



Food Diversity and Consumption Patterns of Rural Households in South Western Uganda

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How to cite this paper: Ntakyo, P.R., Muzira, R., Muyanja, C., Kankwatsa, P., Byenkya, S., Turyagyenda, L. and Buyinza, B. (2026) Food Diversity and Consumption Patterns of Rural Households in South Western Uganda. *Open Access Library Journal*, 13: e14332.

<https://doi.org/10.4236/oalib.1114332>

Received: September 22, 2025

Accepted: January 10, 2026

Published: January 13, 2026

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Abstract

It is estimated that 23% of the Ugandan population is malnourished and 5% of the rural population is considered to be chronically food insecure while 35% of the rural population is considered highly vulnerable to food insecurity. South Western Uganda Agro ecological Zone is equally faced with inter-related challenges of food insecurity. Although the region is known as a food basket for Uganda, there are reports of malnutrition resulting from consumption of inadequate and low nutrient foods. The aim of this study was to ascertain rural households' food diversity and utilization in the banana farming systems. Findings revealed that food availability was seasonal and none locally produced foods and livestock products were not frequently consumed. Households generally depended on bananas and beans for food. Food insecurity was evident as indicated by 79.1% of the households. The age of household head which is associated with lack of labor, limited sources of income, coupled with small land holdings and limited use of improved technologies in production, were the main causes of poor nutrition status and food insecurity among the rural poor households. The study advocates for off-farm sources of income and considering the current climate change, increasing public awareness of other opportunity crops, promoting high yielding, nutrient dense food security crops and drought tolerant varieties to bridge the gap between planting and harvesting periods when food is scarce are highly recommended.

Subject Areas

Agricultural Science, Food Science & Technology

Keywords

Banana, Beans, Food-Diversity, Food-Utilization, Malnutrition

1. Introduction

High prevalence of hunger and malnutrition is a global concern. The most affected population is in developing countries which are predominantly rural and dependent on subsistence agriculture for their livelihood. Food insecurity and malnutrition have greatly contributed to high mortality and morbidity rates in Africa [1]. In Uganda, for example, it is estimated that 26% of the Ugandan population (45 million) is malnourished and 5% of the rural population is considered to be chronically food insecure while 39% are estimated not to meet their energy requirements [2]. There is persistent food and nutrition insecurity manifested by high prevalence of nutritional related diseases mainly among children, women and persons living with HIV and AIDS. Studies have shown that more diverse farming systems can contribute to household food, nutrition and income security [3]. Households with greater farming diversity where crops are integrated with livestock are more likely to meet their consumption needs [4]. Nonetheless, with ever reducing land size due to increasing population this could be a challenge to most farmers who do not practice intensive farming. Thus, crop production diversification and consumption habits should include a broader range of crop plant species, in particular those identified currently as underutilized, therefore scarce in household food diets. Crop diversity can improve household income and enhance the purchasing power of the smallholder farmers thereby allowing purchase of other food products. This paper assesses the food diversity and consumption patterns of the smallholder farming communities in the banana farming systems of the South Western Agro-ecological Zone of Uganda. Food diversity in this paper refers to the variety of foods within the production system and diet of the communities. This is important as it supports resilience of the food systems as well as sustainability.

The diets in Uganda are mainly composed of starchy staples, especially cereals, root tubers and bananas while legumes provide the main source of protein [5]. The main nutrition challenge for most households is inadequate intake of nutritious foods such as leafy green vegetables, fruits, legumes (like beans and lentils), seeds and nuts, whole grains, and animal products like meat, fish, eggs, and dairy containing necessary micronutrients and vitamins [6] [7]. The highest prevalence of malnutrition has been reported among children. For example, it was estimated that 29%, 11%, 4%, and 4% of Ugandan children under five were stunted, underweight, overweight, or wasted, respectively [8]. Poverty, illiteracy, big families, pandemics related to HIV/AIDS and the recent COVID-19 and poor child feeding practices

have been reported as some of the factors leading to malnutrition in infants [9].

While a definitive source isn't provided, the statistic that 55% of the population purchases food and 33% produce their own food in Uganda suggests a strong reliance on market purchases for food, which is common, as most households use a combination of own production and market purchases to meet their nutrition needs. It is, therefore, clear that poverty has a great impact on household food consumption patterns. Resource constrained households often have limited alternative food sources and mostly skip meals during periods of scarcity such as in dry seasons [10]. The agricultural sector is dominated by small-scale farmers and most crops are utilized for household food, nutrition and income security. This situation affects consumption levels of various foodstuffs especially in the resource-poor rural households since farmers have a tendency to sell most of the produce to raise income for other needs such as school fees and health services among others. Persistent fluctuations and high food prices in Uganda, significantly affect food consumption levels of resource constrained households, leading to reduced dietary intake, poorer nutritional quality, increased food insecurity, and potential negative impacts on health and development [11]. Household capacity to purchase food is further affected by long distances to markets and limited food diversity in accessible markets [12]. Crop and livestock diseases also pose a threat to household food, nutrition and income security. The most devastating crop diseases (banana bacterial wilt, coffee wilt and bean root rot) and livestock diseases (Foot and Mouth Disease (FMD) and Lumpy Skin Disease (LSD) in cattle are known to deter rapid agricultural development in Uganda [13] [14].

The Uganda food and nutrition and investment strategic plan recommends strengthening the education, communication and information services in the rural areas to enhance delivery of food and nutritional services [15] [16]. It calls for special attention to vulnerable groups such as HIV/AIDS, internally displaced people, elderly, and children. It further emphasizes support to agricultural research and investment to improve household food, nutrition and income security. To improve protein intake in the banana dominated farming systems in southwestern Uganda with high levels of malnutrition, the National Agricultural Research Organization (NARO) got financial support as a grant from McKnight Foundation to promote production and consumption of chickpea, a high protein opportunity crop. Before project intervention, a baseline study was carried out to understand the farming system in the project area, specifically crop and livestock production and the status of food and nutrition security of the households. This paper presents findings of the baseline study that informed the project interventions and also provides insights that will inform other future interventions intended to improve food and nutrition security in similar agroecological systems.

2. Methods

2.1. Study Area

The survey was carried out in Isingiro district located in southwestern Uganda.

Isingiro district is bordered by Kiruhura district to the North, Tanzania to the south, Ntungamo district to the west and Mbarara District to the Northwest. The area is characterized by hills and valleys, fertile gentle slopes and low land areas that support a diversity of farming activities. The district benefits from the equatorial climate and receives an average rainfall of about 1200 mm while the temperature ranges from 17 to 30°C. This climate offers two rainy seasons in a year which supports a wide range of agricultural activities. The main economic activity is small scale farming dominated by banana and bean production. The district is one of the leading banana-producing areas in Uganda, supplying major cities including Kampala and South Sudan. A few households are engaged in livestock rearing. Other economic activities include small scale trade especially in produce and other retail.

2.2. Sampling and Sample Size

Isingiro district was purposively selected for the chickpea project because of its high incidence of malnutrition cases and the farming system and agroecological conditions were appropriate for chickpea production. Two sub counties, Birere and Masha were randomly selected for the household survey. A random stratified sampling method was used to draw a representative household sample from the study area. Based on 8 out of 15 parishes in the two sub-counties, a random sample of households was selected from each village. From a list of households in each village 25 households were randomly selected, making a total of 200 households in the district. Respondents to the questionnaire were household heads and or their spouses.

2.3. Data Collection and Analysis

Focus group discussions and a structured questionnaire were used to collect data from the community and households, respectively. A focus group discussion of 8 - 10 knowledgeable community members was conducted in each village thus making a total of 8. From each village, participants were purposively selected to represent the women, men and youth. Observations and secondary data from district production and health records were also used to complement the information obtained from both focus group discussions and farmer interviews. Primary data were collected on socio-demographic characteristics of the households, sources of food and income, varieties and quantities of food consumed by the households, crops grown by households, management practices, availability of labour and other agricultural inputs and markets of food crops. Collected data were analysed using Statistical Package for Socio Scientists (SPSS) to generate descriptive statistics in addition to cross tabulations while STATA 17 was used to perform a multiple regression analysis to determine the factors influencing household dietary diversity.

Dietary diversity is a qualitative measure of food consumption that reflects household access to a variety of foods. It is a proxy used to establish the adequacy of nu-

trient intake at household level¹⁶. Dietary diversity captures the number of different types of food or food groups consumed in a specified period. This study considered a period of 7 days. The various foods are grouped in 12 categories: cereals, root and stem tubers, pulses, green leafy vegetables, fruits, meat and poultry, eggs, fish, milk and milk products, cooking oil, sweeteners and beverages. If a household consumed any one of the categories in a period of 7 days before the interview it scores 1 and 0 otherwise. The sum of all categories is the Household Dietary Diversity Score (HDDS). The value of this variable ranges from 0 - 12. We categorised households into two groups: those with low dietary diversity (HDDS below the average of 8) and those with high dietary diversity (HDDS of 8 and above).

We estimated a logistic regression model to understand how dietary diversity is associated with other demographic and socioeconomic factors. The relationship is predicted by the following equation;

$$\text{General model; } Y = \beta_0 + \beta X + e$$

The estimated model is specified as;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \cdots \beta_9 X_9 + e$$

where Y is the household dietary diversity score (high HDDS = 1, low HDDS = 0)

β_0 is the vector of unknown parameters (intercept).

$\beta_1, \beta_2 \cdots \beta_9$ are the coefficients of the explanatory variables.

$X_1 - X_9$ represent the explanatory variables.

e is the error term.

The explanatory variables include; age of household head, Marital status of household head (married = 1, otherwise = 0), highest education level of household head (primary and below = 1; otherwise = 0), number of people living in the household, household income from crops, household income from livestock, size of land under crop production, source of labour for the household (family = 1, otherwise = 0) and access to credit (if household accessed credit in previous season before the survey = 1; otherwise = 0).

3. Results and Discussion

3.1. Socio-Economic Characteristics of the Study Sample Population

A majority (73.3%) of farmers who participated in the study were women (**Table 1**). This was because women were more familiar with household food and nutrition security compared to their male counterparts. Most farmers were between 30 and 55 years of age. The average age of Ugandan farmers is 54 years, indicating that the farming population is aging. With few left to pass the mantle to, the country could face food security challenges. Isingiro district is considered the main food basket for Uganda, providing bananas as both food and cash crop along its value chain [17]. A majority of respondents were married with an average household size of 7 persons of which the majority were children between 5 - 18 years of age. This was slightly above the national average household size of 4.4 persons [18]. Like in most other rural areas, majority (53.9%) of farmers had primary ed-

ucation. This concurred with national statistics which reported 51.4% of Ugandan adults with primary education. Education affects many aspects of life including adoption and management of agricultural technologies. Primary level education is regarded as adequate level of education for an individual to read and write. A threshold effect of at least four years of primary schooling is reported to have a significant positive effect upon farm productivity [19].

Table 1. Socio-economic characteristics of sampled farmers.

Socio-economic variable	Category (n = 200)	Percentage
Sex	Male	25.6
	Female	74.3
Age of farmer (years)	<30	18.5
	30 - 55	59.2
	55 - 90	22.3
Marital status	Single	2.1
	Married	72.8
	Separated	4.2
	Widowed	20.9
Education of household head	No formal education	19.9
	Primary	53.9
	Secondary	23.0
	Tertiary and higher institution	3.1
Education of spouse	No formal education	10.5
	Primary	44.5
	Secondary	14.1
	Tertiary and higher institution	4.2
Main occupation	Farming	93.2
	Nonfarm business	5.2
	Government/NGO job	1.6
Household composition	Average household size	7
	Average number of children 0 - 5 years	1
	Children 5 - 18 years	3
	Adult males (18 - 59)	1
	Adult females (18 - 59)	2
Average income from farming UGX (USD)*		941,500 (266)
Assets	Average farm size (ha)	1.9
	Heads of cattle	11
	Number of goats	7

*Exchange rate: USD 1 = 3,536.

3.2. Sources of Household Income

Subsistence agricultural production was the main source of livelihood for a majority of the households (93.2%). Their main source of income is selling produce especially green bananas and beans. The mean annual income from farming was USD 266 per household. This income was too low compared to national statistics which indicate a mean annual household income of USD 894 in rural western region [20]. It was also far from the government target of USD 5332 annually per household [21]. This could partly be explained by low-income generating enterprises and small land holdings estimated at an average of 1.9 acres per household. Crop production was the main activity for a majority while a few farmers (23.5%) reared animals. Other sources of income included trade in agricultural produce and craft making especially by women. On the other hand, men were engaged in charcoal burning and brick laying. Some farmers (40.3%) also hired out labour to work on farms within their communities. Whereas nonfarm business generates relatively higher income (Figure 1), it was found to benefit only 6.8% of the farmers.

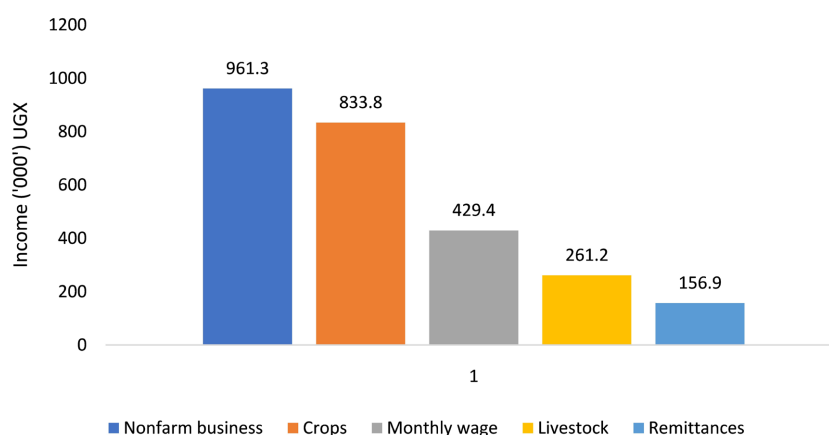


Figure 1. Sources of household income.

3.3. Food Diversity and Household Food Security

Farmers practiced subsistence agriculture as evidenced by the small plots that hardly make up one acre (Table 2). The common crops grown were bananas, beans, maize, millet, groundnuts, sweet potato, potato and cassava in addition to soy bean, sorghum and garden peas in small proportions.

Table 2. Common crops grown by farmers.

Crops	Average acreage per household (Acres)	Average production/season (kgs)	Proportion consumed (%)	Proportion sold (%)
Bananas	1.6	3854.2	60.1	37.5
Beans	0.5	204.1	38.5	43.9
Sweet potatoes	0.2	337.3	81.7	13.1
Cassava	0.2	292.0	79.5	20.5

Continued

Maize	0.4	121.7	63.7	26.9
Millet	0.4	231.6	75.8	10.6
Potato	0.1	113.8	80.9	17.3
Soybean	0.2	21.5	76.1	10.6

Farmers practiced mixed cropping consisting of two or three crops in the same field to compensate for limited land, a situation that sometimes, limited farmers from getting optimal yield per crop. The common intercrops were bananas-beans; bananas-beans-maize; maize-millet; groundnuts-maize-beans; and beans-maize-cassava. Other than millet, all other crops were grown in two rain seasons of March-May and September-December. Cassava was mainly grown as a food security crop with some farmers planting it as an edge crop in the banana plantations. Considering crops such as beans and groundnuts, the study showed that a bigger proportion of the harvest was often sold. This suggests that households' diets contained less protein since farmers revealed that little was always harvested, and proportion of the harvested yield is sold off. Chickpea, therefore, presented an alternative supplement to the limited protein sources. Study findings, therefore, revealed transitional food insecurity in Isingiro district mainly due to declining soil fertility, negative impacts of climate change especially drought and excess rains, and farmers selling off most of their harvests to cater for their household needs. Nonetheless, there was relatively sufficient food during the harvesting periods of June-August and January-March of each year when there was plenty of bananas and beans. It was noted that all the crops grown were used for both food and income. Unfortunately, some farmers often sold all the produce and did not leave enough for food and seed for the next season. Consequently, the majority of the households (79.1%) experienced food shortages. Whereas farmers said that a person should eat three times a day, the majority (70%) of the people often ate twice a day and one of the meals (lunch) was sometimes porridge. Only 10.5% of the households had enough to eat and the kind of food they preferred (**Figure 2**). Nonetheless, household food preferences did not mean the right food was consumed in balanced proportions. The main reason for inadequate food as stated by the majority of farmers (80.2%) was a small harvest to last a season.

Food shortage occurs during the months of September to December and partly January of each year. This is the growing period for most of the annual crops. Banana, the main crop also starts flowering during the same period and all the mature fruits will have been harvested during the long dry season of June-August. Prolonged drought, little harvest and selling most of the produce were the major factors contributing to household food insecurity [22].

Household nutrition

The common foods consumed in most households were bananas and beans. The common diet was a mixture of bananas with beans and occasionally groundnuts. During the months of October-December the common type of sauce was

Amaranthus species whereas maize and cassava are the major sources of carbohydrates. Other foods used in the households though on a small scale included sweet potato, millet, cassava and groundnuts among others. Apart from bananas and beans, most foods were often purchased from the market, thus leading to low utilization by the resource constrained households. Similarly, majority of households could not afford balanced diet although they understood its importance. Highly processed foods such as wheat bread and Blue Band margarine are rarely used in households. Crops, especially beans provided the major source of protein for a majority of households (Figure 3).

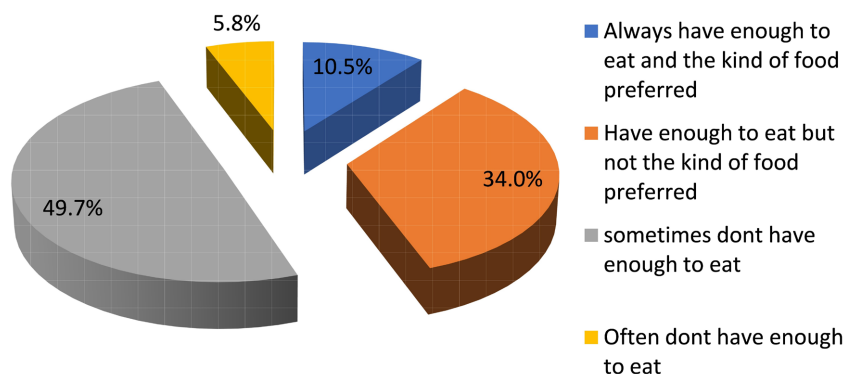


Figure 2. Description of quantities and the kind of food consumed by households.

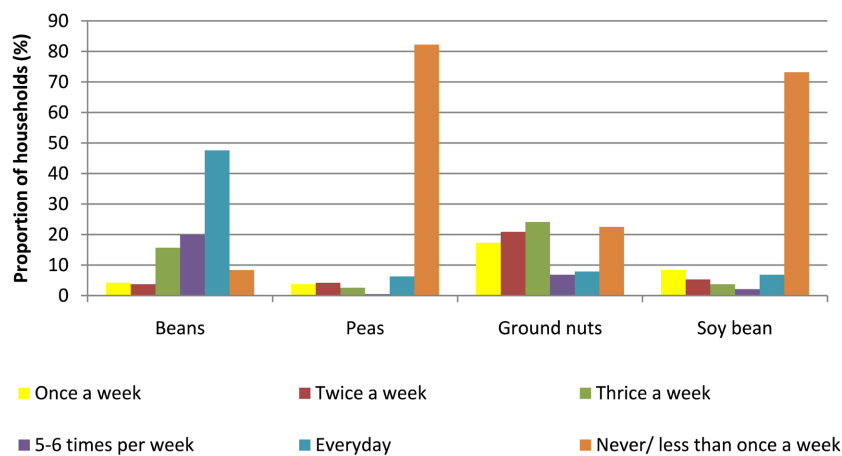


Figure 3. Frequency of legume consumption by households.

Animal protein, however, was often consumed by a small proportion of households. It was observed that apart from milk, over 50% of the households never consume livestock products or consume them less frequently (Figure 4).

Among the cereals, maize was highly utilized both in form of bread and porridge (Figure 5). Maize porridge was commonly used by a few households, which often prepared breakfast especially for children since most households could not afford milk. For some households that could not afford milk, they still mixed it with porridge. In some households, porridge was eaten for lunch especially during the months of September-December when green bananas were scarce. Millet was

also relatively highly utilized cereal because it was locally grown by some households. However, millet production had considerably reduced due to declining soil fertility, and its production was considered labor intensive.

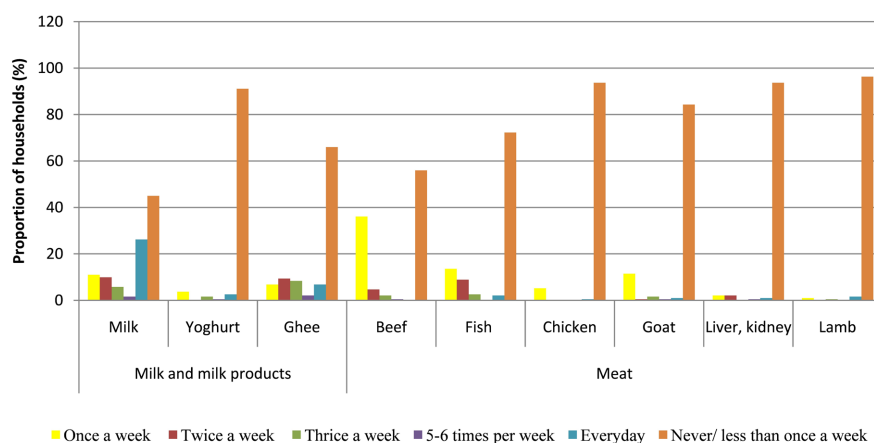


Figure 4. Frequency of consumption of animal-based protein by households.

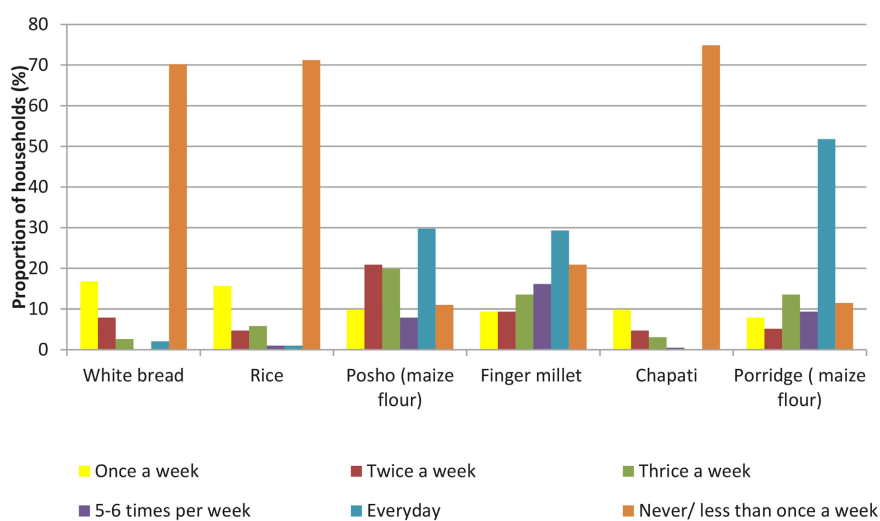


Figure 5. Frequency of consumption of cereals and their products by households.

Among the starchy foods, green banana was the most commonly consumed and grown crop (Figure 6). Close to 70% of the households consumed it daily. It was a kind of food that was easy to cook and could be consumed without sauce. Boiled banana with salt was a common dish among the rural resource constrained households especially during the growing season for beans. Cassava was utilized every day by 25.1 % of the households.

The most commonly utilized vegetables were onions and tomatoes, followed by leafy greens especially *amaranthus* species commonly grown in banana plantations (Figure 7). The majority of households (40%) consumed vegetables once a week. This was low compared to the average national household vegetable consumption rate of three times a week [23]. This could be explained by the fact that

leafy greens were mainly available during the rainy season. Nonetheless, even when they were in abundance, they were never consumed by some households. Avocado was also occasionally consumed, though its abundance was seasonal.

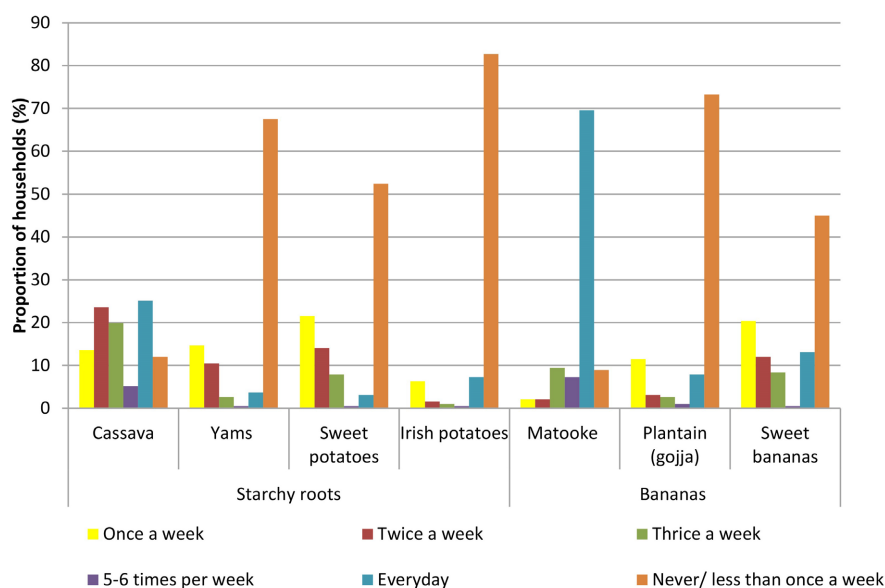


Figure 6. Frequency of consumption of other starchy foods by the households.

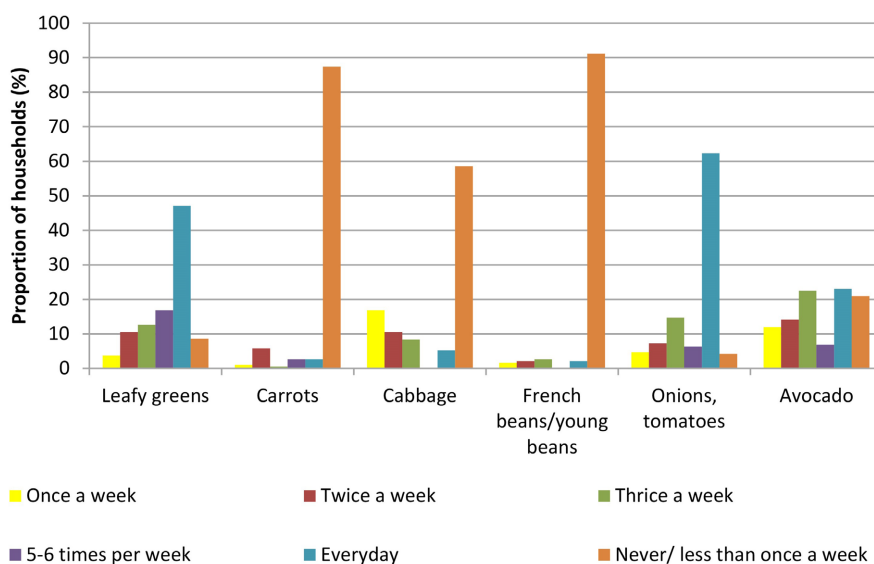


Figure 7. Frequency of consumption of vegetables by households.

The household consumption of fruits was very low (Figure 8). Similar to national statistics [23], a majority of households hardly consumed fruits. Pawpaw and sugarcane had the highest daily consumption rate by 28.3% and 16.2% of the households, respectively. The rest of the fruits were never or rarely consumed by over 60% of the households. This was due to the fact that these fruits were not commonly grown in the area and the farmers could not afford to buy them from the market.

3.4. Household Dietary Diversity

The study assessed dietary diversity at household level and the results are presented in **Table 3**. The 7-day dietary recall period revealed a Household Dietary Diversity Score (HDDS) ranging between 4 and 12 with a mean of 8. The diet for most households was dominated by starchy foods especially cereals and root tubers. Other types of foods especially from animal sources were not regularly consumed by households. For example, fish, milk, milk products and eggs were consumed by less than 60% of the households sampled. Some households indicated that foods such as milk (6.8%), fish (6.3%), rice (10.5%), fruits (5.2%) and meat (2.1%) were mainly provided as special diets to patients. These results are not unique to western Uganda. A critical review of various studies in the country shows a consistent trend across the country [5] including Northern [24] and Eastern Uganda [25].

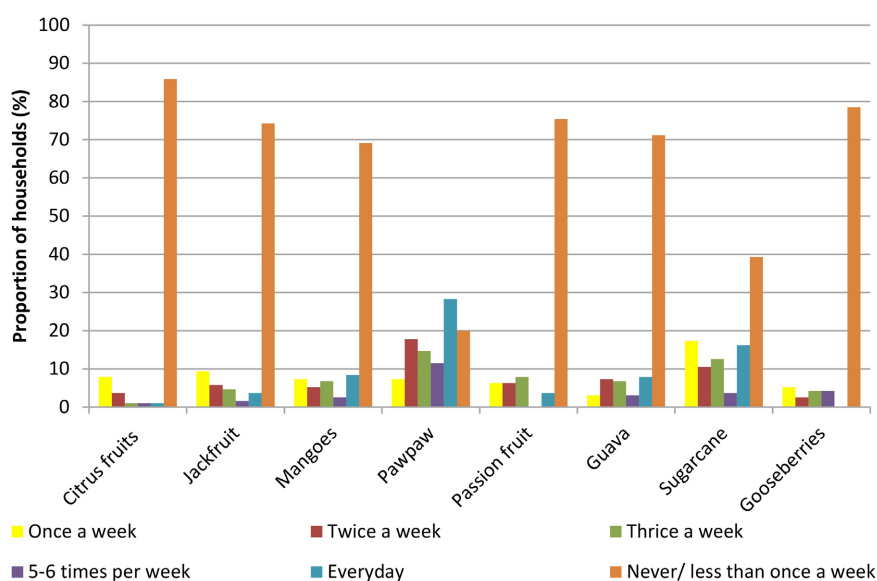


Figure 8. The frequency of consumption of fruits by the households.

Table 3. Household food consumption by type in a period of 7 days.

	List of foods	Proportion (%)
1	Millet, sorghum, rice, maize	92.7
2	Sweet potatoes, cassava, yams, potatoes	96.9
3	Vegetables (pumpkin leaves, amaranthus, spinach, cabbage, eggplant, etc.)	97.9
4	Fruits (mangoes, oranges, pawpaw, guava, passion fruit, pineapple, tangerine, lemon, avocado, gooseberries, etc.)	95.8
5	Beef, pork, goat meat, mutton, chicken, duck, turkey	63.9
6	Eggs	31.4
7	Fish (fresh fish, dried/smoked fish, silver fish)	33.5
8	Beans, cowpeas, groundnuts, soybeans, pigeon peas and other pulses	94.2

Continued

9	Milk, yogurt or any other milk products	59.2
10	Cooking oil, fats, ghee and sesame seeds	72.3
11	Sugar, honey	71.2

3.5. Factors Influencing Household Dietary Diversity

The study assessed the various factors that are likely to influence the household dietary diversity. The results are presented in **Table 4**. Findings indicate that age

Table 4. Factors influencing household dietary diversity score.

Household Dietary Diversity Score (HDDS)	Coefficient	Std. err.	P > z
Age of household head	-0.05304***	0.0191	-2.78
Marital status of household head (married = 1, otherwise = 0)	-0.49473	0.5734	-0.86
Highest Education level of Household head (primary = 1; otherwise = 0)	0.16429	0.5910	0.28
Number of people leaving in the household	-0.02918	0.0816	-0.36
Household income from crops	0.00006**	0.00003	-2.36
Household income from livestock	0.00001	0.00009	-0.07
Size of land under crop production	1.37553***	0.2323	5.92
Source of labour for the household (Family = 1, otherwise = 0)	1.08108	0.7454	1.45
Access to credit in the previous season (yes = 1, otherwise = 0)	-0.83094	0.6643	-1.25
Constant	-0.54265	1.1144	-0.49
Number of observations	179		
Prob > chi2	0.000		
Pseudo R-Squared	0.4022		

*** p-value significant (p < 0.01); ** p-value significant (p < 0.05).

of the household head, income from crop and size of land under crop production are the key factors influencing HDDS at household level. We observe a negative relationship between HDDS and age of the household head suggesting that households headed by the elderly are more likely to have a low HDDS. This can be explained by the fact that such households may not be able to produce a variety of foods due to limited labour for production since most households use family labour to produce what they consume. Regression results revealed a significant negative relationship between HDDS and income from crop production. This is attributed to households selling most of the crops produced leaving insufficient quantities for home consumption. Others tend to concentrate on bananas and beans as cash crops. Yet, they are still not able to purchase a variety of foods they do not produce because they spend the money on other household's needs. This is very

common in areas where crop production is the main source of livelihoods. Similar findings have been reported by studies in Northeast and Northwest regions in Nigeria where households with high income from livestock production had low HDDS [26]. Results further indicate a positive relationship between HDDS and size of land allocated to crop production. Households that have allocated a large amount of land to crop production tend to grow a wide variety of crops and consequently they are likely to consume a more diversified diet. This is consistent with other studies in Uganda which have shown that crop species have a positive significant association with dietary diversity [27].

3.6. Other Factors Influencing Food Diversity and Consumption Patterns

Food diversity and utilization were influenced by various factors that include: soil exhaustion, climate change effects (prolonged drought and excessive rains), small land holdings and low yielding varieties among others. Low soil fertility as a result of poor soil management practices such as continuous cultivation with no soil fertility improving innovations has greatly contributed to reduced food diversity. Whereas some farmers had knowledge of improved soil fertility management practices, they were always constrained by limited resources to implement such practices. This ultimately led to low crop yields and in turn led to reduced household food, nutrition and income security.

Prolonged drought as a result of climate change equally reduced crop yields as reported elsewhere [28] [29]. Livestock farmers were also forced to reduce their herd by selling or transferring them to other areas, a situation that reduced milk and other products for household consumption. In most households, families continue to divide land amongst family members, a practice that has led to steady decline in land size for farm households as population increases. Thus, majority of households that could not afford to buy more land had very small land holdings that could not sustain food production.

The yield for most of the crops was low due to poor soil fertility management practices, negative effects of climate change, low yielding crop varieties and lack of knowledge on production technologies among others. Only 50.3% of households received some training by NGOs and government programs such as the NAADS on production of improved crop varieties. However, only 29.2% of the households had benefited from the government programs National Agricultural Advisory Services (NAADS) program. Poor yields could also be attributed to low or non-use of crop yield improving technologies such as improved seed, fertilizer and pesticides (Figure 9). Most of the households could not afford while others had limited knowledge and access to the required inputs.

There was limited labour in the community which affected agricultural production. Most households (83.2%) used family labour for agricultural production. Nonetheless, youths were more involved in non-farm activities such as motorcycle transport leaving agriculture in the hands of women and the elderly. This had a negative impact on agricultural production and adoption of improved technologies

[21] [30]. Farmers also revealed that majority of men spent their time drinking alcohol while the youth were engaged in luxurious non income generating activities such as playing pool games while the children spent most of the time in school. As such less food in terms of diversity and quantity was often produced by the household. Although, 42.4% of households sometimes hired labour, which was often not available within the community (**Figure 10**). During the months of March, August, September, October and November labour shortages were observed. This period coincided with intensive labor requirements on farms, leading to labor shortages.

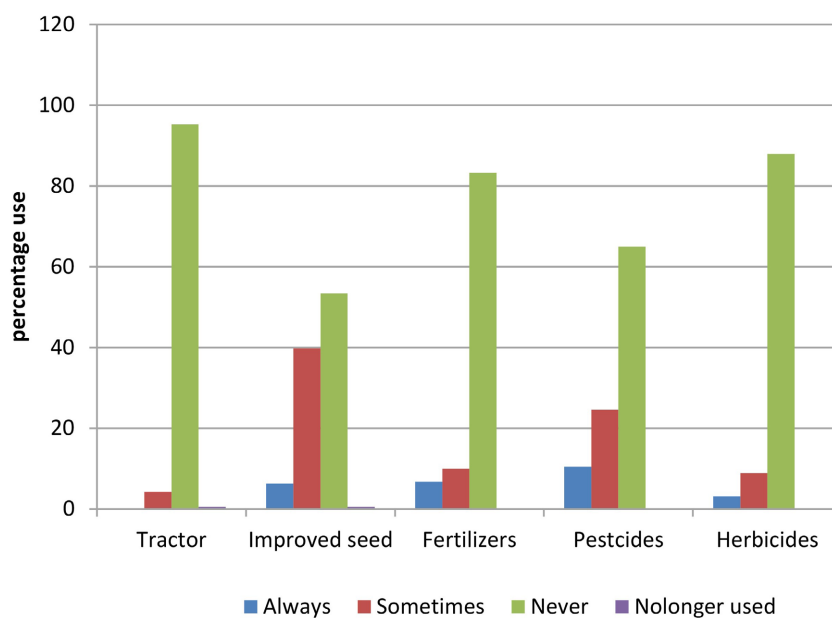


Figure 9. Frequency of major input use in agricultural production.

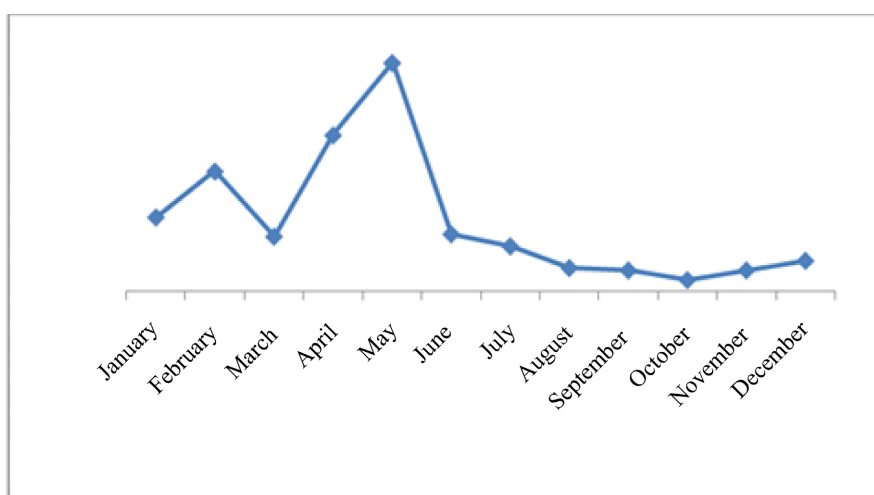


Figure 10. Variation in labour availability in the farming community throughout the year

Crop pests and diseases were also among factors that reduced food availability. The most devastating was banana bacterial wilt which had reduced banana yields—the major crop in the community. Other devastating diseases included bean root

rot and groundnut rosette diseases. Human diseases especially malaria, in addition to HIV/AIDS, also affected agricultural production due to reduced labour [31]. Women spent their productive time taking care of the sick and spent their meager resources buying drugs instead of food. Most rural households had limited income generating activities, and mainly depended on subsistence farming for food, nutrition and income. Poor households, as pointed out earlier, often sold most of the produce, and little was always left for home consumption or seed for the next season. This often resulted in household food insecurity and perpetual poverty. This situation was more pronounced among the widows who had the burden of taking care of the orphaned children. High cost of education equally forced households to sell off a big percentage of their harvest to raise school fees. Parents preferred educating their children in private schools because of the high-quality education offered compared to fully government managed schools.

Other factors such as alcoholism equally had a negative influence on household food consumption patterns. Men and women involved in alcoholism were less productive. They spent most of their productive time drinking alcohol and they were generally too weak to carry out any productive activities. Apart from wasting time, they also spent the little money that would be used for household needs.

Negative effects of climate change were a challenge to farmers in decision making, especially when deciding when to sow or plant crops. Adverse weather conditions such as too much rainfall with a lot of wind and prolonged drought also caused devastating crop losses, which impacted household food, nutrition and income security. Farmers also lacked information on improved agricultural technologies due to limited extension services. This contributed to low crop yields, hence less food availability for households. Due to high costs, and lack of awareness and access to improved agricultural technologies, most households (53.4%) could not plant improved crop varieties. Most farmers often recycled seeds of local varieties of beans, groundnuts, and maize while other crops were not grown due to lack of seed. Consequently, farmers often had poor harvests that could not sustain households for a season. For example, the average grain yield of beans was 600 kg ha⁻¹, which was far below the expected yield of 1500 - 3000 kg ha⁻¹. Similarly, the average groundnut yield was 750 kg ha⁻¹ below the expected yield of 2500 - 3000 kg ha⁻¹.

Poor marketing systems for agricultural products often compel farmers to sell off most of their agricultural produce to middlemen. Farmers were offered very low prices immediately after harvest; hence, they sold large volumes of produce to raise substantial income for household needs. As a result, less food was often saved for household consumption. Regrettably, they pay high prices when they are buying food and seed from the market a few months after harvest. Such changes in market prices significantly affected food consumption of resource poor households [32].

3.7. Household Gender Relations and Household Food Security

Crops production was a core responsibility for women in the household (Table

5). This was in addition to taking care of the household welfare. This implies that women play a key role in the adoption of a diverse range of crop related technologies and their utilization.

Table 5. Gender roles in farm production activities.

Farm activities	Gender responsible (% response)		
	Man	wife	Children
Land preparation	33	76	-
Weeding of crops	27.7	94.2	18.8
Harvesting of crops	31.4	94.2	23.9
Drying of crops	25.7	95.3	23.6
Storing produce	26.2	93.7	14.7

In the focus group discussions, it was revealed that both husband and wife were involved in decision-making with regard to resource allocation (Table 6). This implies that both men and women play a key role in ensuring household food availability and accessibility.

Table 6. Gender and decision-making in the household.

Area of Decision-Making	Gender responsible (% response)		
	Man	wife	Both
Sale of farm produce	23.7	25.1	46.7
Sale of livestock	18.1	27.5	53.6
Use of money from sales	23.0	17.9	58.2
Which cash crops to produce	17.3	31.1	50.7
Which food crops to produce	8.6	44.6	46.0
How much produce to sell	22.3	23.7	53.2

4. Limitations of the Study

The study had some limitations that should be considered when interpreting the findings. One drawback of this study is that it is based on cross sectional data thus it did not account for seasonal variations yet crop production and consequently food availability in the study area are heavily influenced by the rainy season. Further, the study relied on self-reported data, based on recall of the food consumed by the respondents. This creates potential for bias as respondents may not be accurate. Moreover, the study coverage was limited to one district due to limited logistics. Although it is a good representation of most districts in the region, food diversity may differ in some of the districts especially those with livestock dominated production systems. Despite these limitations the study provides insights that are useful for future interventions and research aimed at improving food and

nutrition security for rural households.

5. Conclusions

Households generally depend on bananas and beans for food with very limited food diversity. Food availability is seasonal and none locally produced foods and livestock products were not frequently consumed due to low levels of household income. Households in the project sites experience food insecurity both in terms of quantity and quality. Inadequate food quantity and quality standards is observed among majority of households. Lack of labour especially among households headed by the elderly, limited off farm income generating activities, small land holdings coupled with limited use of improved technologies are the major causes of household food, nutrition and income insecurity in the project sites. The same factors coupled with inadequate technologies in the areas of production, storage and processing are some of the factors likely to affect productivity and utilization of chickpea. Nonetheless, chickpea is likely to be embraced given its potential to survive under residual soil moisture. Emphasis should be put on nutrition driven feeding and its impact on health other than feeding for satisfaction as stated by farmers. There is need for households to engage in other off-farm income generating enterprises to provide additional resources for their welfare. Considering the current climate change, there is need to increase public awareness of other non-traditional foods that can be adopted in the area. There must be deliberate efforts to promote high yielding, nutrient dense food security crops and drought tolerant varieties to bridge the gap between planting and harvesting periods when food is scarce. Strengthening farmer groups will be fundamental to accelerating the adoption of improved technologies especially among those with small land holdings.

Ethical Considerations

The study followed the ethical guidelines on data collection. The survey was done with full permission from National Agricultural Research Organization (NARO) in Uganda and all procedures were followed to involve the key stakeholders. Respondents were provided with all the relevant information about the study and the purpose of the project for which the baseline was conducted. We requested consent from the respondents before they participated in both focus groups and household survey. The information provided has been kept anonymous.

Acknowledgements

We acknowledge funding from McKnight foundation, the support from the National Agricultural Research Organization (NARO) and Foundation for AIDS Orphaned Children (FAOC), which enabled the authors to conduct this research. Their contribution is highly appreciated.

Conflicts of Interest

The authors declare no conflicts of interest.

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