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Research Article

The Influence of Agricultural Input Support on the Nutritional Outcomes among Refugee Children 0–59 Months in West Nile Sub-Region of Uganda

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Abstract
The Uganda refugee policy seeks a long-term development approach that promotes self-reliance, local integration, and economic development of refugees and their host communities, allowing refugees to own land for homestead and engage in subsistence farming. This study assessed the nutritional status of children aged 0–59 months from households that received agricultural inputs in form of land, tools, and seeds as a form of assistance. The study used a mixed-method approach. Questionnaires were administered to 392 households to obtain information on agricultural inputs provided. Anthropometric measurement tools were used for collecting anthropometric information on mid-upper arm circumference (MUAC), weight, and height of children 0–59 months to assess the physical growth and nutritional status of the children aged 0–59 months expressed as percentages. Qualitative data was obtained through focus group discussions and key informant interviews. STATA 18.0 was used to convert nutritional data into percentages. Prevalences of underweight, stunting, and wasting among children 0–59 months whose caregivers received agricultural inputs were found to be generally moderate. However, based on MUAC screening, 0.77% of children 0–59 months had severe malnutrition (MUAC<11.5cm), 4.59% had moderate malnutrition (MUAC of 11.5 to <12.5cm) and the majority of children were normal (MUAC>2.5cm). Conclusively, access to farm seeds significantly influenced nutritional outcomes while, access to land and farm tools did not produce a statistical significance on the prevalence of underweight, stunting, and wasting among children 0–59 months. Humanitarian agencies should scale up the support for agricultural inputs to improve household food production and income.
Keywords: Agricultural Inputs Support, Children, Nutrition Outcomes, Refugees.

1. Introduction and Background Information

Uganda's refugee policy has a unique feature that allows refugees to be allocated land for homestead and farmlands upon registration, giving them the right to work and access social services for free (Watera *et al.,* 2017; Zhu, *et al.,* 2016). Uganda's refugee framework seeks to advance integration and self-reliance as emphasized in the settlement transformative agenda and National Development Plan II-NDP II, 2016-2021 (UNHCR, 2019b; 2020c). de Bruijn (2009) states that due to the liberal policy of the Government of Uganda, refugees tend to have access to farmland, which enables them to be more self-reliant in food supply. The refugees upon registration are not encamped but rather allocated plots of land for housing, backyard farming, and animal rearing as an empowerment strategy, and their movements are not restricted, irrespective of ethnicity and origin (Frank, 2013; UNHCR, 2019; OPM, 2021).

According to UNICEF, (2018), Uganda's refugee policies offer refugees various rights, which include the right to land for shelter and agriculture use; access to public social services including education, health, water, and sanitation; access to income-generating activities and employment opportunities and protection, etc., to promote self-reliance among refugees. Refugees are allotted land with the main aim of shifting refugees from the traditional peasant economic model to more productive and economically diverse opportunities (Watera *et al.,* 2017). The Uganda refugee policy seeks a long-term development approach that promotes self-reliance, local integration, and economic development of refugees and their host communities. While the

refugee situation in Uganda has become protracted with the continuous influx of refugees, land has remained the same and is a major source of livelihood for refugees and demand for it has increased among the refugees.

The Uganda Government provides plots of land for refugees in its settlements as a basis of self-reliance and allows urban refugees to work and register businesses (Khasalamwa-Mwandha, 2021). Refugee households are allocated a 30 m by 30 m plot of land for crop cultivation and animal rearing as an empowerment strategy (Frank, 2013; Berke and Larsen, 2022). An analysis report on the potential productivity of a 30 m by 30 m plot, found that plots of this size could not meet the dietary needs of refugees in the absence of food rations and that the quality of the land allocated to refugees varied widely, with some rocky, infertile and fertile areas (Berke and Larsen, 2022). Although, Uganda's refugee model addresses key refugee welfare constraints, the outcomes and impacts are mixed for example, the high dependence on agricultural livelihoods is undermined by land scarcity, unpredictable weather, and the settlement-based aid delivery system, which restricts the pursuit of alternative livelihoods (Khasalamwa-Mwandha, 2021). Insufficient fertile land and variable land quality, weather variation complicate refugees' efforts in undertaking farming due to drought and flooding which could reduce refugees' ability to rely on subsistence agriculture (Berke and Larsen, 2022). Climatic change, especially drought and occasionally floods in West Nile refugee settlements, affect refugee agricultural activities.

Uganda is the largest refugee host country in Africa, with over 1.4 million refugees and asylum seekers (UNDP, 2017; MOES, 2017; UNHCR, 2018). About 92% of the refugees live in settlements alongside the local communities with only 8% of them in urban centres, and more than 50% of the 1.4 million refugees are settled in West Nile, and about 61% are children under the age of 18 (MOES, 2017; FAO, 2018; OPM, 2019; IPC, 2021). Uganda's refugee policy with integrated settlements has failed to specifically address land negotiations and acquisition (Berke and Larsen, 2022). The land conflict between the refugees and host communities in Uganda, especially in Nakivale settlement, is due to poor management of land allocation to refugees by settlement administrators (Frank, 2013). In Uganda, land for refugee settlement is allocated by the host communities managed by UNHCR, however, the land size allocated is small. Although, the Uganda refugee model addresses key refugee welfare constraints, the outcomes and impacts are mixed for example, the high dependence on agricultural livelihoods is undermined by land scarcity, unpredictable weather, and a settlement-based aid delivery system, which restricts the pursuit of alternative livelihoods (Khasalamwa-Mwandha, 2021). According to UNHCR, (2019), 86% of refugee households (HHs) reported using their shelter plot for cultivation, 94% reported insufficient land size, only 6% reported sufficiency of the land to provide food for the household and 20% of the land is accessed in the community through renting with formal agreement. Additionally, there are still challenges related to access to labour markets, education, and healthcare (Khasalamwa-Mwandha, 2021). Unreliable weather, poor quality, and inadequate land for farming significantly undermine the agricultural activities of refugees (Berke and Larsen, 2022). Weather changes due to global warming, droughts, and floods continue to affect refugee agricultural activities.

Severe food insecurity in Uganda is experienced by 7 out of 10 refugee households, unlike the host community with 5 out of 10 host households facing food insecurity (Idris, 2020). Most of the refugees in Uganda depend on food assistance provided by WFP to meet their daily food needs, and without sustained assistance, refugees may face acute food insecurity (USAID, 2019). This situation increases a child's risk of morbidity and mortality due to malnutrition and affects their cognitive function and developmental outcomes (Bailey and Hedlund, 2012; Dawson-Hahn *et al.,* 2016; Legason and Dricile, 2018; Ali *et al.,* 2019). Evidence has shown that food in-kind assistance creates smaller impacts on food production (Zhu *et al.,* 2016). The refugees struggle to put the arable land available under cultivation and have been able to grow their food and supplement the humanitarian assistance received from the relief agencies (Frank, 2013). Refugees farm the land more intensively than host farmers, making refugee agricultural productivity high (Zhu *et al.,* 2016). Providing refugees with land significantly increases refugees' impacts on local incomes, and access to land increases the local income spillovers created by refugees receiving food aid (Zhu *et al.,* 2016). Integrating agricultural activities within humanitarian assistance could result in increased food production by the refugees and improved refugee household food security and income.

A report by UBOS, MUSPH, and UNICEF (2019), showed that 24% of children below five years were stunted in 10 districts of Northern Uganda, with a stunting prevalence of 10-20 percent in Adjumani and Moyo while Yumbe and Koboko had between 20-30% prevalence of stunting, categorized as "high" burden of stunting. Wanzira *et al.,* (2018), found that 10.4% of children had moderate malnutrition and 5.6% had severe acute malnutrition in Arua district, higher than the national estimates of 3.6% for moderate and 1.3% for severe

acute malnutrition. Rondinelli, *et al.*, (2010), Krishnamani (2016), and Aguayo and Morris, (2020) found that inadequate and poor diets and socioeconomic influences contribute to nutritional problems among children which undermine their health, growth, and development. West Nile sub-region has a long history of hosting refugees due to the persistent violence and conflicts in the neighbouring countries (World Vision, 2017). Conflict and political instability are major drivers of hunger and undernutrition (Tranchant *et al.,* 2019; Bounie *et al.,* 2020). Nutrition problems arise as a result of inadequate and improper diet, especially in children. Malnutrition remains widespread across refugee settlements in Uganda including West Nile region, with 8% wasting and 20% stunting among children (WFP, 2017) higher than WHO standards of <5% and <20% for wasting and stunting respectively (WHO, 2010). GAM prevalence of 11.8% in Adjumani, 11.8% in Bidi-bidi, and 11.1% Palorinya, higher than WHO threshold of <10% (WHO, 2010; UNHCR, 2017). The presence of refugees has increased the demand for food and the majority of refugees in Uganda depend on food assistance to meet their daily food and nutrition needs (FAO, 2012; USAID, 2019). Insufficient intake of nutrients such as calories, protein, or micronutrients, and severe or repeated diseases result in malnutrition in children (WHO, 1997; GoU, 2011; UNICEF, 2019; Idris, 2020). Adequate food consumption by populations affected by conflict is required to ensure proper nutrition (European Commission, 2013). In Uganda, land for refugee' settlement is allocated by the host communities managed by UNHCR, however, the land size allocated is small.

Nutrition-sensitive policies and development approaches are designed to address malnutrition causes by reducing food and nutrition insecurity, strengthening resilience to shocks, and reducing disease burdens (Ecker and Nene, 2010). A report by FAO (2018), revealed that refugees' food security remains low since they depend on food assistance. Recently, UNHCR distributed 142,323 kg of assorted seeds (like maize, beans, groundnuts, rice, sesame, sorghum, cowpeas, cabbages, tomatoes, eggplants, okra, collards, greens, onions, spinach, green pepper, eggplants) to 254,990 refugee households in all settlements to avert potential food insecurity and malnutrition, due to COVID-19 and reduction in food aid (UNHCR, 2020d). Although Uganda's refugee policy promotes integration and self-reliance strategy, the land use by the refugees has created conflicts and misunderstandings with the host communities. Evidence has shown that land can be a source of conflict between refugees and host communities since it is a scarce resource (Herbert and Idris, 2018).

Tensions exist between host communities and refugees due to competition over limited natural resources, such as land, firewood, water, grazing of cattle, destruction of crops by stray animals, and real or perceived unequal access to services (UNHCR, 2020). Accordingly, refugees claimed that the host communities restrict their access to natural resources, especially firewood for cooking and grass for thatched roofs, and at times attacked those venturing out of the settlements to fetch them, in particular women (IRRI, 2019). While the host communities, in turn, complain that refugees did not seek their consent to access the natural resources. Refugees are given basic farm tools upon registration, in line with Uganda's refugee model that promotes integration and self-reliance strategy. Backyard farming and gardening present an opportunity to grow their food and enhance access to culturally appropriate food, thus improving household food security.

Peter *et al.,* (2019), found that stunting and underweight were significant nutrition problems while low education levels of caregivers and poor weaning practices were associated with malnutrition among children 0-59 months. The prevalence of stunting significantly reduces when the level of education of caregivers is high (Snodgrass and Mensa, 2012; Uganda Bureau of Statistics (UBOS) and ICF, 2018). Knowledge of nutrition influences childcaring and feeding practices. Similarly, poor diets and socioeconomic influences contribute to nutritional problems among children (Aguayo and Morris, 2020). Refugees are vulnerable since they depend on humanitarian aid for survival. The provision of agricultural inputs for refugees as a self-reliant strategy for increasing agricultural production and productivity is to avoid overdependence on food assistance therefore, it is important to know how nutritional outcomes are influenced by the provision of agricultural inputs like land, farm tools, and seeds for planting. This paper sought to examine the influence of agricultural inputs support on the nutritional outcomes among children under five years in selected refugee settlements of Adjumani, Obongi, and Yumbe districts in West Nile sub-region.

2. Materials and Methods

2.1. The Study Design

A cross-sectional study employing a mixed-method approach using both qualitative and quantitative approaches was conducted. The study was carried out in the refugee settlements of Adjumani, Obongi, and Yumbe districts out of the six refugee hosting districts in the West Nile sub-region of Uganda because the

districts host the largest number of refugees. Adjumani district is found in the north-western region of Uganda, between latitudes 31^0 24 and 32^0 4 E and longitudes 2^0 53 and 3^0 37 N (Adjumani District Development Plan, 2015). Adjumani district has fifteen refugee settlements which include Mirieyi, Olua 2, Ayilo 1, Ayilo 2, Boroli, Alere/Olijji, Baratuku/Elema, Nyumanzi, Maaji 1, Maaji 3, Agojo, Maaji 2, Mungula 1, Mungula 2, Pagirinya. In the Adjumani district, the study was conducted in six refugee settlements of Ayilo 1, Alere/Olijji, Nyumanzi, Maaji 3, Mungula 1, and Pagirinya.

Obongi district is located in the north-western part of Uganda, between latitudes 31^0 30" and 31^0 45" E and longitudes 3^0 30 and 3^0 15 N. The refugee settlements in Obongi district include Chinyi (Zone 1), Ibakwe (Base Camp Zone), Dongo East (Zone 2), and Dongo West (Zone 3). The study was conducted in 3 settlements of Chinyi, Ibakwe, and Dongo West. While Yumbe District is in the north-western part of Uganda, with coordinates of 03^o 28N and 31^o 15E (UNDP, 2009b; Yumbe District Local Government (YLG), 2015). Yumbe district has five settlements namely Bidibidi Zone 1, Bidibidi Zone 2, Bidibidi Zone 3, Bidibidi Zone 4, and Bidibidi Zone 5.

The study was carried out in 3 settlements namely Bidibidi Zone 1, Bidibidi Zone 2, and Bidibidi Zone 4. According to UNCHR refugee state, 582,112 refugees were in the districts of Adjumani, Obongi, and Yumbe, with 223,785 refugees (29,710 HHs) in Adjumani district, 125,617 refugees (28,810 HHs) in Obongi district, and 232,710 refugees (43,213 HHs) Yumbe district (UNHCR, 2020b; UNHCR, 2021). Agriculture input support in addition to food assistance was provided in the three districts. A sample size of 392 refugee households both on cash and food was used (122 households on cash and 270 households on dry food ration). Also, the major economic activities in these districts include among others subsistence agriculture, cattle rearing, fishing, charcoal burning, stone quarrying, sand excavation, and trading in small businesses. Data was obtained from refugees, and the results were generalized to inform improvements in humanitarian assistance.

2.2. Methods

The study focused on assessing the impact of agricultural inputs distributed to refugee households on the nutritional outcomes among children 0–59 months in settlements of Adjumani, Obongi, and Yumbe districts. Specifically, the paper aimed at assessing the nutritional status of children aged 0–59 months whose caregivers received agricultural inputs support as a form of assistance. The study used a mixed-method research approach that employed both qualitative and quantitative methods to obtain information and conclude whether agricultural inputs assistance influenced the nutritional outcomes of refugee children 0–59 months as suggested by Creswell, (2014). Using Yamane's (1967:886) simplified formula (Adam, 2020), $n = N/1+N(e)^2$, where n= sample size (392), N= population size (20,347), and e= level of precision or significance (0.05), with a 95% confidence level, giving a sample size of $n=20,347/1+20,347\ (0.05)^2= 392$.

A total of 392 respondents and 61 key informants were interviewed. However, out of 392 respondents, only 122 respondents were receiving cash-based assistance, and 270 of them were on food-in-kind assistance. Two survey questionnaires and anthropometric measurement tools were used to obtain primary data from the caregivers of children 0–59 months who received agricultural inputs (mainly the head of household and mother/caregiver of the child), children less than 6 months, and children 6–59 months. A semi-structured survey questionnaire (containing both closed and open-ended questions) was used to collect the qualitative data from the key informants, which included the implementing partners, UN agencies, and district authorities. Focus group discussion (FGD) was done using an FGD guide with small groups of 10 to 12 members to gather their experiences and views of agricultural input assistance and how they think it influenced the nutritional status of their children, as proposed by Creswell, (2014).

Responses were received from 392 caregivers with anthropometric measurements of their children, representing a 100% response rate for questionnaire and anthropometric instruments respectively. For the qualitative study, responses were received from 44 respondents out of a target of 61, which represents a 72.1% response rate. The overall response rate was 96.3% (436 responses received out of 453 targeted respondents) which is higher than what was previously advanced by Mundy (2002). Before interviews and anthropometric measurements were done, research tools were reviewed by peers and supervisors for face validity, and the questionnaires and anthropometric tools were pre-tested to test their validity using a section of respondents in one of the settlements as supported by Kelati (2014). The research assistants were trained for 3 days on the study scope, data collection components, and study procedures which included data collection techniques and instruments, informed consent form administration, maintenance of confidentiality, anonymity, privacy, respect for research participants, and observance of principles of

beneficence and non-maleficence throughout the study. Informed consent forms and research tools were translated into the different local languages spoken by the respondents, mainly Bari, Dinka, and Arabic. Observation and documentary review were used to collect qualitative information.

Children's nutrition status was also observed and triangulated with information obtained from the anthropometric measurements and health facility data. The anthropometric measurement tools were used for collecting anthropometric information on mid-upper arm circumference (MUAC), weight, and height of children 0–59 months to assess the physical growth and nutritional status of the children aged 0–59 months expressed as percentages. Weighing scales, height boards and MUAC tapes were used for measuring weight, height, and mid-upper arm circumference (MUAC) respectively. Non-stretchable MUAC tapes of MOH/WHO were used for the measurement of MUAC of children to the nearest 0.1 cm, and weight was recorded using a digital weighing scale. Weight was measured to the nearest 0.1 kg in light indoor clothing and with bare feet or stockings, using a portable standard calibrated digital weighing scale, and height was measured, without shoes, to the nearest 0.1 cm using a portable height board. Quantitative data collected was coded and reviewed for quality, accuracy, consistency, and completeness and analysed using STATA 18.0 as suggested by Aliyu *et al.,* (2015).

The analysed data was used to present the descriptive statistics pertaining to the agricultural inputs support and nutritional outcomes. Notes were generated from the analysed data to create meaning for the readers, and generalization of the analysed data was made based on the prevalence levels of malnutrition in relation to access to agricultural inputs. While, qualitative data collected through interviews, focus groups, observation, or review of documents was edited and imported into Open Code 4.02 through rich text format and categorized into themes and contents using mother and child nodes, from where interpretation and meanings are generated. Concerning participants' responses on access to land, farm tools, and seeds, the researcher recorded their responses in their own words. General conclusions were made based on the responses obtained about the themes of the study.

3. Results

3.1. Agricultural Inputs Support (Land, Farm Tools, and Seeds) for Refugee Households

Table 1. Showing agricultural inputs provided to caregivers of children under five years in selected refugee settlements in West Nile sub-region.

Agricultural inputs support		**Overall (N = 392)**	**(%)**	**District**			
				Adjumani	**Obongi**	**Yumbe**	**Sig.**
Land access	Yes	198	50.51	35.96	48.65	61.68	chi2(2) = 18.1324, sig=0.000
	No	194	49.49	64.04	51.35	38.32	
Access to farm tools	Yes	249	63.52	42.98	63.06	77.84	chi2(2) = 35.5487, sig=0.000
	No	143	36.48	57.02	36.94	22.16	
Seeds access	Yes	161	41.07	16.67	42.34	56.89	chi2(2) = 45.3852, sig=0.000
	No	231	58.93	83.33	57.66	43.11	
Crops grown	Cereals	213	54.34	42.11	50.45	65.27	chi2(2) = 15.5943, sig=0.000
	Pulses	75	19.13	7.02	16.22	29.34	chi2(2) = 22.6736, sig=0.000
	Groundnuts	68	17.35	8.77	17.12	23.35	chi2(2) = 10.0525, sig=0.007
	Vegetables	234	59.69	43.86	61.26	69.46	chi2(2) = 18.6143, sig=0.000
	Tubers	76	19.39	6.14	18.02	29.34	chi2(2) = 23.5204, sig=0.000
	Other crops	32	8.16	6.14	11.71	7.19	chi2(2) = 2.6995, sig=0.259
Source: Primary data (2022).							

The findings of the study in Table 1 above revealed that access to land, farm tools, and seeds for farming by caregivers of children 0–59 months was 50.51% (P=0.000), 63.52% (P=0.000) and 41.07% (P=0.000). This implies few households who received agricultural inputs were able to engage in farming activities to produce additional food.

The results in Table 1 above showed that the proportion of caregivers of children 0–59 months that had access to land, farm tools, and seeds for farming was 50.51% (P=0.000), 63.52% (P=0.000) and 41.07% (P=0.000) respectively compared those that did not access land with significant differences in proportions between the districts of Adjumani, Obongi, and Yumbe at P<0.05. Pearson chi-square test for the districts (χ^2 =18.1324, p= 0.000) confirms that these differences are statistically significant. This could be attributed to the availability of vast and unoccupied land provided by the host community for refugees. Additionally, refugees hire land from the host community for mainly subsistence farming however, the refugees reported facing numerous challenges related for example high cost and a short period of land hire, restricting them to cultivate the land for only one farming season, far distances of the farmland, and sometimes landlords demand to be given the first harvest. These findings suggest that if the caregivers of children under five years are provided land for farming, without any other hindrances, they can grow additional food to supplement the assistance, thus improving household food security and income. Although the refugees had access to land for farming, harassment by the landlords, destruction of crops by stray animals, lack of extension services, absence of support for pest management, and infertile and unproductive remain key constraints to effective farming by refugees. The government should allocate land to refugees for farming.

One of the respondents submitted that;

> "*The land size allocated for settling is small about 30 meters by 30 meters, so it is difficult to cultivate other crops in it and I advised my fellow refugees to create good relationships with the host community so that they can be given more land for growing their food to supplement the food and cash distributed. Let the government allocate land for refugees for only cultivation to avoid the landowners from cheating us"* (R03, FGD Belameling, R05, FGD Chinyi, 2022) (Ecega *et al.,* 2025).

Further, regarding the quality of the land, some of the respondents reported that the land provided for refugees in some settlements is rocky, not fertile, and not cultivable, making them unable to practice farming. One respondent mentioned (R05, FGD, Yumbe, 2022) mentioned that*;*

> *"In some areas, the land provided for refugees is rocky, not fertile, and can not be cultivated for example UNHCR provided land for refugees for cultivation in Bidibidi settlement zone 4, however, the land is far from the settlement which makes it very dangerous for the women and young girls. Many refugees, hire land for cultivation from the cost of community members with available land however, after the first season of cultivation, the landowners take away the land, which discourages us from farming activities"*(Ecega *et al.,* 2025).

3.2. Crops Cultivated by Caregivers of Children of 0–59 Months

Concerning the crops grown by the caregivers of children under five years, table 1 above showed that the majority, 59.69% and 54.34% of caregivers cultivated vegetables and cereals (mainly maize and sorghum) respectively with significant difference proportions between the districts at a chi2(2) of 18.6143 and 15.5943 with P-values of 0.000<0.05 implying the variation in proportions is statistically significant. This could be attributed to the presence of land and support from implementing partners. Therefore, the results demonstrate the need for humanitarian agencies to expand access to land and other farm inputs to ensure refugees can grow and produce their own food.

3.3. Association between Agricultural Inputs and Nutritional Outcomes among Children

Table 2. Showing the association between agricultural input support and nutritional outcomes among children under five years in selected refugee settlements.

		Malnutrition		**Underweight**		**Stunting**		**Wasting**	
		%	**P-value**	**%**	**P-value**	**%**	**P-value**	**%**	**P-value**
Land access	Yes	23.23%	0.4535	12.63%	0.4731	15.15%	0.2039	7.07%	0.3329
	No	20.10%		10.31%		10.82%		9.79%	
Access to farm tools	Yes	23.29%	0.3088	13.65%	0.0750	14.86%	0.1517	7.63%	0.4598
	No	18.88%		7.69%		9.79%		9.79%	
Seeds access	Yes	27.95%	0.0119	18.01%	0.0007	18.01%	0.0139	9.32%	0.5939
	No	17.32%		6.93%		9.52%		7.79%	
Source: Primary data (2022)									

From Table 2 above underweight, a chi-square test revealed that the prevalence of underweight, stunting, and wasting among caregivers of children 0–59 months who had access to land was 12.63% (P=0.4731), 15.15% (P=0.2039) and 7.07% (P=0.3329) respectively compared to those that did not have access to land for farming with underweight prevalence of 10.31% (P=0.4731), stunting prevalence of 10.82% (P=0.2039) and 9.79% wasting prevalence (P=0.3329) which are not statistically significant. Those who accessed land for farming had more children with malnutrition compared to those who did not, this could be attributed to the fact that the caregivers spent more time in the gardens cultivating than caring for children, unlike those caregivers with no land. The variations in prevalences of underweight, stunting, and wasting are not statistically significant, implying there is no sufficient evidence that access to land influences nutritional outcomes.

On access to farm tools, the results in Table 2 showed that there is no significant association between agricultural inputs support in terms of access to farm tools on nutritional outcomes as confirmed by the prevalence of underweight, stunting, and wasting among the children whose caregivers received farm tools being 13.65%, 14.86% and 7.63% at P-values of 0.0750, 0.1517 and 0.4598 respectively compared to those children whose caregivers did not receive farm tools with 7.69% underweight prevalence (P=0.0750), 9.79% stunting levels (P=0.1517) and 9.79% were wasted (P=0.4598). This implies that children from households that received farm tools were more stunted, underweight, and wasting because the caregivers were busy involved in farming activities with less focus on child caring example timely breastfeeding, and timely food preparation as compared to those without farm tools. Although the prevalences of underweight, stunting, and wasting are not statistically significant, the findings indicate that the prevalences are generally low for underweight and stunting in comparison with WHO cut thresholds of lower than 10% and 20% respectively however, wasting prevalence is above <5% WHO cut off classified as moderate wasting.

While on access to farm tools, the study found no significant association with nutritional outcomes as confirmed by the moderate prevalence of underweight, low stunting prevalence, and moderate wasting prevalence among the children whose caregivers received farm tools compared to those children whose caregivers did not receive farm tools having low underweight prevalence, very low stunting prevalence and high wasting prevalence higher than <5% WHO cut off, classified as moderate at a P-value of 0.4598 which are not statistically significant. Even if refugees can access some farm tools, access to land and seeds remains crucial in ensuring they can produce their food. Generally, agricultural input distribution is not widely done and is ineffective as land access remains a challenge to many refugees. A respondent confirmed that;

> "*Agricultural tools are given once to refugees during registration, but the tools are not provided yearly or frequently. These days the tools are given to selected households and particular villages, that are identified by the NGO partners, so how can we grow crops when the tools are only given to specific groups*? *They told us that if we don't join the group, we will not be given tools and seeds*" (R07, FGD, Zone 2, Yumbe, 2022) (Ecega *et al.,* 2025).

This claim shows that agricultural input distribution is limited to selected groups of refugees identified by the implementing partners. Although the selective distribution approach was adopted by some humanitarian partners supporting livelihood activities that target households for a certain period, the households are expected to cascade the knowledge and skills to the next groups. The selective distribution of farm inputs perhaps explains why malnutrition is common among refugee children since many refugees could not supplement the food assistance distributed.

The access to seeds for planting by caregivers of children below 5 years, the findings revealed that there is a significant association between agricultural inputs support in terms of access to seeds on nutritional outcomes among children supported by the 18.01% (P=0.0007) prevalence of underweight and stunting prevalence of 18.01% (P=0.0139) among children whose caregivers received farm seeds for planting however, the wasting prevalence was found to be 9.32% at P-value of 0.5939 unlike those that who did not receive seeds for planting had lower prevalence of 9.52% underweight, 6.93% stunting and 7.79% wasting among the children. This implies there is a direct effect of seeds distributed on the children's nutrition status among those households that received seeds, which could be attributed to the caregivers selling off the seeds and misusing the money instead of planting them.

Responses from the respondents indicated that the distribution of agricultural inputs is not consistent, and, in most cases, seeds are distributed late as confirmed by a respondent (R02, FGD Belameling, 2022) who submitted that;

> *"Agricultural seeds were distributed in the dry season which does not help us and even the land/plot allocated for the refugees for settling is only 30 by 30 meters, which is not enough for growing crops. So, UNHCR and the government should acquire more land from the host community for cultivation for the refugees"* (Ecega *et al.,* 2025).

Similarly, for some respondents the selective distribution of agricultural inputs like farm tools and seeds including seedlings does not encourage refugees to cultivate extensively, and yet most refugees come from communities that are subsistence farmers. Distribution should target every refugee household like the food assistance program (Ecega *et al.,* 2025). A respondent claimed that*;*

> *"The livelihood support provided to the refugees is not sufficient because the agricultural inputs are mostly provided to care group mothers (nutrition groups) and few refugees who have formed groups with the support of the organizations"* (KII, 15, Yumbe, 2022) (Ecega *et al.,* 2025).

3.4. Assessment of Malnutrition Based on Anthropometric Measurements

Table 3. Showing the child-related characteristics of the refuge households in Adjumani, Obongi, and Yumbe refugee settlements in West Nile sub-region of Uganda (N= 392).

	Adjumani		Obongi		Yumbe		Overall	
	Mean	**STD**	**Mean**	**STD**	**Mean**	**STD**	**Mean**	**STD**
Age (months)	33.61	8.77	32.23	9.25	30.69	8.94	32.18	8.99
MUAC/nearest 0.1cm	14.69	1.266	14.49	1.24	14.47	1.10	14.55	1.202
Weight/nearest 0.1kg	12.34	3.59	9.64	7.45	11.14	5.31	11.04	5.45
Height/nearest 0.1cm	94.44	13.49	63.26	45.45	82.32	13.10	80.01	24.01
Source: Primary data (2022).								

Mid-upper arm circumference (MUAC) screening results in Table 3 above showed that 0.77% of children 0–59 months with MUAC of <11.5 cm had severe malnutrition, while 4.59% of them had moderate malnutrition with MUAC of between 11.5 to <12.5cm. The majority of children (94.64%) were normal, with MUAC of >2.5cm. The categorization of severity of malnutrition using MUAC is based on WHO classification. The anthropometric characteristic measures by age in Table 3 showed a slight difference in the mean age and standard deviation of children 0–59 months, where the overall mean of 32.18 months, and the average of children measured being 32 months which is 2 years and 8 months. The children's mean age of 26.37cm falls above the expected for children 24-35 months. While the mean weight of 11.04kg falls in the expected range of 11.9-17.1cm for children aged 32 months. The mean length/height of 80.01cm falls slightly below the expected range of 86.8-100.0cm for the average age of 32 months. The deviation of length/or height is considered idiopathic and hence, does not impact the overall results.

3.5. Results of Regression Analysis for Agricultural Input Support and the Nutritional Outcomes

Table 4. Results of logistic regression analysis for agricultural input support and nutritional outcomes among children under five years in selected refugee settlements in West Nile.

Variables	**Malnutrition**	**Stunting**	**Underweight**	**Wasting**
Received seed inputs	1.917517 **	1.952908*	2.869232 ***	1.626786
	(.5573099)	(.6937876)	(1.114544)	(.7158904)
Received farm tools	.9004838	1.034291	1.076731	.6603765
	(.2881238)	(.4188685)	(.4801268)	(.3036057)
Has farmland	1.075217	1.254952	.9708995	**.**7202668
	(.2841154)	(.4087915)	(.3333473)	(.2838205)
Constant	.2126022***	.093942***	.0728928***	.111839***
	(.0488103)	(.0285027)	(.024469)	(.0335669)
Observations	392	392	392	392
Source: Primary data (2022). Standard errors in parentheses *** P<0.01, ** P<0.05, * P<0.1.				

In Table 4 above, the odds ratios indicated that the likelihood of stunting, being underweight, and wasting is associated with different predictor variables. Access to farm seeds odds ratio of 1.917517 significant at a 5% level (P<0.05), implying children from households that received farm seeds were about 1.92 times more

likely to be malnourished compared to those who did not receive farm seeds. Stunting prevalence the odds ratio of 1.952908, significant at a 10% level (P<0.1) indicating that children in households that received seeds were about 1.95 times more likely to be stunted while in terms of underweight as a nutritional outcome, the odds ratio was 2.869232 highly significant at 1% level (P<0.01), suggesting that receiving seeds was associated with a 2.87 times higher likelihood of children being underweight. The odds ratio of 1.626786 for wasting was not statistically significant, implying no significant difference in the likelihood of wasting between those who received seeds and those who did not.

Concerning access to farm tools, the stunting and underweight prevalences odds ratio of 1.034291 and 1.076731 respectively, are not statistically significant, suggesting no significant association between receiving farm tools and being stunted and underweight. Similarly, the wasting prevalence odds ratio of 0.6603765 is not statistically significant, demonstrating no significant association between receiving farm tools and wasting as a nutritional outcome. While access to land for farming odds ratio of 1.075217 which is not statistically significant suggests no significant association between having farmland and malnutrition. From the table above, stunting, underweight, and wasting odds ratios of 1.254952, 0.9708995, and 0.7202668 are not statistically significant, indicating no significant association between having farmland and prevalences of stunting, underweight, and wasting respectively. In conclusion, receiving farm seed is significantly associated with higher odds of adverse child nutritional outcomes of wasting, stunting, and underweight prevalences, whereas receiving farm tools and having farmland do not show significant associations with wasting, stunting, and underweight as nutritional outcomes.

4. Discussions

Uganda's refugee policy and comprehensive refugee response framework advocate for self-reliance, integration, and empowerment strategy, which is why, the humanitarian agencies are supporting refugee food security and livelihood activities through the provision of land for farming, farm tools, and seeds to promote food production. In West Nile refugee settlements, out of the total of 392 respondents, 50.51% had access to land for farming, 63.52% received farm tools and 41.07% got seeds for planting distributed by the implementing partners. The refugees, upon registration, are allocated plots of land for housing and backyard farming with no movement restrictions irrespective of ethnicity and origin (OPM, 2021; UNHCR, 2019). As suggested by Zhu *et al.,* (2016), refugees farm the land more intensively than host farmers, which has increased refugee agricultural productivity. Further, providing refugees with farmland significantly increases refugees' impacts on local incomes and local income spillovers created by refugees receiving food aid (Zhu, *et al.,* 2016). However, high dependence on agricultural livelihoods is undermined by land scarcity, unpredictable weather, and the settlement-based aid delivery system, which restricts the pursuit of alternative livelihoods (Khasalamwa-Mwandha, 2021). Climate-related factors like drought and occasionally flooding also affect the farming activities of refugees. West Nile is faced with unreliable rainfall patterns, which affects the agricultural activities of the population. Further, the finding on access to land agrees with Watera *et al.,* (2017), that refugees are allocated land to shift from the traditional peasant economic model to more productive and economically diverse opportunities. Land access by refugees is essential in promoting sustainable livelihoods given the rapid reduction in funding for refugee response which has led to a significant reduction in food and cash rations. This reduction has affected access to food by refugees. Rukundo *et al.,* (2014) states that all people have the right to adequate food as defined by the Progressive Food and Nutrition Policy (UFNP) adopted in 2003. Access to adequate food prevents malnutrition among the population, especially in young children.

Based on the findings, children whose caregivers had accessed land for cultivation were found to have moderate underweight prevalence, low stunting prevalence, and moderate wasting level. Although these prevalences were low, malnutrition remains a burden among the refugee population due to lack of adequate intake of dietary foods and insufficient intake. This finding agrees with Galloway *et al.,* (2017), who stated that persistent malnutrition can have adverse health outcomes and can lead to reduced quality of life. Good nutrition is essential for human health and survival (Grijalva-Eternod *et al.,* 2012). Refugee children are still vulnerable and prone to malnutrition due to inadequate food intake and lack of a balanced diet. To achieve the objective of self-reliance and empowerment strategy as highlighted in the Uganda refugee policy, access to land by refugees is critical in promoting food production and improving household food security. Evidence shows that providing refugees with land significantly increases refugees' impacts on local income, and access to land increases the local income spillovers created by refugees receiving food aid for example to UGX 1.8 million, or $533, in Rwamwanja and UGX 1.6 million, or $465, in Adjumani (Zhu *et al.,* 2016). Refugee food production has a direct influence on the local economy if local integration and empowerment approaches are effectively supported. This also conforms with the study findings of Berke and Larsen, (2022), which

revealed that full refugee integration can provide economic and social benefits that contribute to the host country, for instance, increased GDP and agricultural production including increased provision of infrastructure supported by aid agencies.

The views of respondents on access to land indicated that land allocated for homestead and farming is small. The land allocated is estimated to be 30 meters by 30 meters to allow refugees to cultivate vegetables and crops, including fruits. However, due to the small size of the land, refugees are not able to rear domestic animals like goats, cows, etc. As supported by Berke and Larsen (2022) and Khasalamwa-Mwandha (2021), land scarcity, unpredictable weather, insufficient fertile land, and variable land quality undermine refugees' efforts in subsistence farming and high dependence on agricultural livelihoods. Although access to land for refugees is essential in promoting agricultural activities, evidence has shown that land can be a source of conflict between the refugees and host communities since it is a scarce resource (Herbert and Idris, 2018). Tensions exist between host communities and refugees due to competition over limited natural resources, such as land, firewood, water, grazing of cattle and destruction of crops by stray animals, and real or perceived unequal access to services (UNHCR, 2020).

Gender-based violence issues have been commonly reported among refugees related to land use and scarcity of land for farming. Refugees hire land from the host community but have reported harassment by landowners, who threaten them and even demand to be given the first harvest. The land allocated to refugees is not owned by the government, but the land belongs to the host communities. Refugees complained about the host communities' restrictions on natural resources like firewood for cooking and grass for thatched roofs, and at times harassed women when they went looking for water (IRRI, 2019). The government should gazette land for refugees and farming to ensure decent and dignified settlement, but most importantly provide adequate land for refugee farming activities and minimize such aggression.

Regarding the access to seeds for farming by the refugees, the study found that there was a significant association between nutritional outcomes among children whose caregivers received seeds with both 18.01% prevalence of underweight and stunting at P-values of 0.0007 and 0.0139 respectively. This finding agrees with FAO (2018), that refugees' food security remains low since they depend on food assistance, which made UNHCR distribute assorted seeds to refugee households in all settlements to avert potential food insecurity and malnutrition due to the reduction in food aid and COVID-19-related (UNHCR, 2020d). Although access to land remains a challenge, access to seeds should be expanded since the refugee situation in Uganda is protracted with the continuous influx of refugees. Effective land use by refugees can be a major source of livelihood for them. As supported by Ahimbisibwe (2013), refugees have been able to grow their food and supplement humanitarian assistance using the land allocated for farming. The humanitarian agencies should increase the supply of locally resistant seeds for refugees considering the climatic conditions of the areas where refugees are settled and the preferences of the refugees as they are important for the farmers to carry on with farming activities. There is a need to re-think the current food assistance approach, scale up the distribution of farm seeds to every household, and prioritize households with children 0–59 months so that they can grow additional food to feed the children on.

Uganda still faces numerous undernutrition challenges, malnutrition, and poor health which are significant risks for young children and increase a child's risk of morbidity, and mortality (Lean, 2015; Galloway *et al.,* 2017; UNHCR, 2017b; Simelane and Worth, 2020). Therefore, to meet the food and nutritional needs of children more effectively, humanitarian assistance should scale up farming activities among the refugees. This is also emphasized by Muhangi *et al.,* (2022) that the presence of favourable climatic conditions enhances agricultural productivity, and this has triggered redirecting refugees into agricultural production as the major source of livelihood. Based on the anthropometric measures, the mid-upper arm circumference (MUAC) screening, the findings revealed that 0.77% of children 0–59 months with MUAC of <11.5 cm were severely malnourished and 4.59% of the children with MUAC of between 11.5 to <12.5 cm had moderate malnutrition while the majority of children with MUAC of >2.5 cm were normal in conformity with WHO classification of malnutrition using MUAC. This implies that despite the humanitarian assistance, the burden of malnutrition among refugee children is still a problem requiring intervention. These findings agree with the report of the Ministry of Health of Uganda, which found the prevalence of moderate acute malnutrition of 10.4% and severe acute malnutrition of 5.6% in the refugee settlements in West Nile, higher than WHO targets of below 5% for wasting in children (GoU, 2011b). Malnutrition is as a result of intake inadequate of nutritious food. Grijalva-Eternod *et al.,* (2012) and (OPM, 2019), stated that a diet deficient in macronutrients leads to underweight, wasting and micronutrient deficiencies indicate malnutrition arising from insufficient food intake. Inadequate intake of diverse and nutritious foods deprives the child of

essential micronutrients for the growth and development of the body.

Regression results showed that receiving seed inputs as a form of humanitarian assistance in addition to food in-kind or cash assistance, is significantly associated with higher odds of adverse child nutritional outcomes (wasting, stunting, underweight) whereas receiving farm tools and having farmland do not show significant associations with prevalences of underweight, wasting and stunting. Generally, access to land for farming and farm inputs remain a challenge for refugee households since the distribution of agricultural inputs was not done regularly despite the efforts made by the humanitarian agencies to operationalize the refugee model which seeks for empowerment of refugees and host communities. Refugees have indicated clearly the agricultural inputs like hoes, panga, rake etc were distributed during registration however, some partners were distributing farm inputs to some selected groups. Strengthening refugee food security and livelihoods is important to ensure they become self-reliant and can produce their own preferred foods. As emphasized in the CRRF, refugees have equal access to government-provided social services like the nationals, are allocated land for farming and shelter, and are allowed to work and operate businesses to earn a living (OPM, 2019). It is on this basis that humanitarian agencies are labouring to provide additional support for improving refugee household food and security and income through engaging them in farming activities within the plots allocated, to supplement the food and cash assistance. Uganda's refugee model is regarded as the best approach to supporting refugees and asylum seekers because it advocates for the empowerment of refugees and the host communities. Several initiatives have been implemented to strengthen the resilience of refugees and host communities for example the Development Response to Displacement Impacts Project (DRDIP) in the Horn of Africa, Settlement Transformation Agenda (STA) integrating refugees into the National Development Plan II, and Refugee and Host Population Empowerment (ReHoPE). These programmes are meant to integrate refugees into the host communities, improve access to basic social services by refugees, expand economic opportunities for refugees and host communities, and enhance environmental management for communities hosting refugees. Further, the initiatives are intended to explore opportunities that benefit both refugees and the communities that host them, by bridging the gap between humanitarian and development interventions.

Some limitations were faced during the study which included long bureaucratic processes of accessing refugees which delayed the data collection process despite the approval obtained; involvement of refugee leaders in the research process as leads to the research teams in the settlements required additional funds as this was not planned for; verification of agricultural inputs distributed was difficult since the refugees could not show the inputs received; interviews took a lot of time and resources; during the focus group discussions, some members were shy to share their views while others over dominated the discussions since they had valuable information pertaining the topics; and the use of mixed methods delayed the data collection process as it took a lot of time as well as analysis of data. Based on the findings of the study, the researcher identified areas for future research that were not addressed by this study but are very crucial in the improvement of humanitarian assistance and nutritional outcomes among refugees which include knowing the impact of refugee presence on host community land use and agricultural production in West Nile and assess the relationship between refugee household food security and gender-based violence among refugees in West Nile.

5. Conclusion and Recommendations

Although the prevalence of underweight, stunting, and wasting are low among caregivers who had access to land and farm tools, the study concluded that access to farm seeds has a significant association with stunting and underweight among children 0–59 months. The study also concluded that access to farmland and farm tools did not have significant associations with wasting, stunting, and underweight prevalences as nutritional outcomes.

The study, therefore, recommended that humanitarian agencies, government (the line ministries), and refugee-hosting districts should scale up support for agricultural inputs, and ensure easy access to land and technical extension services to promote food production and productivity hence improving refugee household food security and income. The Government of Uganda and line ministries (Ministry of Disasters Response, Ministry of Agriculture and Fisheries) should gazette land for refugees and ensure farming among refugees is intensively promoted to reduce dependence on humanitarian aid in line with the comprehensive refugee response framework. The government and humanitarian agencies should strengthen market systems for agricultural inputs and agrochemicals, as well as for veterinary drugs, to access the inputs. Finally, the study recommended the adoption of the model to improve humanitarian assistance and nutritional outcomes in refugee settings.

Declarations
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Author Contributions: AGE: Formulated study title and objectives, searched for related literature, designed the methodology, collected data, analyzed the data, and discussed the findings; AB: Formulated the title of the study and objectives, analyzed the collected data, and proofread the entire manuscript; RZ: Analyzed the collected data, proofread the whole manuscript.
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