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Review Article

Revitalizing Traditional Food Systems in Uganda: Restoring and Adapting Indigenous Food Storage and Preservation Methods for Improved Food Security in Kitu Guru Parish, Rampura District, South-Western Uganda

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Abstract:

Traditional food preservation and storage methods play a crucial role in enhancing food security and reducing poverty in Uganda. However, modernization and shifting dietary preferences have led to the decline of indigenous knowledge in food systems. This study explores the restoration, adaptation, and valorization of traditional food preservation and storage methods in Kitunguru Parish, Rugando Sub-County, Rwampara District, in Uganda's Southwestern Region. Through qualitative research, the study examined how methods such as smoking, sun-drying, boiling, steaming, and frying contribute to prolonged food shelf life, ensuring year-round availability and resilience against food scarcity. The findings highlight the socio-economic and cultural significance of these techniques, emphasizing their potential to enhance food security, reduce dependency on expensive modern storage facilities, and promoting sustainable livelihoods. By integrating indigenous knowledge with modern innovations, the study advocates for policy interventions and community-driven strategies to revitalize traditional food systems. Ultimately, this research underscores the importance of preserving, storing and adapting indigenous food practices and methods to foster resilience, self-reliance, and sustainable development in rural Uganda.

Keywords: traditional food preservation, food security, indigenous knowledge, sustainable livelihoods, rural development

Introduction:

Indigenous food preservation and storage methods historically played a critical role in ensuring food security and alleviating poverty in Uganda, offering sustainable, cost-effective, and adaptable solutions (Okoye & Oni, 2017; Singh & Singh, 2017). However, modernization, urbanization, and climate change increasingly marginalized these traditional practices, leading to their gradual erosion. Despite their significance, many of these preservation and storage techniques remained undocumented, posing a challenge to global food security efforts, particularly in regions where food insecurity affected an estimated 702–828 million people, with Africa being disproportionately impacted (FAO, 2021). This study aimed to systematically document, adapt, and revitalize indigenous food preservation and storage methods to enhance community resilience against food insecurity and poverty. By integrating indigenous knowledge with contemporary innovations, the study sought to contribute to the achievement of Sustainable Development Goals 1 (No Poverty) and 2 (Zero Hunger). Furthermore, the research addressed critical issues such as post-harvest losses, declining food availability, and reduced resilience to climate variability. Through knowledge dissemination and community engagement, the study advanced sustainable food systems while improving the livelihoods of rural populations.

1.1 Statement of the Problem

Districts in Southwestern region of Uganda, historically recognized for their agricultural productivity, have faced a paradoxical challenge. Despite producing food surpluses during peak seasons—often resulting in significant wastage of staple crops such as bananas, millet, beans, cassava and potatoes—communities continue to experience hunger and food insecurity during periods of scarcity. This cyclical pattern is sustained by deeply ingrained consumption practices that encourage excessive food intake during times of abundance, followed by indiscriminate disposal of surplus produce. A critical factor underlying this challenge is the widespread deficiency in knowledge and skills related to food preservation and storage. The increasing detachment of younger generations from indigenous food preservation methods further exacerbates this issue. As elderly custodians of traditional knowledge pass away, the transmission of valuable expertise is disrupted, leading to the gradual erosion of cultural heritage and the loss of context-specific, sustainable food security practices. The implications of this phenomenon are twofold. First, persistent food insecurity arises from the inability to store and preserve food effectively, leaving communities vulnerable to seasonal fluctuations in food availability. Second, the economic burden on households intensifies, as families are compelled to allocate limited financial resources toward purchasing food during periods of scarcity, thereby constraining investment in other critical needs such as education and healthcare. In response to these pressing concerns, this study aimed to investigate the restoration, adaptation, and valorization of indigenous food preservation and storage methods in Kitunguru Parish, Rugunda Sub County, Rampura District, Southwestern Uganda. By systematically documenting and promoting traditional knowledge, the study sought to enhance food security, mitigate poverty, and contribute to sustainable, contextually relevant solutions to food preservation and storage challenges.

1.2 Research Question

What indigenous food storage and preservation methods are used by local communities in Kitunguru Parish, Rugando Sub-County, Rampura District, and how effective are these methods in addressing food security challenges?

1. Theoretical Review

The study on revitalizing traditional food systems in Kitunguru Parish, was anchored in two key theoretical frameworks: the Post-Harvest Loss Reduction Theory and the Theory of Change. These frameworks provided a comprehensive lens through which to examine the restoration, adaptation, and valorization of indigenous food preservation and storage methods in Western Uganda. The Post-Harvest Loss Reduction Theory underscored the importance of minimizing food losses during the post-harvest stage, thereby enhancing food availability, access, and utilization. By applying this framework, the study systematically documented and analyzed traditional food preservation and storage techniques, critically assessing their strengths and limitations. This approach facilitated the identification of strategies to improve and standardize indigenous methods, ensuring their effectiveness and sustainability in contemporary food systems. Complementing this, the Theory of Change provided a structured approach for evaluating the impact of interventions on behavioral transformation. Within this study, the theory was operationalized through a targeted program designed to enhance food security and mitigate hunger and famine. This was achieved by identifying prevailing food wastage practices, assessing their socio-cultural and economic drivers, and developing strategic interventions to promote sustainable food-saving practices. The integration of these theoretical perspectives offered a multidimensional framework for promoting food security through the restoration and adaptation of indigenous food preservation and storage practices. By leveraging these theories, the study advanced the preservation and dissemination of indigenous knowledge, reduced post-harvest losses, and strengthened food security mechanisms. Ultimately, this research contributed to broader efforts aimed at combating hunger, famine, and poverty by fostering sustainable, culturally relevant food preservation strategies.

2.1 Literature Review

The research question aligns with the reviewed literature on indigenous food preservation and storage methods utilized by local communities in Rugando Sub County. Scholars have documented how indigenous communities, particularly women, have historically developed sophisticated techniques to process and preserve surplus crops, ensuring food sustainability and resilience (Swinbank & Swinbank, 2021). For instance, Native American communities employed drying, smoking, and fermentation to maintain dietary diversity despite seasonal fluctuations (Knorr & Augustin, 2023). Similarly, in Africa, traditional preservation techniques such as sun drying, fermentation, and soaking have been integral in reducing post-harvest losses and prolonging food availability (Ogwu et al., 2024). These methods not only provide an inexpensive and safe means of food preservation but also enhance year-round food security and nutritional well-being (Okoye & Oni, 2017). However, despite their effectiveness, indigenous food preservation practices and storage methods are increasingly being eroded due to factors such as cultural shifts influenced by Westernization, limited intergenerational knowledge transfer, and inadequate documentation (Mawere, 2024). In Uganda, while rural communities possess a wealth of indigenous knowledge on food processing and storage, these methods are often marginalized in contemporary food security strategies. This study addressed this critical gap by systematically documenting and promoting indigenous food preservation and storage techniques in Kitunguru Parish, Rampura District. By restoring, adapting, and valorizing these traditional practices, the research contributed to strengthening food security, mitigating post-harvest losses, and enhancing poverty reduction efforts in the region.

Methodology

3.1 Philosophical Paradigm

This study was grounded in the philosophical paradigm of social constructivism, which posits that reality is socially constructed through human interactions, historical contexts, and cultural norms (Saleem et al., 2021). By adopting this perspective, the research critically examined how indigenous food storage and preservation methods have evolved within specific sociocultural and historical frameworks. A qualitative approach was employed, utilizing interviews, focus groups, and observations to capture the lived experiences and tacit knowledge of community members. This methodological stance facilitated a nuanced understanding of the intricate interplay between food security, indigenous knowledge, and cultural continuity, acknowledging that knowledge is value-laden and influenced by socio-historical dynamics.

3.2 Research Design

The study employed an ethnographic research design to systematically investigate indigenous food preservation and storage methods within their cultural context. Ethnography allowed for an immersive exploration of local practices, ensuring that findings were deeply rooted in the lived realities of the community. Data collection and analysis relied on qualitative methods, including in-depth interviews and participant observations. The study not only documented traditional preservation techniques but also critically examined their effectiveness and adaptability in contemporary food security frameworks. Furthermore, by integrating indigenous knowledge with modern preservation approaches, the study sought to address both immediate food security challenges and long-term resilience-building within local communities. Ultimately, this research contributed to sustainable, culturally sensitive food security strategies that respect and uphold community agency, well-being, and dignity.

3.3 Scope and Study Participants

This study was conducted in Parish, Rugunda Sub County, Rampura District, Southwestern Uganda, where seasonal food waste during peak periods and subsequent hunger in off-peak times create a recurring cycle of food insecurity. Locally, this contrast is known as *mower* (plenty season) and *injera* (hunger season). The research examined indigenous food preservation Kitunguru and storage techniques as sustainable solutions to these shortages. Beyond documenting traditional methods, the study aimed to enhance food security through community training programs, stakeholder engagement, and policy recommendations to integrate indigenous practices into broader food security frameworks. By grounding the research within this specific geographical and cultural context, the study provided an empirical foundation for food security and poverty alleviation strategies. Data saturation was achieved through interviews with 15 respondents.

3.4 Sampling Techniques

A purposive sampling strategy was employed to identify participants with specialized knowledge of indigenous food preservation and storage methods. This non-random sampling approach ensured that the study engaged individuals with extensive experience and expertise, particularly elderly community members (aged 60+) who have traditionally played a custodial role in the transmission of preservation knowledge. Sampling continued until data saturation was reached—that is, when no new themes, insights, or significant variations emerged from the data—ensuring a comprehensive and in-depth understanding of the phenomenon under investigation.

3.5 Data Collection Methods

This study adopted a multi-method qualitative approach to data collection, integrating in-depth interviews, focus group discussions, over participant observations, and key informant interviews. Engaging elderly community members, with specialized indigenous knowledge allowed for the triangulation of data, enhancing the validity and reliability of findings. The study also explored how social norms, cultural values, and intergenerational knowledge transfer influence food preservation practices. Data collection was conducted in participants' preferred languages, with translation assistance provided when necessary to ensure accurate and uninhibited expression of ideas and experiences.

3.6 Data Analysis

Data analysis was conducted using NVivo software, facilitating efficient data organization, coding, and thematic analysis. Thematic analysis was employed to identify, analyze, and interpret patterns within the data, enabling the extraction of key insights on indigenous food preservation and storage methods. Through an iterative coding process, emergent themes were categorized into broader conceptual frameworks, allowing for a critical examination of the role of traditional preservation techniques in enhancing food security and poverty alleviation. This analytical approach not only documented existing indigenous knowledge but also evaluated its relevance and applicability within contemporary food security discourse, offering insights into how these methods could be adapted and valorized in modern contexts.

3.7 Ethical Considerations

This study adhered to rigorous ethical research standards to ensure integrity, transparency, and the protection of participants' rights. Ethical clearance was obtained from relevant institutional and governmental bodies before commencing data collection. Participants were provided with informed consent forms detailing the study's objectives, procedures, potential risks, and anticipated benefits. Confidentiality and privacy were upheld through secure data management protocols, including anonymization and encryption of participant information. Additionally, participants retained the right to withdraw from the study at any stage without repercussions, reinforcing the principle of voluntary participation. By adhering to these ethical standards, the research ensured responsible engagement with local communities and upheld the ethical imperatives of academic research.

2. Presentation of Findings

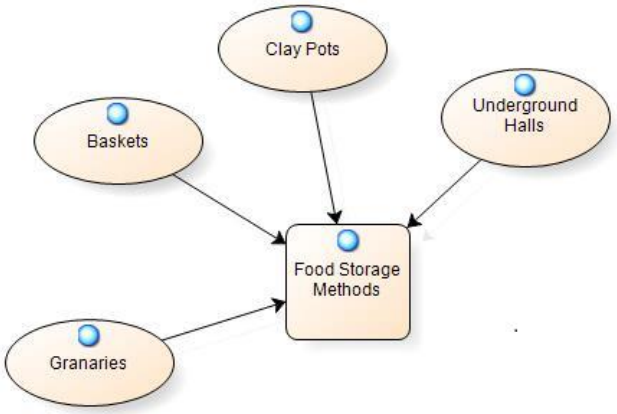

Fig1: Indigenous food storage methods in Kitunguru Parish

During the interviews, the researcher observed that while the concepts of preservation and storage are closely related, they are often used interchangeably despite their distinct meanings. In this context, storage refers to the practice of keeping food in a secure location for future use, whereas preservation involves specific techniques aimed at preventing spoilage and extending the shelf life of food. In Kitunguru Parish, the most prevalent storage method identified among respondents was the use of granaries, which were primarily used for storing foodstuffs and beverages. Other traditional storage methods included clay pots, baskets, and underground halls, which provided long-term solutions for maintaining food supplies. The researcher began by exploring the food storage methods historically and currently used in Kitunguru

Parish, examining how they contributed to food security. Despite advancements in modern storage techniques, traditional methods remain relevant due to their effectiveness in preserving food without refrigeration.

4.1 Indigenous Storage Methods

Theme 1: Storage of Grains in Granaries (Ebitaara)

The use of granaries was a common food storage technique among many households. These structures were elevated above the ground and thatched with grass to create a cool, dry storage environment. Due to their design, granaries maintained stable temperatures throughout all seasons. To gain a comprehensive understanding of granary construction, the researcher interviewed Katongole, a 78-year-old resident of Kyamukyira village, who provided detailed insights into traditional building techniques. He emphasized the importance of selecting a suitable location, preferably a dry area near the homestead—to prevent moisture-related damage. The foundational structure consists of durable wooden logs that elevate the granary off the ground, reducing contact with moisture and wet soil that could compromise stored food. Traditionally, the granary walls were made from a combination of clay and reeds rather than cement and bricks, which, according to Katongole, generate excessive heat and may accelerate food spoilage. Similarly, roofing materials such as grass or banana leaves were preferred over iron sheets because they helped regulate temperature more effectively. Katongole also highlighted the multifunctional nature of granaries. The space beneath them often served as a shelter for livestock such as sheep and goats, whose waste provided valuable manure for agricultural use. In discussing food storage methods, Katongole stressed the necessity of thoroughly drying food before storing it. Sun-drying was the primary method used to ensure cereals and foods such as beans, cassava, peas, millet, and sorghum reached optimal moisture levels for long-term preservation. To further extend their shelf life, these dried foodstuffs were traditionally wrapped in dry banana leaves or grass before being placed in the granary.

Katongole continued and explained.

Mbwenu (so), when I was growing up, every household had a granary. At that time, our leaders ensured that every home had a pit latrine, a plate stand, and a granary for food storage. Therefore, the primary African and indigenous method of storing food is storing them in granaries. (78-year-old Katongole) An 87-year-old woman, Forogo Regina, began by explaining how food was traditionally stored in a granary.

During the harvest season, food was so abundant that we often ended up wasting some of it. When I got married, my husband had already built a granary, so I began storing all our food there—but only after ensuring proper drying. For instance, millet was harvested and spread out in the sun to dry thoroughly. Sometimes, I would beat (*okuhura*) it to separate the grains from the chaff before storage, while other times, I left it in its husks, and made sure it was completely dry. I would then take out small portions as needed to prepare meals or make porridge for my family. Millet stored in a granary can last up to five years without spoiling. I store all kinds of food and drinks in my granary—dried cassava, beans, and even my local beer, which I keep in pots. The beer remains cool, almost as if it were refrigerated, until customers come to buy it. (Forogo Regina 87 years old).

In a rejoinder from 90-year-old Kadingo, it became evident that granaries are the best indigenous method for food storage among the Banyankore.

I was born a long time ago, and though people estimate my age to be 90 based on the events I recall, I have never seen anything in Africa that preserves food as well as granaries. I even fought in World War II, but I never saw granaries in the places where I was deployed. Food stored in granaries lasts a long time without spoiling, and traditional methods are used to keep it safe from pests. Instead of pesticides, we apply cow dung to smear the granary floor, which helps protect the food. Additionally, the stored food must be covered with dry banana leaves and grass to ensure its preservation. (Kadingo, 90 years old).

On granary storage, 66-year-old Matayo shared his experience:

I do not have a granary school at home because I have always been running to town in search of money. Instead, I use a store to keep food, but it often gets spoiled. Beans develop weevils, millet can develop a bad smell, and yellow bananas rot quickly. However, when I

was young, we had a granary at home, and I remember that bananas ripened from the granary were very sweet. Every time my mother said we were going to the granary to get food for a meal, I knew we would at least find bananas, mangoes, jackfruit, or a pawpaw. When it comes to food storage, granaries are the best. (Matayo, 66 years old).

A Picture of Granary as taken from the home of Forogo in Kitunguru

Theme 2: *Storage of Grains and Meat in Clay Pots and Baskets*

Another indigenous method of food storage involved using clay pots and baskets, which were primarily used to keep perishable foods like tomatoes, greens, and fruits fresh for longer periods. Katabira shared the following insight:

When using clay pots and baskets to store vegetables, one must first ensure that the vegetables and fruits are thoroughly cleaned with clean water. After washing, they must be properly dried. Once you are certain they are completely dry, take a clean and dry clay

pot and carefully place the fruits or vegetables inside. Let me tell you, if done correctly, you can enjoy your fruits and vegetables for up to two or three weeks. However, if they are not dried well before storage, they will start rotting and smelling bad. (Katabira is 50 years old).

Meanwhile, regarding the use of baskets, Matege explained:

If one wants to use baskets to store vegetables, they should not cover them. First, clean and dry the vegetables thoroughly before placing them in the basket, but it is advisable to sprinkle water on them every day to ensure they remain fresh. Stored this way, they can last for up to two weeks. It is not advisable to store vegetables and fruits in the fridge, as refrigeration can reduce their nutritional value. Keeping them in a basket is a better way to preserve their freshness and nutrients. (Matege, 83 years old).

Theme 3: ***Storing Food in Underground Halls***

Respondents explained that this traditional method of food storage has become extinct due to modern advancements. However, it was once an effective way of preserving food and combating food insecurity. Kandebe recalled his experiences growing up, when he participated in digging storage halls to keep food safe for times of famine or instability:

When I grew up, my father would gather all the boys and take us on a journey far from home. We would carry hoes and shovels into the bush, where he taught us how to dig deep underground storage halls—about 40 to 50 meters deep. After digging, we would carefully cover them to prevent accidents. Later, we would return home, collect excess beans and millet, and wrap them securely in dry banana leaves, known as *emishenga (wrap of food stuff)*. At night, using a small light, we would secretly carry the wrapped food to the storage underground halls. Once there, we carefully placed the *emishenga* inside, covered the hall thoroughly, and camouflaged it with branches. However, my father always left a small mark to ensure we could locate the storage site in the future. I remember a time when our land faced a five-year famine. While many families struggled, we never went hungry because we had stored enough food in these underground halls. In fact, we even engaged in barter trade, exchanging food for livestock from people in need. (Kandebe 100 years of age).

Respondents highlighted various indigenous methods of food storage and preservation, emphasizing that smoking, sun drying, boiling, and steaming were the most effective in preventing food spoilage

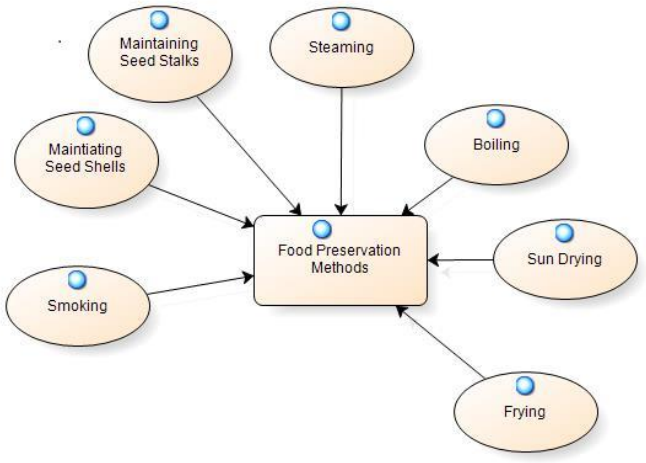

Fig 2: *Indigenous food preservation methods.*

4.2 Indigenous Preservation Food Methods

Theme 1: Smoking

Smoking was a commonly used method for preserving bush meat and fish, allowing them to last for an extended period without spoiling. The process involved hooking meat onto sticks and suspending it on cross-laid wooden beams, where it would be exposed to cooking smoke, ensuring continuous preservation.

Katorogo shared his experience with smoking meat:

I was an avid hunter when I was growing up, but hunting, both as a profession and a passion, was seasonal. There were times when we could not hunt due to changing climatic and weather conditions. So, whenever I successfully hunted an animal, I would carefully slaughter it, smear a little salt on the meat, and then light a good fire using dry, hard firewood. However, I would not place the meat directly over the flames. Instead, I would slowly smoke it, allowing it to dry thoroughly. Once I was certain the meat was properly smoked, I would either store it on ahabugamba (a wooden rack above the fireplace in the kitchen) or cut it into pieces and wrap it in banana leaves and sometimes keep it in baskets. This method preserved beef, mutton, and fowl meat for an exceptionally long time—almost indefinitely. Whenever we needed some for a meal, we would simply cut the required portion. Smoked meat was also highly valued for entertaining visitors, especially those who came to enjoy beer at our home. (Katorogo, 85 years old)

Theme 2: Sun Drying

Sun drying is a traditional food preservation technique that involves exposing food to direct sunlight to remove moisture. This process helps prevent spoilage and extends the shelf life of various food items by reducing the chances of mold growth and bacterial contamination. This method is particularly effective for preserving seeds, vegetables, fish, fresh meat, and cassava. For example, seeds such as millet, maize, and beans are spread out on mats or raised platforms under the sun to dry completely before storage. Vegetables like leafy greens are often sun-dried to make them last longer, while fish and fresh meat are dried to preserve them for future consumption. Cassava, a staple food in many communities in Kitunguru, is sliced into thin pieces and sun-dried before being processed into flour or stored for later use. Sun drying remains one of the most cost-effective and widely used preservation methods, especially in rural areas where access to modern refrigeration is limited.

Forogo, 87, shared her experience:

Whenever I harvest my cassava, I bring it home and peel it carefully, making sure I have clean water ready for soaking. After peeling, I call my children, and together we wash the cassava thoroughly—at least three times—to ensure it is completely clean. We then slice it into small pieces and spread it out under the sun to dry properly. Once it is well dried, we store it in large baskets (*ebitukuru*) and place them in our granary. Whenever we want to mix cassava with millet flour, we crush it using a mortar (*eshekuro*) before preparing our food. If we want to eat cassava on its own, we either crush it into smaller pieces or grind it finely to make smooth cassava flour for bread. Sometimes, we even use it to make pancakes. Sun-dried cassava is excellent because it never spoils. But these days, people use electricity to dry food, which is not as good as the traditional method. (Forogo, 87 years of age). Sun drying especially vegetables is very important as explained by Pantareho, 95 years old, who emphasized that sun drying is an effective method for preserving food, especially vegetables. He

nostalgically recalled: When I was growing up, my mother would send us to gather vegetables. We would go into the bush, banana plantations and gardens to pick (okushoroma) a large quantity, carry them in baskets, and bring them home to her. She would wash them thoroughly with salty water to kill any germs and then spread them out in the sun to dry properly. Once dried, we would use mortars to crush them into a fine powder, which we later added to groundnut sauce, beans, or used directly to make sauce. These dried vegetables were stored in a pot for a long time, allowing us to consume them over an extended period. Other families would take some of the powdered vegetables to the market to sell, ensuring they had an additional source of income. (Pantareho, 95 years old).

Theme 3: Boiling and Steaming

Boiling and steaming were commonly used methods to preserve leafy greens, raw milk, and various sauces, extending their shelf life while maintaining their nutritional value. **Nzara explained the benefits of boiling in preserving raw milk:** In my home, we are cattle keepers. Every morning, my husband and the boys wake up early to begin milking. I am expected to take a bucket and collect milk for home consumption. Sometimes, I receive ten liters for making tea and for the children to drink. This milk needs to last about three days, yet I do not have a fridge. But I do not need one because refrigeration makes my milk spoil faster. So, I always start by thoroughly cleaning my saucepan before pouring in the milk and boiling it well. After boiling, I transfer it to another clean, dry container for safekeeping and covering it properly. Whenever I need to prepare tea, I take a clean cup, scoop out the necessary amount, and add water and tea leaves. Similarly, if I need milk for the children, I pour some into a clean drinking gourd and serve them or my husband. I can assure you that when milk is properly boiled and handled with cleanliness, it can stay fresh for up to a week without refrigeration. (Nzara, 78 years of age).

During an interview, Kapira explained that steaming potatoes in a clay pot helps preserve them for a long time without spoiling. I normally go to the garden and harvest a basket of potatoes once a week. When I bring them home, I wash them thoroughly with clean water. After that, I clean my clay cooking pot well, place the potatoes inside, and light a fire, ensuring the heat remains steady. I let them steam in the pot for about two hours. Once I am sure they are fully cooked, I drain all the water to ensure they are completely dry. I then leave them in the pot to cool before storing them in a safe place. To keep them fresh, I leave them in the pot and cover them with a banana leaf. Every morning, we eat them as an accompaniment to our tea for breakfast. We use the same method for making maize and ground nuts. Steamed food can last for several days, reducing the need to cook every morning and saving firewood. (Kapira 75 years of age).

Theme 4: Frying

This was another popular method of food preservation, particularly for seeds, nuts, and fish, as explained by the respondents. Santina shared her experience with frying and how it helps preserve seeds for an extended period: I fry groundnuts, cowpeas, hard cones, pumpkin seeds, and soya beans for both selling and home consumption. This method is not only effective for preservation but also a profitable venture. Sometimes, I grow these crops myself, and when my supply runs out, I purchase more. Fried ground nuts can be eaten with tea, crushed into a paste for spreading on bread, or used as a sauce. I prefer giving my children these homemade snacks instead of biscuits and other processed foods. In fact, I prepare these snacks for them to take to school, and they last them the entire term. (Santina, 45 years old).

Forogo interjected, emphasizing the importance of fried nuts, especially during difficult times when millet bread was available but there was no sauce.Fried groundnuts were very useful because, in hard times, they are served as a substitute when millet bread was made, but no sauce was available. One could kunenesereza (chew) millet bread with fried ground nuts. For example, my husband loved meat, and whenever we did not have any meat, the only sauce he would use to eat akaro (millet bread) was a mixture of fried ground nuts and pumpkins. Because of this, even today, I always ensure we have fried groundnuts and soybeans at home—not just for tea, but also for eating with akaro. (Forogo 87 years of age).

Theme 5: Maintaining Stalks and Shells on Seeds

This method, which has been and continues to be commonly used, helps prevent weevils from attacking the food and preserves its natural aroma. Katongole shared the following: When I harvest my beans and ground nuts, I do not remove them from their shells. I ensure everything stays intact, and we only open them when we are ready to prepare sauce. This method extends the shelf life of the seeds because it prevents them from spoiling. I am telling you; it is effective—because with this method, a farmer never has to worry about sauce, and they will never get weevils. (Katongole, 78 years old).

Theme 6: Ash Mixing

In Kitunguru, ash mixing is a traditional method used to protect grains like sorghum, millet, cowpeas, and beans from pests. Grains are treated with cooled ash from burnt manure, wood, or aloe plants, which deter rodents and insects with their bitter taste. The ash reduces moisture, preventing spoilage and microbial contamination. This cost-effective, environmentally friendly method ensures food security, seed viability, and longer shelf life, particularly in rural communities without access to modern pest control or chemical preservatives.

Kakikuru shared the following regarding this method:

I normally cultivate and harvest a lot of ground nuts and beans, and to ensure they do not get spoilt, I get dry sugarcane leaves, aloevera leaves or dry banana leaves, burn them to ashes, and after that, I mix the ash with my dry beans and cowpeas. The ash from sugarcane leaves ensures that my harvested beans will never be attacked by weevils. The reason I do this is to avoid using poisonous ash. These beans will even stay for a year. I fear using imported pesticides because they are poisonous (Kakikuru, 73 years of age).

Discussions of Findings

Indigenous communities worldwide have developed diverse food storage and preservation techniques to ensure food availability year-round (Domingo et al., 2021). These methods, grounded in centuries of local knowledge and adaptation to specific environmental conditions, are essential in securing food, particularly in regions where seasonal variations significantly impact agricultural production (Singh & Singh, 2017). Traditional food preservation practices promote sustainability and help preserve the nutritional value, flavor, and overall quality of food (Lisboa et al., 2024). The main goal of food preservation is to ensure food remains available during off-seasons while preventing spoilage, decay, and nutrient loss (Priyanka et al., 2024). These techniques can be broadly classified into traditional and modern

methods. Historically, indigenous communities relied on traditional preservation out of necessity, as many crops were seasonal, and advanced processing or value-addition technologies were scarce (Leakey et al., 2022). However, with the increasing dependence on commercially produced, high-yield crop varieties, traditional preservation methods have been marginalized (Ficiciyan et al., 2018).

As a result, large quantities of food, especially vegetables, are lost annually due to spoilage and pest infestations (Enyiukwu et al., 2020). Food preservation is vital to maintaining household food security and promoting long-term sustainability without compromising future consumption (Berry et al., 2015). Indigenous preservation methods, refined over generations, offer cost-effective and environmentally sustainable solutions to reduce food waste (Joardder & Masud, 2019). Common techniques for preserving indigenous vegetables, grains, and seeds include air and sun drying, smoking, ash mixing, post-harvest storage with natural coverings, shade preservation, and freezing (Mobolade et al., 2019). In sub-Saharan Africa, food preservation and storage methods remain underdeveloped, inadequately implemented, and inefficient, leading to significant losses due to microbial activity, spoilage, and rodent infestations (Stathers & Mvumi, 2020). Despite Africa's rich agricultural diversity and a wealth of indigenous knowledge systems, traditional techniques often fail to meet the growing food security challenges in the region (Nelson, 2015). While advanced preservation methods such as canning, pickling, freeze-drying, irradiation, pasteurization, smoking, and chemical additives are used globally, these techniques are economically unfeasible and impractical for resource-constrained communities (Ogwu & Ogunsola, 2024). Traditional preservation methods, which have evolved over generations, include long-term techniques such as fermentation and drying for fruits and vegetables (Sharif et al., 2017), as well as short-term methods like storing produce in buckets or clay pots and blanching (Madison, 2007). For grains, storage practices typically involve cribs and silos, while root crops like yams are traditionally stored fresh in barns and platforms, or buried in the ground to preserve their freshness (Arum & Falayi, 2012). Cassava, being highly perishable, requires more specialized short-term preservation methods, including re-burying in trenches, coating with soft clay or mud, or storing in small quantities in water.

Indigenous food preservation strategies are often tailored to local climate, food availability, and traditional knowledge (Lynn et al., 2014). For instance, Native American tribes used underground granaries to store dried maize, while Southeast Asian communities preserved fish by fermenting them in salt to create long-lasting food products (Ogwu et al., 2024). In Ethiopia, farmers utilize a combination of dry straw and ash in grain storage pits to control pests and mold, preserving grains like sorghum, millet, and maize for extended periods (Duguma, 2020). Scholars have identified various methods such as drying, smoking, fermentation, and salting, all of which ensure food security within communities (Kuyu & Bereka, 2020). Some of these practices resemble those in Kitunguru parish, while others differ; however, integrating traditional and modern methods could foster a more effective strategy for ensuring food security and alleviating poverty. For example, indigenous leafy vegetables are often harvested in abundance during periods of high rainfall (Imathiu, 2021). To ensure their availability during scarcity periods such as winter, these vegetables are subjected to a drying process (Krishna et al., 2024). The process typically involves cleaning, parboiling, and sun-drying over several days, with the drying duration depending on sunlight intensity (Aworh, 2023). Once sufficiently dried, the vegetables are stored in containers like bags or pots to preserve their flavor and nutritional value. This method enables households to store preserved vegetables for up to a year, significantly contributing to food security and dietary stability.

Drying is one of the oldest and most widely used food preservation techniques. By reducing moisture content, this method inhibits microbial growth and enzymatic activity, preventing spoilage (Rahman & Perera, 2007). Sun-drying, a natural preservation method, involves exposing food to direct sunlight, allowing moisture to evaporate. It is commonly used for vegetables, fruits, grains, and certain meat products (Tiwari, 2016). Sun-drying is an effective and low-cost method, particularly in warm climates where high temperatures facilitate the process. Smoking involves exposing food, particularly meat and fish, to smoke from burning wood (Lingayat et al., 2022). This process not only dehydrates the food but also introduces antimicrobial compounds that inhibit bacterial growth. In addition, smoking imparts a distinct flavor and extends the shelf life of perishable foods. Fermentation, a biochemical process that transforms food through the action of microorganisms, enhances its shelf life while improving nutritional quality (Sharma et al., 2020). Lactic acid fermentation, used in preserving vegetables, dairy products, and grains, creates an acidic environment that prevents spoilage (Anumudu et al., 2024). Examples include fermented milk products such as yogurt and pickled vegetables, both of which develop probiotic properties beneficial to gut health. Alcoholic fermentation, which converts sugars into alcohol by yeast, is commonly used to produce beverages like beer and wine (Maicas, 2020). The alcohol content serves as a preservative by inhibiting microbial growth. Salting, another traditional preservation method, prevents spoilage by drawing moisture out of food, creating an environment hostile to bacterial growth (Tucker, 2016). Curing with salt is commonly applied to meat and fish, as salt penetrates the food tissues, reducing water activity and preventing microbial proliferation (Arason et al., 2014). In many indigenous cultures, salted food is further dried or smoked to enhance preservation. Beyond drying, fermentation, and salting, various indigenous food storage techniques have been developed based on local environmental conditions and resource availability (Okoye & Oni, 2017).

In colder climates, natural freezing is used to preserve perishable food items. Indigenous communities in Arctic and high-altitude regions have long relied on sub-zero temperatures to store meat and fish for extended periods (Kumari et al., 2021). Indigenous peoples have also traditionally used clay pots, woven baskets, and underground storage pits to maintain food at optimal conditions. These methods help regulate temperature and humidity, extending the shelf life of food. To protect stored food from insect infestations, indigenous groups use organic deterrents such as wood ash, tobacco leaves, and plant extracts, which serve as natural pesticides, reducing the reliance on chemical preservatives. Additionally, millet and sorghum seeds are preserved through a traditional method involving drying and smoke coating (Mobolade et al., 2019). After harvesting, the tassels are cut, dried, and then exposed to smoke before being suspended in the kitchen until the next planting season (Toht, 2017). The smoke not only helps with

drying but also imparts a bitter taste, acting as a natural deterrent against pests and ensuring seed viability for future cultivation (Kiran Babu & Rampal, 2024). Certain fruit varieties, including melons, pumpkins, and bottle gourds, are traditionally stored under shade, often in granaries or grain barns (Kiran & Rampal, 2024). This method protects them from excessive sunlight, which can accelerate spoilage. While watermelons are highly perishable and require immediate consumption, pumpkins can be stored for six to twelve months, and some melon varieties can last until the following season. Shade preservation is an effective strategy for extending the shelf life of these crops.

Ash mixing is another traditional method used to protect stored grains such as sorghum, pearl millet, cowpeas, mung beans, and Bambara groundnuts (Kapembe, 2024). This process involves treating the grains with cooled ash derived from burnt manure, wood, or aloe plants (Sharma et al., 2023). The ash, particularly when sourced from trees, has a naturally bitter taste that deters rodents and insect pests. By creating an inhospitable environment for pests, this method effectively extends the shelf life of stored grains, ensuring food security and seed viability for future planting seasons. Freezing is an advanced preservation method used to maintain seed viability over extended periods. The process begins with seed collection, followed by fumigation and thorough cleaning to eliminate potential contaminants (Walters & Pence, 2021). The seeds are then dried to a moisture content of about 7% and sealed in aluminum bags to prevent moisture absorption and deterioration (Dadlani et al., 2023). These sealed bags are stored in freezers at a controlled temperature of -18°C, allowing the seeds to remain viable for up to five years (El Fargani et al., 2024). This method is particularly effective for long-term conservation, ensuring genetic preservation and availability for future planting seasons. Indigenous communities globally have developed diverse food storage and preservation techniques to ensure food availability year-round (Richmond, 2021). These methods, grounded in centuries of adaptation to local environmental conditions, are crucial for food security, particularly in regions where seasonal variations impact food production (Muluneh, 2021). Traditional preservation techniques not only enhance food sustainability but also contribute to the retention of nutritional value, flavor, and quality

Conclusion and Recommendations

In conclusion, revitalizing traditional food storage and preservation methods in Kitunguru Parish, Rampura District, offers a promising pathway to enhancing food security by preserving food quality and minimizing post-harvest losses. These indigenous techniques, such as sun drying, smoking, ash mixing, drying, and the use of natural storage containers, provide effective solutions to pest infestations and spoilage, offering cost-effective and sustainable alternatives. To strengthen and expand these practices, comprehensive documentation and research should be conducted to evaluate the effectiveness of these methods in maintaining food quality and safety, with all evidence carefully documented for future reference. Community engagement and education are crucial to raising awareness about the importance of preserving indigenous knowledge and practices, and this can be achieved through training sessions, workshops, and the establishment of demonstration plots to showcase the effectiveness of these methods. Additionally, providing resources such as traditional storage containers and empowering women, who often bear the primary responsibility for food preservation, will facilitate the adoption of these practices. Involving the youth in food storage and preservation will also ensure intergenerational knowledge transfer. Integrating modern technologies, such as solar dryers and cold chain systems, will complement traditional practices and support the preservation of perishables. Furthermore, policy support and advocacy for the development of a framework that recognizes, and values indigenous food storage and preservation methods are essential for long-term success. By fostering a supportive environment through education, resources, and policy, we can create sustainable, resilient food systems that ensure food security for current and future generations.

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Conflict of Interest

The author declares no conflict of interest.

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