and those with tertiary education were the lowest at 18.0%. This implies that most of the refugees in Nakivale have low levels of education, with a high proportion having primary or no education, which might have an influence on the adoption and use of animal husbandry training.

In addition, majority of the respondents were Congolese represented by 35.5%, while Eritreans comprised 25.0% of the population. Somalis accounted for 19.2% and Burundians 11.5%. Rwandese were the least numerous at 8.8%. This shows that Congolese and Eritreans comprise the largest refugee populations in Nakivale, which could impact the cultural diversity of food habits and preference for livestock in the settlement.

Finally, a big number of the respondents have been living in the settlement for 11–15 years represented by 35.0%, followed by those who had lived for 6–10 years represented by 25.5%. Refugees who had lived in Nakivale for over 15 years made up 22.2%, and the fewest were those who had lived for less than 5 years were represented by 17.3%. This means that most of the refugees are long-term residents, and this can mean that they have gained a lot of experience and adaptation in terms of embracing agrarian interventions such as animal husbandry.

The effects of animal husbandry agrarian interventions on food availability in Nakivale Refugee Settlement

Table 6 summarizes respondents' responses on the effects of animal husbandry agrarian interventions on food availability in Nakivale Refugee Settlement by using a Likert scale where SA (Strongly Agree), A (Agree), NS (Not Sure), D (Disagree) and SD (Strongly Disagree).

Table 6: The effects of animal husbandry agrarian interventions on food availability in Nakivale Refugee Settlement

Statements	Extent of agreement and disagreement				
	SA	A	NS	D	SDA
	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)
Animal husbandry activities have increased the availability of diverse food sources in our settlement.	288 72.0%	32 8.0%	00	80 20.0%	00
Due to animal husbandry programs, I feel there is less need to depend solely on food aid for daily meals.	256 64.0%	56 14.0%	32 8.0%	32 8.0%	24 6.0%
The livestock provided by agrarian interventions has improved the quantity of food available to my household.	160 40.0%	160 40.0%	00	56 14.0%	24 6.0%
Animal farming has led to a more reliable food supply throughout the year in our community.	64 16.0%	224 56.0%	56 14.0%	24 6.0%	32 8.0%

The training provided in animal husbandry has contributed to improved food availability in our settlement.	192 48.0%	176 44.0%	00	32 8.0%	00
The animal husbandry interventions have enabled me to have surplus food that I can share or sell within the community.	64 16.0%	184 46.0%	96 24.0%	24 6.0%	32 8.0%

Source: *Primary data*

According to the study in table 6 above, 80.0% of the respondents agreed that animal husbandry operations have increased the diversity of food sources in the settlement, whereas 20.0% of the respondents disagreed with the statement. This implies that animal husbandry is largely viewed to be sustainable way of enhancing food diversity in Nakivale Refugee Settlement, which implies that scaling up and sustaining such interventions would have a greater positive effect on the diversity of animal products consumed among refugee households.

The findings also indicated that 78.0% of the respondents agreed that with animal husbandry programs, there is less reliance on humanitarian food aid for regular meals, while 14.0% of the respondents disagreed and 8.0% were not certain about the statement. This supports the fact that animal husbandry is increasingly reducing reliance on humanitarian food aid, meaning that strengthening these interventions can promote self-sufficiency and food independence among refugees.

Furthermore, findings showed that 80.0% of respondents agreed that livestock provided under agrarian interventions has increased the quantity of food being received in households, whereas 20.0% of respondents disagreed with the statement. This denotes the role of livestock distribution in increasing household food stocks, which implies that livestock provision can be scaled up to increase food adequacy among refugees.

More so, the results confirmed that 72.0% of the participants concurred that animal farming has ensured a year-round consistent food supply in the community, 14.0% disagreed, 8.0% strongly disagreed, and 14.0% were not sure about the statement. This, therefore, reinforces that animal husbandry assures year-round food consistency, which assumes that there can be constant support for animal farming to fill seasonal food gaps within the settlement.

In addition, the findings established that 92.0% of the respondents agreed that training provided in animal husbandry has resulted in increased food availability, whereas 8.0% of the respondents disagreed with the statement. This confirms that training equips refugees with knowledge and skills necessary for effective animal breeding, thus implying that ongoing training programs are crucial in increasing food security outcomes through improved livestock management.

Lastly, the findings showed that 62.0% of the respondents agreed that animal husbandry interventions have enabled them to have surplus food to share or sell within the community, whereas 14.0% disagreed, 8.0% strongly disagreed, and 24.0% were not sure about the statement. This presents the potential of animal husbandry not only to respond to household needs but also to help generate income, thus implying that the strengthening of such programs has the potential to improve livelihoods and food security among refugees.

Overall, the findings demonstrate that agrarian intervention in animal husbandry has significantly improved the availability of food in Nakivale Refugee Settlement. The majority of the respondents in all statements understood that such interventions have increased food sources, reduced dependence on food aid, increased food quantity, provided stability of supply throughout the year, increased knowledge from

training, and in certain cases created surplus to be shared or sold. These findings indicate that animal husbandry is an important factor in food security among refugees, and sustained investment in the provision of livestock, veterinary services, and building capacities is needed to maintain and improve the availability of food in refugee camps. The findings of the study concerning the effects of animal husbandry agrarian interventions on food availability in Nakivale Refugee Settlement were further determined using Pearson's correlation that was conducted as shown below;

Table 7: Pearson's correlation on animal husbandry agrarian interventions and food availability in Nakivale Refugee Settlement

Correlations			
		Animal husbandry agrarian interventions	Food availability
Animal husbandry agrarian interventions	Pearson Correlation	1	.656**
	Sig. (2-tailed)		.000
	N	400	400
Food availability	Pearson Correlation	.656**	1
	Sig. (2-tailed)	.000	
	N	400	400

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

Source: Primary data

The findings indicated in the table above show that there is a significant positive relationship between animal husbandry agrarian interventions and food availability in Nakivale Refugee Settlement. This is affirmed by r-values of 0.656** with significant p-values of 0.000 at the level of 0.05 (2tailed) as ($r = .656^{**}, p < .05$). This implies that strengthening animal husbandry agrarian interventions directly enhances food availability in Nakivale Refugee Settlement, meaning that the more such programs are implemented, the greater the improvement in household food supply.

Influence of animal husbandry interventions on food availability

From the interviews conducted with the key informants who are; settlement commandant from the Office of the Prime Minister (OPM)-Department of Refugees and the welfare refugee council one, two and three consisting of elected members from the refugee population, particularly the chairperson, the DAO, the UNHCR Livelihood Officer and the field coordinators from FAO, they were asked for their views on how animal husbandry interventions influenced food availability for refugees in the settlement and their responses were as follows;

The responses from the key informants revealed that animal husbandry interventions have played a very vital role in improving food availability within Nakivale Refugee Settlement. In their opinion, through the distribution of livestock such as goats, poultry, and cattle, the majority of households are now able to obtain animal-based foods such as milk, meat, and eggs directly. These products have also diversified the diets of the refugee families and reduced dependence on food aid, thus fostering self-reliance. Furthermore, increased numbers of livestock at the household level have implied a constant and regular food supply throughout the year.

The informants also noted that the introduction of training sessions in animal husbandry has empowered refugees with skills to sustain and support the distributed animals. Such capacity-development efforts have

resulted in improved livestock productivity, such that not only are households taking in more animal products, but they are also producing surpluses that can be given away or sold within the settlement. The availability of animal-source food products has, therefore, been increased at both the household and local market levels, making these products more accessible to the whole community.

Also, activities such as veterinary care and vaccination campaigns were mentioned as being significant in maintaining livestock health and productivity. This has reduced animal mortality and rendered livestock a more sustainable source of food. Informants indicated that refugees are now less vulnerable to food shortages since animal husbandry provides a renewable source of food. They emphasized that these interventions are gradually transforming the settlement from a very externally reliant location to one where refugees can sustainably meet their own food requirements. Some of the selected respondents reported that;

“.....Animal husbandry has reduced the heavy reliance on food aid because families can now get milk, eggs, and meat directly from their livestock.....” **Key Informant 1**

“.....With the veterinary support and training, livestock survival rates have increased, which means more reliable food for the households and the local community.....” **Key Informant 2**

Specific animal husbandry programs enhancing food availability in Nakivale

From the interviews conducted with the key informants who are; settlement commandant from the Office of the Prime Minister (OPM)-Department of Refugees and the welfare refugee council one, two and three consisting of elected members from the refugee population, particularly the chairperson, the DAO, the UNHCR Livelihood Officer and the field coordinators from FAO, they were asked for their views on the specific animal husbandry programs that have contributed to increasing the availability of food resources in Nakivale and their responses were as follows;

The responses from the key informants seemed to indicate that several animal husbandry projects have been instrumental towards improving the access to food for refugees in Nakivale. Among the most outstanding were livestock distribution programs, where families were given goats, chickens, and cattle to boost their short-term as well as long-term food needs. These programs were targeted as vital as they elevated the yield of animal commodities such as milk, eggs, and meat directly, which not only improved diet diversity but also reduced excessive reliance on food aid.

The second program emphasized was the establishment of community-based breeding and restocking programs. The informants noted that such programs supported sustainability through restocking of the animals and introduction of improved breeds, which were more productive and suited to local conditions. The programs were complemented by veterinary services such as vaccination and disease control campaigns, which ensured animal health and prevented losses, thereby ensuring a consistent supply of food resources in the settlement.

Training and capacity-building programs were also reported as significant interventions. New animal husbandry skills of feeding, housing, and disease control were acquired by refugees through practical training exercises. Such knowledge helped families achieve maximum productivity from livestock, which later resulted in higher availability of food made from animal products. Training was reported by informants to have played a crucial role in realizing long-term benefits from the livestock distributed and reducing cases of animal loss due to improper handling.

Additionally, market-linkage and value chain development activities were noted as being a major contribution. They exposed the refugees to local markets, allowing them to sell surplus animal products like poultry meat, eggs, and milk. The income thus generated allowed households to purchase more food,

thus broadening food availability beyond direct livestock production. Informants also emphasized the importance of partnerships with organizations such as FAO and UNHCR to ensure continuity and mobilization of resources to support these programs. Some of the selected respondents reported that;

“.....The livestock distribution programs, especially goats and poultry, have been a game-changer because they give families a steady source of food like milk and eggs almost immediately.....” **Key informant 3**

“.....When refugees are trained on how to care for the animals and linked to markets, the impact goes beyond just food—families also gain income to buy other essentials.....” **Key informant 4**

The effects of animal husbandry agrarian interventions on food accessibility in Nakivale Refugee Settlement

Table 8 summarizes respondents' responses on the effects of animal husbandry agrarian interventions on food accessibility in Nakivale Refugee Settlement by using a Likert scale where SA (Strongly Agree), A (Agree), NS (Not Sure), D (Disagree) and SD (Strongly Disagree).

Table 8: The effects of animal husbandry agrarian interventions on food accessibility in Nakivale Refugee Settlement

Statements	Extent of agreement and disagreement				
	SA	A	NS	D	SD
	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)
Animal husbandry initiatives have made it easier for me to access nutritious food in this settlement.	192 48.0%	96 24.0%	24 6.0%	56 14.0%	32 8.0%
Raising animals has provided me with the resources needed to obtain other food items in the local market.	64 16.0%	248 62.0%	00	56 14.0%	32 8.0%
I am now able to access animal-based foods, such as milk or eggs, more frequently than before.	128 32.0%	192 48.0%	00	80 20.0%	
My household has experienced improved access to food due to increased income from animal husbandry.	224 56.0%	88 22.0%	32 8.0%	32 8.0%	124 6.0%
The accessibility of locally produced food has improved through the animal husbandry programs.	160 40.0%	160 40.0%	00	56 14.0%	24 6.0%
The livestock products from these interventions are affordable and accessible within our community.	64 16.0%	224 56.0%	56 14.0%	24 6.0%	32 8.0%

Source: Primary data

According to the study in table 8 above, 72.0% of the respondents agreed that animal husbandry activities have facilitated easier access to nutritious food in the settlement, while 22.0% disagreed and 6.0% were not sure about the statement. This means that a majority of the refugees are of the view that animal husbandry has enhanced their access to nutritious food, meaning more investment in such programs is essential in ensuring that refugees eat balanced and healthy diets.

The findings also showed that 78.0% of the interviewees agreed that raising animals has provided them with resources to have access to other foodstuffs in the local market, whereas 22.0% disagreed with the statement. This reveals that animal husbandry not only provides explicit food products but also yields

exchangeable resources such as income or animal by-products, which means that livestock farming improves food purchasing power and household capacity to withstand food unavailability.

Furthermore, the findings showed that 80.0% of the respondents agreed that they have greater access to animal foods such as milk and eggs more frequently than previously, while 20.0% disagreed with the above statement. This confirms that agrarian interventions are, in fact, increasing access and frequency to animal foods, which confirms that the programs are improving refugees' dietary diversity and protein consumption directly.

More so, the findings established that 78.0% of the respondents agreed that their families experienced increased access to food due to increased income from animal husbandry, 14.0% disagreed, 6.0% strongly disagreed, and 8.0% were not sure about the statement. This points towards the role of animal husbandry in generating household income, which in turn enables refugees to purchase more food options, and, by extension, farming animals is both a livelihood and food security strategy.

In addition, the study findings indicated that 80.0% of the respondents agreed with the assertion that locally produced food is more available through animal husbandry initiatives, whereas 20.0% disagreed with the assertion. This indicates that animal husbandry has enhanced food availability in the settlement, and that promoting local livestock production can reduce dependence on external supply chains as well as strengthen community-based food systems.

Lastly, the findings revealed that 72.0% of the respondents agreed that the products from such interventions were within reach and affordable to the community, whereas 22.0% disagreed and 14.0% were not sure about the statement. This means that most of the refugees find the animal products to be affordable and within reach, which implies that the interventions not only result in food access but also its affordability, which matters when in refugee camps where incomes are usually low.

Overall, the findings indicate that animal husbandry agrarian interventions have significantly improved food accessibility in Nakivale Refugee Settlement. Across all the statements, the majority of respondents affirmed that animal husbandry programs have improved the availability of nutritious food, provided means to purchase more food items, enhanced the frequency of accessing animal products, and raised household income to improve food accessibility. The interventions have also enhanced the availability of locally produced food and ensured the affordability and availability of livestock products. The implications of the findings are that animal husbandry is a pillar of food availability in the settlement with both direct and indirect effect in terms of food provision and income and access to the market respectively among refugees. The findings of the study concerning the effects of animal husbandry agrarian interventions on food accessibility in Nakivale Refugee Settlement were further determined using Pearson's correlation that was conducted as shown below;

Table 9: Pearson's correlation on animal husbandry agrarian interventions and food accessibility in Nakivale Refugee Settlement

Correlations			
		Animal husbandry agrarian interventions	Food accessibility
Animal husbandry agrarian interventions	Pearson Correlation	1	.623**
	Sig. (2-tailed)		.000
	N	400	400
Food accessibility	Pearson Correlation	.623**	1

	Sig. (2-tailed)	.000	
	N	400	400
**. Correlation is significant at the 0.05 level (2-tailed).			

Source: *Primary data*

The findings indicated in the table above show that there is a significant positive relationship between animal husbandry agrarian interventions and food accessibility in Nakivale Refugee Settlement. This is affirmed by r-values of 0.656** with significant p-values of 0.000 at the level of 0.05 (2tailed) as ($r = .623^{**}$, $p < .05$). This implies that enhancing animal husbandry agrarian interventions significantly improves food accessibility in Nakivale Refugee Settlement, suggesting that increased livestock-related support directly enables households to obtain food more easily.

Influence of animal husbandry interventions on food accessibility

From the interviews conducted with the key informants who are; settlement commandant from the Office of the Prime Minister (OPM)-Department of Refugees and the welfare refugee council one, two and three consisting of elected members from the refugee population, particularly the chairperson, the DAO, the UNHCR Livelihood Officer and the field coordinators from FAO, they were asked for their views on ways how animal husbandry initiatives have impacted refugees' access to food within the settlement and their responses were as follows;

The interviews with the key informants revealed that the animal husbandry projects increased the access of food to the refugees in Nakivale Refugee Settlement by availing multiple sources of nutrition to the households. Refugees are directly able to consume animal-based foods such as milk, eggs, and meat from their livestock, reducing dependency on intermittent or unsatisfactory food distributions. This consistent availability of animal products has helped provide easier access to well-balanced foods and dietary variety by households, previously limited by high reliance on staple food relief.

The second important channel through which animal husbandry programs have shaped food access is by reducing the economic limitations that refugees typically face while trying to obtain meals. By raising livestock, the majority of households are in a position to eat part of their crops and sell the rest at the nearby markets to gain income. The generated income is utilized to purchase other foods such as fruits, cereals, and vegetables, thereby increasing the quantity and diversity of food at their disposal. This strategy has been advantageous on two counts: direct access and indirect access through money generation.

Key informants also noted that animal husbandry has improved accessibility through the reduction of distance and effort required by refugees to seek access to food. Previously, refugees would walk for long distances to markets outside the settlement to procure animal products, but with rearing animals in the settlement, such products are made locally accessible. This has enabled physical access to food, especially for low-income groups like women, children, and the elderly who may not be able to go far in looking for simple nutrition.

Additionally, the presence of community-based animal husbandry programs has promoted a feeling of sharing resources among the refugees. The informants attributed the reason why some families with more livestock share or sell products like milk and eggs to their neighbors at affordable prices, ensuring even those households with no animals are still in a position to access such food. This system of exchange motivated by the community has enhanced the availability of food within the settlement and decreased food access inequalities.

Capacity-building activities were also found necessary in sustaining access to food. Trained refugees in animal breeding, animal feeding, and disease management have been able to sustain healthy animals as

well as sustained animal product supplies. These capacities have reduced the likelihood of livestock losses and sustained regular supplies of food, improving the sustainability and reliability of access to food in the settlement. Acquired information also allows refugees to operate small-scale livestock enterprises, thereby improving food security.

Finally, informants noted that partnerships with organizations such as FAO and UNHCR have remained the most significant drivers of up-scaling animal husbandry projects, therefore improving access to food resources. Through provision of veterinary services, improved breeds and feed supplements, these institutions enhance livestock productivity to high levels, thereby availing animal-based foods to refugees on a regular basis. Such coordination has also strengthened market systems in the settlement, offering alternative means of accessing food through exchange and purchase. Some of the selected respondents reported that;

“.....By having animals within the settlement, refugees don’t just wait for food distributions anymore; they can get milk, eggs, and even sell some products to buy what they lack.....” **Key Informant 5**

“.....Animal husbandry has brought food closer to the people—families no longer have to struggle or travel long distances to access nutritious foods.....” **Key Informant 6**

The effects of animal husbandry agrarian interventions on food quality in Nakivale Refugee Settlement

Table 10 summarizes respondents’ responses on the effects of animal husbandry agrarian interventions on food quality in Nakivale Refugee Settlement by using a Likert scale where SA (Strongly Agree), A (Agree), NS (Not Sure), D (Disagree) and SD (Strongly Disagree).

Table 10: The effects of animal husbandry agrarian interventions on food quality in Nakivale Refugee Settlement

Statements	Extent of agreement and disagreement				
	SA	A	NS	D	SDA
	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)
The animal husbandry programs have improved the quality of the food I consume.	288 72.0%	32 8.0%	00	80 20.0%	00
Since the agrarian interventions began, the nutritional value of food in my diet has increased.	256 64.0%	56 14.0%	32 8.0%	32 8.0%	24 6.0%
I believe the animal products obtained from these programs are safer and healthier for my family.	160 40.0%	160 40.0%	00	56 14.0%	24 6.0%
These interventions have introduced high-quality, fresh animal-based foods like milk and eggs to our settlement.	64 16.0%	224 56.0%	56 14.0%	24 6.0%	32 8.0%
The quality of food available within the community has been enhanced by the animal husbandry interventions.	192 48.0%	176 44.0%	00	32 8.0%	00
The training in animal farming practices has led to higher standards in the quality of food products in our area.	64 16.0%	184 46.0%	96 24.0%	24 6.0%	32 8.0%

Source: Primary data

According to the study in table 10 above, 80.0% of the participants agreed that animal husbandry programs improved the quality of food they consume, whereas 20.0% disagreed with the statement. It, therefore,

indicates that most refugees consider animal husbandry programs to be among the most important elements in improving food quality, meaning the intervention is essential to raising overall food levels and food performance in the settlement.

The survey further showed that 78.0% of the respondents agreed that the nutritional quality of food in their diets improved since the agrarian interventions began, whereas 20.0% disagreed and 8.0% were not sure about the statement. This shows that most households recognize improvements in dietary composition of their diets, demonstrating that animal husbandry interventions are directly associated with increased healthier and balanced consumption profiles.

Furthermore, the findings revealed that 80.0% of the respondents agreed that animal products from such programs are safer and healthier for their families, whereas 20.0% disagreed with the statement. This reveals the positive attitude of livestock interventions towards food safety and health, indicating that programs that promote animal welfare and veterinary care play a key role in guaranteeing the consumption of safe high-quality animal products.

More so, the findings established that 72.0% of the respondents agreed that the interventions have introduced high-quality, fresh animal-based foods like milk and eggs into the settlement, whereas 28.0% of the respondents disagreed with the statement. This highlights that most of the refugees have been impacted by enhanced diversity and freshness of animal products; hence animal husbandry programs are crucial in enhancing food diversity and freshness at the local level.

In addition, findings indicated that 92.0% of respondents agreed that food quality provided in the community has been enhanced because of animal husbandry interventions, whereas 8.0% disagreed with the statement. Evidence indicates that there is considerable agreement that livestock programs enhance food quality throughout the settlement, which implies that sustained maintenance and scaling up of the interventions will increase individual and group dietary well-being in refugee households.

Lastly, the study showed that 62.0% of the participants agreed that training in animal farming practice has led to enhanced levels of quality in the products, whereas 14.0% disagreed and 24.0% were not sure about the statement. This means that while most of the respondents find training to be effective, there is still uncertainty and some disharmony, indicating a need for more specific and prolonged capacity development programs to maximally maximize improvements in food quality through skills transfer.

Overall, the findings indicate that agrarian interventions in animal husbandry have significantly enhanced food quality in Nakivale Refugee Settlement. All the interviewees testified unequivocally that these programs improved the quality of food, nutritional value, safety, and freshness and community-level standards of food. Although some uncertainty still exists regarding the impact of training in animal husbandry, by and large, the perception is that livestock interventions have enhanced the quality of meat produce available for consumption. This implies that constructing such interventions, especially in capacity building, could further entrench food quality gains and empower refugees to always consume safe, healthy, and high-quality animal-based foods. The findings of the study concerning the effects of animal husbandry agrarian interventions on food quality in Nakivale Refugee Settlement were further determined using Pearson's correlation that was conducted as shown below;

Table 11: Pearson's correlation on animal husbandry agrarian interventions and food quality in Nakivale Refugee Settlement

Correlations			
		Animal husbandry agrarian interventions	Food quality
Animal husbandry agrarian interventions	Pearson Correlation	1	.644**
	Sig. (2-tailed)		.000
	N	400	400
Food quality	Pearson Correlation	.644**	1
	Sig. (2-tailed)	.000	
	N	400	400

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

Source: *Primary data*

The findings indicated in the table above show that there is a significant positive relationship between animal husbandry agrarian interventions and food quality in Nakivale Refugee Settlement. This is affirmed by r-values of 0.656** with significant p-values of 0.000 at the level of 0.05 (2tailed) as ($r = .656^{**}$, $p < .05$). This implies that animal husbandry agrarian interventions significantly enhance food quality in Nakivale Refugee Settlement, indicating that livestock-related programs directly contribute to safer, healthier, and more nutritious diets for refugees.

Influence of animal husbandry interventions on food quality

From the interviews conducted with the key informants who are; settlement commandant from the Office of the Prime Minister (OPM)-Department of Refugees and the welfare refugee council one, two and three consisting of elected members from the refugee population, particularly the chairperson, the DAO, the UNHCR Livelihood Officer and the field coordinators from FAO, they were asked for their views on ways how animal husbandry initiatives have impacted refugees' access to food within the settlement and their responses were as follows;

Key informant interviews revealed that animal husbandry interventions have had a positive impact on the nutrition provided to refugees in Nakivale by introducing new fresh protein-rich animal foods into the diet. The majority of homes before these interventions were nearly completely reliant on rations made up of cereals and legumes with very little nutritional diversity. With animal rearing such as goats, poultry, and cattle, refugees now have uninterrupted access to milk, eggs, and meat, which are rich in essential nutrients such as proteins, vitamins, and minerals. This has significantly improved the nutrition quality of the food consumed in the settlement.

Informants also pointed out that the animal husbandry projects have contributed to easier food safety standards. Animal handling, hygiene, and the proper handling of animal products are training courses that have minimized risk factors for food contamination. Refugees have also been educated on the proper milking, safe storage of animal products, and processing products such as ghee and cheese without their quality being compromised. As such, homes are now safer as far as food consumption is concerned, which means less health risk from foodborne illnesses.

Another of the primary impacts noted was the improvement in consumed food freshness. Compared to imported or distributed rations that may be stored for long periods prior to being transported to the settlement, animal food items like eggs and milk are easily available and consumed within moments of

collection. This immediacy ensures better freshness and nutritional value compared to stored or processed alternatives. The availability of fresh animal products has thus enhanced the quality of refugee meals, especially for vulnerable groups like children and pregnant women.

The respondents also included that the availability of improved breeds of animals through these programs has assisted in enhancing the quality of foods available. Better breeds of chickens and cows, for example, produce eggs and milk of higher quality with a superior nutrition level compared to their conventional equivalents. This not only increased the taste and nutrition of the foods but also created by-products that could be sold, further supporting the quality image among consumers of the settlement.

Besides this, capacity-building components of the animal husbandry interventions have trained refugees with skills that are able to sustain high-quality production. Training in feeding regimes, disease management, and utilization of veterinary services has kept livestock healthy and thus producing safe and high-quality animal products. Informants emphasized that this knowledge transfer has reduced cases of poor-quality or unsafe food, and therefore the entire settlement benefits from better nutrition outcomes.

Lastly, humanitarian organizations such as UNHCR and FAO were seen to be involved in the provision of assistance to veterinary facilities, supplementation of feed and ongoing vaccination campaigns as a main aspect of food quality assurance. These steps guarantee that the animals remain productive and disease-free, something that does not jeopardize the quality of the produced food. Refugees feel more secure in the food they consume because they are assured of the health and safety of their animals. Generally, the programs have led to a tremendous reduction in the level of malnutrition, safety, and acceptability of the food that ends up in the refugee community in Nakivale. Some of the selected respondents reported that;

“.....With these programs, refugees are now eating fresher and more nutritious food like eggs and milk, which were not common in their diet before.....” **Key Informant 7**

“.....The training on animal care and food handling has improved the safety and quality of what people consume, reducing illnesses that used to come from poor food hygiene.....” **Key Informant**

8

DISCUSSION OF FINDINGS

Effects of animal husbandry agrarian interventions on food availability in Nakivale Refugee Settlement

The findings of the study showed that animal husbandry interventions in Nakivale operationalized diets diversified with meat, eggs, and milk and reduced dependence on food aid and year-round supply stabilization. The findings harmonize with the literature by Nisbet et al. (2022) who illustrate that targeted agricultural interventions among refugees improve food security outcomes and dietary diversity, and by Betts et al. (2020) who argue that self-reliance models can reduce aid dependence. They also concur with Bashaasha et al. (2021), who hold that Uganda's liberal refugee policies enable better food security if refugees can work productively in agriculture, and with Kamugisha et al. (2024), who document better food security where refugees are meaningfully engaged in livelihood interventions.

The study findings revealed that livestock distribution to households, combined with community-based breeding and restocking using exotic breeds, enhanced immediate and long-term access to animal-source foods. The findings are consistent with the literature by Muhangi et al. (2022), who report in Nakivale that farming activities raise household food availability and production, and by Pace et al. (2023) who document those improving agrifood systems in refugee camps including the use of improved breeds boost

production at scale. They also align with Osman and Abebe (2023), who illustrate that agrarian interventions maintain livelihoods and food security among displaced communities, and with Niragira et al. (2021), who describe how adaptive agrarian change enhances household survival in the face of food insecurity.

The findings of the research illustrated that control of disease and improved animal survival under veterinary services underlined a stable supply of secure animal products. The findings echo the literature by George and Adelaja (2022) who note that conflict-affected contexts require interventions that strengthen resilience of local food systems in order to maintain supply, and by Jaspars (2021) who cautions that "resilience" must be based on concrete support such as animal health services in order to achieve real food security gains. They also align with broader evidence that livestock productivity is threatened by displacement and environmental pressures, calling for management and health interventions to sustain food supplies (Morales-Muñoz et al., 2020; Bernard et al., 2022).

The research findings determined that refugees were given animal management training that supplied applied husbandry skills that boosted productivity and sustained household food stocks. The findings are consistent with the literature from Nisbet et al. (2022) who include capacity development as a common success factor in refugee food security programs, and from Sanni (2024) who shows that training conducted by NGOs among vulnerable groups improves food security outcomes. They are also consistent with Steine (2024), who emphasizes how interaction and knowledge exchange between refugees and hosts drive innovation and agricultural performance enhancement, and Meixner Vasquez (2021), who emphasizes how technical learning within support programs improves food security and income generation.

The research findings recognized that market-linkage and value-chain activities enabled households to sell surplus animal products and purchase other foods, thereby expanding overall food access and complementing availability. These findings are consistent with the research by Pace et al. (2023) that demonstrate how integrating refugees into agricultural value chains improves market participation and food outcomes, and Vos et al. (2020) who suggest integrating displaced individuals into local food systems for improving access and affordability. Complementary evidence shows that assistance liquidity, when paired with productive activities, enhances self-sufficiency and food security (Mastorillo et al., 2022), and broader policy lessons highlight that minimizing risks and displacement requires market-sensitive, livelihood-oriented responses to food access.

Effects of animal husbandry agrarian interventions on food accessibility in Nakivale Refugee Settlement

The results of the research indicated that animal husbandry activities in Nakivale Refugee Settlement significantly enhanced food availability through direct access to animal-based foods such as milk, eggs, and meat, thus reducing reliance on food aid. The findings relate to the literature by Alam et al. (2020), who argue that agriculture-based projects among the refugee population can reduce vulnerability to food insecurity through assured diversified and stable food access of quality. Similarly, Bernard et al. (2022) point out that locally initiated livestock schemes can attain food security in cases where displacement and resource shortage constraint regular food availability.

The study results revealed that the production of livestock generated income through the sale of animals and animal by-products, enabling refugees to purchase other foods and enhance the diversification of their diet. These are in agreement with literature by Nabulsi et al. (2020), who demonstrate that diversified production-market livelihood strategies improve household purchasing power and access to a wider

variety of foods. Morales-Muñoz et al. (2020) also note that income-generating activities among displaced communities play a key role in economic resilience and food variety as households can supplement limited aid with purchased nutritious foods.

The study results indicated that the integration of animals into the settlement reduced distance and effort costs of accessing animal products from external markets in the past, increasing physical accessibility. The research results are consistent with the research by Bernard et al. (2022), where they highlight that proximity of agricultural resources within refugee settlements reduces logistical barriers to food consumption and increases patterns of daily consumption. Similarly, Alam et al. (2020) suggest that local production of fresh perishable commodities such as milk and eggs minimizes dependence on distant markets and ensures timely supply of healthy commodities to poor households.

The research results exposed that sharing within the community and affordable sales of livestock commodities ensured access even for those households without their own animals. The findings are consistent with Nabulsi et al. (2020) literature, which documents that food-sharing networks based in the community play a critical role in reducing food access inequalities among the displaced population. Vos et al. (2020) further emphasize that equitable redistribution of locally produced food within the refugee communities heightens overall food security, both increasing social solidarity and dietary outcomes.

The outcomes from this research informed that animal husbandry training, coupled with coordination with organizations such as FAO and UNHCR providing veterinary services, improved breeds, and market connections sustained livestock productivity and regular food supplies. The results concur with literature by Kamugisha et al. (2024), who classify capacity development and technical support as important elements in guaranteeing agricultural production and food security within refugee camps. Additionally, Bernard et al. (2022) point out that technical innovations combined with institutional support can enhance long-term dependability in food supplies such that the displaced individuals have assured and safe access to healthy and safe foods.

Effects of animal husbandry agrarian interventions on food quality in Nakivale Refugee Settlement

The research findings revealed that animal husbandry interventions in Nakivale Refugee Settlement have significantly improved the nutritional value of food by providing regular access to protein-dense animal products such as milk, eggs, and meat. The findings are in support of the literature of Meixner (2021), which reported that farm interventions that involve high-protein crops and livestock can significantly increase the nutritional value of the diet of displaced and rural dwellers. Similarly, Muhangi et al. (2022) highlighted that livestock projects in refugees contribute to food diversity, particularly in the instances where diets are traditionally marked by cereal- and legume-based diets, confirming animal husbandry as a source of nutrition security.

The research findings revealed that training on animal handling, hygiene, and safe processing of animal products has contributed to improved food safety and contamination and foodborne disease risk reduction. The findings agree with the Pace et al. (2023) literature, where they emphasized that food handling and production capacity development improves safety levels among refugee and rural communities. Osman and Abebe (2023) also added that technical skills and education in animal management are critical in making sure that products from animals meet health and safety standards, thereby protecting vulnerable populations from nutrition-related health risks.

The research concluded that availability of fresh animal products has improved food quality through improved nutrient retention than stored or processed foods. The conclusion aligns with literature by Sanni (2024), which noted that availability of locally produced, fresh animal-based foods in refugee camps

significantly improves dietary status, including consumption of micronutrients and overall health. Bernard et al. (2022) also believed that fresh, perishable food sources are central to providing nutrient density, particularly in prolonged crisis contexts where food distribution networks have a tendency to be reliant on rationed or processed foods.

The study's findings reflected that access to improved breeds of animals has enhanced the nutrition and level of quality of animal products like milk and eggs by enhancing their protein and micronutrient concentration. The findings agree with research conducted by Steine (2024), who noted that improved breeds of livestock in refugee-hosted agricultural schemes enhance productivity, nutritional content, and overall food quality. Meixner (2021) also noted that schemes for improving breeds contribute not only to yield but also to higher-quality animal produce, which plays an essential role in the reduction of malnutrition among displaced populations.

The research findings showed that supportive services of FAO and UNHCR in the form of veterinary services, improved feeds, and immunization campaigns have helped keep healthier animals with safe and healthy animal products. The conclusion is aligned with Betts et al. (2020), who observed that institution-based assistance and technical interventions in animal husbandry play a critical role in ensuring unbroken quality and safety of food in refugee camps. Similarly, Kamugisha et al. (2024) also noted that ongoing veterinary management and material support enhance livestock health and productivity, therefore directly improving the dietary well-being and nutritional attainment of the refugee households.

SUMMARY OF FINDINGS

The findings revealed that Nakivale Refugee Settlement animal husbandry agrarian interventions significantly enhanced the availability of food through diversified diets, reduced dependence on food assistance, and the presence of animal food throughout the year such as milk, eggs, and meat. All of these interventions such as livestock distribution, restocking with improved breeds through community breeding, veterinary services, and animal husbandry training enhanced the productivity and sustainability of livestock, which all together enhanced food availability. Value chain development and market-linkage also helped the sale of surpluses by refugees, generating income to purchase more food items, thus expanding access. The interventions were observed by key informants as having made households self-sufficient, with reduced vulnerability to food shortages and improved availability of animal products in the market. The findings are also quantitatively supported by Pearson's correlation, indicating that animal husbandry interventions have a good positive correlation with food availability ($r = 0.656$, $p < 0.05$), indicating that better animal husbandry programs significantly contribute to household and community-level food availability.

Furthermore, the findings established that animal husbandry agrarian interventions significantly improved food availability in Nakivale Refugee Settlement by providing immediate and indirect means for families to obtain food. Families directly have access to animal products such as milk, eggs, and meat from their own animals, reducing dependency on food aid and diet diversity improvement. Livestock production indirectly supports household earnings, enabling the buying of additional food items from local markets and consequently enhancing overall food access and accessibility. The interventions have also reduced the time and distance to procure animal products, while practices of sharing among communities ensure that even non-livestock-keeping households benefit from food access. Capacity building through animal husbandry training and coordination with organizations like FAO and UNHCR, providing veterinary services, better breeds, and feeding assistance, has sustained livestock productivity and stable food supply.

These findings are quantitatively validated through Pearson's correlation, which shows a high positive correlation between animal husbandry interventions and food availability ($r = 0.623, p < 0.05$), such that stronger animal husbandry programs directly influence the enhanced capacity of refugees to access food. Lastly, the study found out that agrarian interventions in animal production have immensely enhanced food quality in Nakivale Refugee Settlement through improved nutritional value, safety, freshness, and overall food diet standards. Refugees are now able to receive protein-based animal foods such as milk, eggs, and meat on a regular basis, which improve diets previously dominated by cereals and legumes, thus improving nutrition. Safe processing training, hygiene, and animal handling have minimized contamination and foodborne disease risks, and the introduction of improved breeds has increased nutritional content and product quality. Institutional support in the form of capacity-building efforts by UNHCR and FAO through vaccination campaigns, supplementation with feed, and veterinary care has ensured livestock health and high-quality output. These qualitative results are supported by Pearson's correlation, which shows high and significant positive correlations between animal husbandry interventions and food quality ($r = 0.644, p < 0.05$), indicating more effective livestock-centered programs directly affecting safer, healthier, and better-nourished refugee diets in the settlement.

CONCLUSIONS

The study concludes that animal husbandry interventions in Nakivale Refugee Settlement have played a critical role in enhancing food availability at the refugee household level. By achieving food diversification and reducing dependence on food assistance, the interventions have contributed a reliable year-round output of food of animal origin, including milk, eggs, and meat. These interventions, such as livestock distribution, community-level breeding, veterinary services, and animal husbandry training, have collectively improved the food stocks at household level, promoted self-reliance, and increased short- and long-term food security in the settlement.

Furthermore, the study concludes that these interventions have substantially improved food access for the refugees. Direct access to meat within the settlement, combined with revenues from sales and by-products of livestock, has provided households with the means to purchase more food items and diversify their diets. Locality of animals, communal sharing arrangements between groups, and cheap market possibilities have reduced earlier barriers to consumption of animal-based foods. Capacity building programs and institution support through institutions such as FAO and UNHCR have also contributed to the sustainability of food availability through maintaining livestock productivity and easing constant supply.

Lastly, the study concludes that animal husbandry interventions have greatly enhanced the quality of food in Nakivale Refugee Settlement. Better, consistent consumption of fresh, protein-rich food has enhanced nutrition, and training in animal handling, hygiene, and safe processing has enhanced food safety levels. The introduction of improved quality animal breeds, with veterinary treatment and supplementing with feeds, has made available improved animal health and product quality. Overall, these interventions have assisted in reducing malnutrition, improving the quality of diets, and preserving safe, nutritious, and high-quality food among refugee families.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations have been found necessary concerning the effect of animal husbandry agrarian interventions on food security in refugee settlements in Uganda;

a case of Nakivale Refugee Settlement.

The study recommends the need for scaling up of livestock distribution and breeding interventions in Nakivale Refugee Settlement to enable more households to own productive animals. Through increased animal numbers and introduction of improved breeds, households are able to diversify diets, generate income, and reduce reliance on external food aid, thus consolidating food availability and long-term food security.

The study also recommends the need for increasing animal husbandry training and capacity-building activities among refugees. Providing continuous training in animal handling, feeding, disease control, and hygiene will sustain livestock productivity, maintain animal products safe, and increase the nutritional value of food consumed within the settlement.

Furthermore, the study recommends the need for enhancing veterinary and health care services in the settlement, including regular vaccination, disease control, and feed supplementation. Enhancing such services will ensure healthier animals, reduce mortality, and maintain the production of high-quality and nutritious animal products that directly impact food quality and safety.

In addition, the study recommends the need for promoting market-linkage and value chain development initiatives for livestock and animal products. Facilitating access to local markets, cooperative marketing, and community-based trading will allow refugees to market surplus products, purchase complementary foods, and increase household income, which cumulatively enhances food access and economic resilience. Lastly, the study recommends the need to institutionalize monitoring and evaluation mechanisms for animal husbandry interventions in refugee camps. Regular assessment of program impact on food availability, access, and quality will unearth gaps, inform policy, and facilitate the sustainability of interventions that promote food security and overall dietary well-being of refugee households.

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