

Household Response to Seasonal Hunger in Uganda: Evidence from National Panel Surveys

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Abstract

Despite Uganda having constitutional provisions to ensure food security, a large population of Ugandans can still not meet the minimum recommended dietary intake (RDI). In addition, there are within-country variations in the number of cropping seasons, which affect continuous food availability. The study explored the correlates of seasonal hunger, an important but neglected issue within the African and Ugandan food security literature. In addition, we explored the nature of coping strategies adopted by households faced with seasonal hunger using four waves of a unique panel dataset of Ugandan households from the Living Standard Measurement Surveys-Integrated Surveys on Agriculture (LSMS-ISA). We find that fertilisers significantly reduce the risk of experiencing seasonal hunger. In some estimations, having a household member engaged in wage employment is associated with an increased risk of seasonal hunger. Our results show that policies focusing on smoothing consumption or boosting productivity can help address seasonal hunger. Concerning the appropriateness of coping strategies, we find that having adequate storage is negatively associated with the seasonal hunger experience. Regarding policies, households can adopt ex-ante strategies to smooth consumption, such as keeping livestock and establishing appropriate storage facilities. Social protection interventions should thus have a livestock component. Using improved agricultural inputs should be a major focus for extension services in order to enhance productivity.

1. Introduction

Food insecurity remains a significant development challenge in sub-Saharan Africa (SSA). In this regard, understanding how households respond to changes in food availability is an economic priority. According to the 2022 State of Food Security report, at least 783 million people globally are faced with hunger (FAO *et al.*, 2023). The 2022 State of Food Security report projects that the share of the global population affected by hunger in Sub-Saharan Africa (SSA) will increase from 36.4% in 2020 to 51.5% by 2030. Furthermore, the reliance on rain-fed subsistence agriculture exposes a substantial proportion of the SSA population to seasonal hunger, leading to disastrous consequences. For example, evidence shows that despite such potentially devastating consequences, seasonal hunger is among the least understood issues regarding food security and hence the least studied in SSA (Anderson *et al.*, 2018; Maxwell, 1996).

Policy makers and researchers are increasingly concerned with how households respond to seasonal changes in food availability (see, e.g., Christian and Dillon, 2016). They have realised that coping strategies in response to seasonal hunger can compromise current and long-term food security. The literature highlights poor coping mechanisms as the primary drivers of vulnerability to food insecurity (Christian and Dillon, 2016). Faced with the likelihood of seasonal hunger, households can adopt several coping strategies ex-ante to deal with the potential threat. These can range from farm or crop diversification, engaging in commercially oriented agriculture, and adopting improved agricultural technologies to boost food production and seek off-farm employment. Indeed, some recent studies point to non-farm incomes as a vital factor for household food security status (Tibesigwa and Visser, 2016; 4). Apart from ex-ante strategies, the spatial location has also been the focus of research on seasonal hunger, with the consensus being that rural households have both a higher chance of experiencing seasonal hunger and, when it occurs, the effects last longer (e.g. Anderson *et al.*, 2018; Becquey *et al.*, 2012).

Issues of access to sufficient food all year round have been central to Uganda's development agenda. The Government of Uganda (GoU) recognises the urgent need to ensure its entire population's food and nutrition security. Indeed, Article 14 (XIV) of the 1995 Uganda Constitution states that "*The State shall*

endeavour to fulfil the fundamental rights of all Ugandans, including ensuring food security". In addition, Article 22 (XXII) affirms that *"the State shall encourage food production and storage, establish food reserves and encourage and promote proper nutrition through education and appropriate health measures"*. Nonetheless, Uganda, like several other SSA countries, could not achieve Millennium Development Goal (MDG) 1 on food security despite the above constitutional provisions. Indeed, food insecurity has remained a persistent challenge in the country; since 2002, two out of three Ugandans cannot meet the minimum recommended dietary intake (Ssewanyana and Kasirye, 2010; National Planning Authority, 2017).

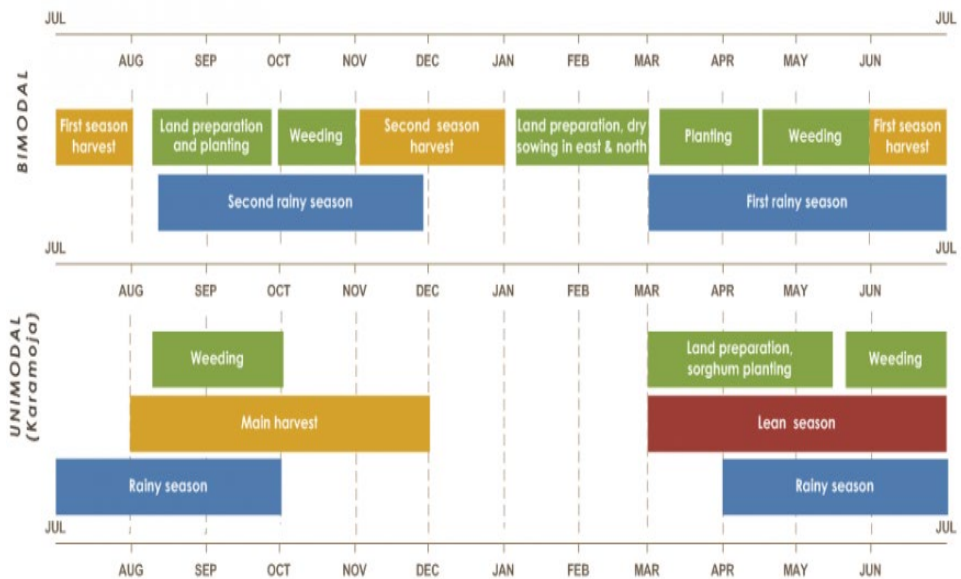
Although Uganda has achieved some commendable results in improving nutritional indicators, especially child anthropometric indicators, challenges remain regarding overall household nutritional status. First, despite improvements in Uganda's ranking in the Global Hunger Index (GHI)—reducing from 42 to 31 between 2000 and 2023—relative to other African countries, Uganda has become increasingly food-stressed—dropping in recent GHI rankings from 87th in 2016 to 95th in 2023 out of 125 countries (Global Hunger Index, 2023). Second, although Uganda has a reputation for being food self-sufficient at the national level (i.e., the country does not depend on food imports), this accomplishment does not translate into food security at the household level. Different parts of the country routinely face acute food insecurity because of the challenges of transporting food from surplus to deficit areas (Uganda IPC Technical Working Group, 2019). Hence, food surpluses co-exist with food deficiencies at any given point in time. Third, in 2016/17, the country registered a severe food crisis, further exacerbating the precarious food security position.¹ Such reversals suggest inadequacies in household-employed coping strategies and cast doubts on Uganda's ability to attain SDG2 targets by 2030.

In this paper, we contribute to the small but growing literature on the drivers of seasonal hunger on the African continent. Uganda offers an interesting case to study seasonal hunger. Although previous studies have examined issues of seasonal hunger in other African countries (e.g., Anderson et al., 2018, in

¹ During June 2016-January 2017, at least 31 percent of the country was classified as either 'food security stressed' or facing a food crisis (Uganda IPC Technical Working Group, 2017). This was about three times the rate (11 percent) for the period November 2015-April 2016.

Malawi), there are important reasons for undertaking a specific study in Uganda. First, the food context differs markedly across African countries. Indeed, Malawi differs from Uganda. Specifically, Maize is the dominant staple cultivated by over 90 per cent of households in Malawi, as is the case for Teff in Ethiopia. This is not the case for Uganda, where several food items are essential staples in different geographic areas, e.g., matooke, sweet potatoes, cassava, and maize. Consequently, as an ex-ante coping strategy, households in Uganda have greater latitude concerning food crop diversification or choice. Secondly, countries like Malawi experience two agricultural seasons; for Uganda, the Northern part of the country, which accounts for 35 per cent of the surface area but only 20 per cent of the population, experiences only one cropping season. In most of Uganda, the potential hunger months are April-May and October to November, whereas in Northern Uganda, the hunger months extend from March to June (Figure 1). Consequently, other African countries differ from Uganda, and as such, either local climatic factors or other household factors that can affect seasonal hunger are most likely to vary.

Figure 1: Summary of Ugandan crop season calendar



Source: FEWSNET (2019)

We use 4 waves of the Uganda National Panel Survey (UNPS) to estimate the extent of seasonal hunger in Uganda and how these has changed over the years. The UNPSs are part of the World Bank-supported multi-topic Living Standard Measurement Surveys -Integrated Surveys on Agriculture (LSMS-ISA). Following Anderson et al. (2018), this paper considers the three major pathways that increase the risk of seasonal hunger, i.e., loss of livelihood, absence of self-insurance, and presence of chronic poverty. In addition, the paper examines the effectiveness of strategies adopted by households faced with seasonal hunger. For example, regarding early harvesting, we relate the effects of seasonal hunger following the previous agricultural season to the timing of the first harvest in the current agricultural season.

We organize the rest of the paper as follows. The following section provides the conceptual framework for analyzing seasonal hunger. The methodology is presented in Section 3. In Section 4, we describe the data used in the analysis and the variables. Finally, Section 5 presents the findings of the study.

2. Conceptual Framework

The conceptual framework adopted for the study is premised on the seminal works by Sen (1981) relating to household entitlements, especially the food entitlement failure. This occurs when households cannot access adequate food because of various factors such as income constraints, market dynamics, or social/political factors. According to Sen (1981), communities may go hungry not because food is unavailable, but because they lack the means to obtain it. In this framework, the primary drivers of seasonal hunger are: (i) a loss of livelihood—arising from higher food prices²; (ii) a lack of appropriate insurance mechanisms to support consumption smoothing; and (iii) chronic poverty—which can lead to the adoption of negative strategies when a household is faced with the shocks. Previous authors have used this model to

² Given the significant control of agricultural markets by middle men, rising food prices may not translate into higher incomes for rural households. In such an environment of “declining terms of trade”, households are forced to consume less and the resulting condition of destitution leads to decline in their overall livelihoods.

examine seasonal food insecurity in developing countries, e.g., Basu and Wong (2015) for Indonesia and Kitsuki and Sakurai (2016) for Zambia.

The loss of livelihood because of various factors can fuel seasonal hunger. Factors such as climate change can cause irregular rainfall patterns, prolonged drought, and flooding, disrupting the normal cycle of planting and harvesting crops. This can lead to lower yields and less food production (Food and Agriculture Organization, 2021). Another factor that affects livelihoods is the pre-harvest period, which is the time between planting and harvesting crops. During this period, households may register a decline in food stocks, followed by higher food prices. These conditions make accessing enough food and meeting the nutritional needs of households more challenging (FAO, 2021). Indeed, Bonuedi et al. (2022) show that in Sierra Leone, household food diversity and security depend largely on the agricultural cycle—they worsen during the preharvest period and improve significantly during and after the harvest. Sibhatu and Qaim (2017) show that in Ethiopia, purchased foods account for more than 50 per cent of caloric consumption during the lean season, up from 42 per cent during the primary season. Losing livelihoods can have a negative impact on household income, which reduces the purchasing power of people during times of food scarcity (Dercon, 2016).

One challenge households face in developing countries is the lack of self-insurance and consumption smoothing mechanisms. When these shocks occur, households may not have enough food to eat during the lean season, which can have a negative impact on their health and productivity. For example, Devereux (2016) shows that seasonal hunger in Zimbabwe reduces the ability of workers to perform agricultural tasks effectively. Moreover, households may resort to coping strategies that are not suitable for non-idiosyncratic shocks, such as selling assets, reducing food intake, or migrating (World Bank, 2020). These strategies can have long-term consequences for their livelihoods and well-being.

Another pathway to seasonal hunger is chronic poverty, which limits the ability of people to cope with food insecurity. Chronic poverty means having insufficient assets and resources to invest in solutions that can reduce the effects of seasonal hunger, such as storing food, growing resilient crops, or using irrigation systems (Haddad and Gillespe, 2016). Moreover, chronic poverty and seasonal hunger have negative impacts on health, especially for

those who already suffer from malnutrition and other health problems. For example, a study from Burkina Faso found that people in poverty faced more health challenges during the lean season (Goudet et al., 2015). This creates a vicious cycle, where poverty and hunger reinforce each other and make it harder for people to escape this situation (Barret and Bevis, 2015). Sometimes, people may resort to harmful strategies to cope with seasonal hunger, such as selling their land, selling their crops in advance, or working for low wages. In Ethiopia, for instance, people rely more on purchased foods during the lean season, which accounts for more than half of their caloric intake (Sibhatu and Qaim, 2017).

To address this problem, households can adopt different ex-ante and ex-post strategies. Ex-ante strategies aim to smooth consumption and income over time, such as engaging in wage work, selling assets, or using production inputs. Other strategies entail improving storage facilities, keeping livestock, and harvesting crops early, which can help households cope with seasonal hunger. Some studies have found that taking part in commercialization schemes, such as contract farming, can reduce the risk and duration of seasonal hunger. For instance, Bellemare and Novak (2017) found that contract farming reduced the hungry season by 18 percent on average in Madagascar. Ex-post strategies—adopted after the actual occurrence of seasonal hunger are coping mechanisms that households use to survive food shortages. These also vary and include reducing or rationing food intake, borrowing money to buy food, seeking food aid, selling forest products, migrating temporarily, or harvesting crops early. However, some of these strategies can have negative consequences for household welfare and productivity. For example, early crop harvesting can lower crop yields and future earnings.

To cope with seasonal hunger, households employ crop diversification as a strategy. This strategy includes growing various crops instead of depending on one major crop, which pests, diseases, or climate shocks may impact (FAO et al., 2018). Crop diversification helps households to have a more extended harvest period, as different crops are ready to harvest at different times of the year, ensuring a more continuous supply of food and reducing the impact of seasonal food gaps (Kumar and Quisumbing, 2015). This improves food security and reduces the impact of seasonal food shortages.

Alternatively, households can deal with seasonal hunger by owning and selling livestock. Livestock can provide food and income for households, as well as diversify their sources of livelihood. Livestock can also help decrease the dependency on crops, which might be susceptible to weather or pests. However, the benefits of livestock trade are not always clear and may depend on the context and the type of livestock. For example, some studies from Ethiopia suggest that livestock can help households cope with food shortages, while other studies show mixed results (Muriuki, et al., 2016; USAID, 2018).

Another strategy to cope with seasonal hunger is to grow off-season or permanent crops. Farmers can plant and harvest these crops during the dry season when most crops fail due to lack of rainfall, or they can grow fruit trees or perennial vegetables that produce food throughout the year. Off-season or permanent crops can provide a source of income and food security for households facing seasonal food shortages and diversify their diets and nutrition (FAO, 2018; Kumar and Quisumbing, 2015).

Building buffer stocks of food and other resources can help households smooth their consumption. Poor storage facilities can increase the risk of spoilage and food insecurity during the lean periods (World Bank, 2020). Therefore, it is important to adopt proper storage and post-harvest management practices, such as drying and preserving excess produce, to reduce post-harvest losses and ensure food availability throughout the year. Moreover, crop storage can enable households to sell their produce at higher prices during the offseason, potentially enhancing their income and food access. However, investing in crop storage requires access to credit and financing, which is often limited or unavailable to poor farmers.

One way households cope with seasonal hunger is by selling or harvesting their crops early. This can provide them with some income or food to survive the lean periods. However, this strategy has drawbacks, such as reducing the quality and quantity of the crops and compromising the long-term livelihoods of the households. Therefore, it is not a sustainable or desirable option for addressing seasonal hunger (Anderson et al. 2018).

Another way to cope with seasonal hunger is to engage in wage work. Wage work offers a reliable source of income, which reduces the reliance on agricultural outputs and seasonal variations in food availability. This income

can buy food even when food is scarce. Wage work also enhances financial resilience, allowing households to save money and create a buffer for times of hardship. Savings can be used to buy food. Tibesigwa and Visser (2016) show that off-farm income and asset ownership help households deal with food insecurity. Apart from ex-ante strategies, the spatial location has also been the focus of research on seasonal hunger, with the consensus being that rural households have both a higher chance of experiencing seasonal hunger and, when it occurs, the effects last longer (e.g. Anderson *et al.*, 2018; Becquey *et al.*, 2012).

3. Methodology

Estimation of correlates of seasonal hunger: Ordered probit estimation

We adopt the empirical strategy used by Anderson *et al.* (2018) while examining seasonal hunger in Malawi. In this approach, the measures of seasonal hunger are ordinal. Given the ordinal nature of our dependent variable, we adopt the ordered-probit estimation approach as recommended for similar applied econometric work (Davidson and Mackinnon, 2003). For seasonal hunger, we do not assume that the number of seasonal hunger months or other measures of food insecurity are equally spaced or equally severe. Instead, we can assemble them from the least experienced to the worst. As earlier mentioned, previous studies examining food insecurity on a hunger scale have employed a similar framework (e.g., Anderson *et al.*, 2018, for Malawi, and Nkegbe *et al.*, 2017, in Ghana).

Formally, the order probit model is based on an unobserved latent regression variable (S_i^*) which is a linear function of a vector of independent observable characteristics (X) and boundary parameters (μ) and this can be represented as:

$$S_t^* = X' \beta + \varepsilon_t \tag{1}$$

where β is the vector of regression coefficients to be estimated and ε_i is the error term. If we consider that we cannot observe the latent variable related to seasonal hunger, but can only observe the categories of response, defined by the various categories of seasonal hunger

($j = 0, \dots, J$) as:

$$\begin{aligned}
 S_i &= 0 \text{ if } S_i^* \leq 0 \\
 &= 1 \text{ if } 0 \leq S_i^* \leq \mu_1 \\
 &= 2 \text{ if } 1 \leq S_i^* \leq \mu_2 \\
 &= 3 \text{ if } \mu_2 \leq S_i^*
 \end{aligned} \tag{2}$$

where μ' are the threshold parameters to be estimated along with the regression coefficients (β). The ordered probit estimation will use the observations on S —a form of censored data on S^* , to fit the parameter vector. In this case, the probabilities are given as follows

$$\begin{aligned}
 Prob[S_i = j] &= Prob[\mu_{j-1} < S_i < \mu_j] \\
 &= Prob[\mu_{j-1} - X_i\beta < e_i\beta \leq \mu_j - \\
 &\quad X_i\beta] \\
 &= \Phi[\mu_j - X_i\beta] - \Phi[\mu_{j-1} - X_i\beta]
 \end{aligned} \tag{3}$$

where $\Phi(\cdot)$ is the standard normal distribution function and J are the response categories. In our case, these range from 0, 1, 2, and 3 since our dependent variables measures take on these categories. Following Pal (1999), we obtain the marginal effects as follows

$$\frac{\delta Prob[cell_j]}{\delta X_k} = [\phi(\mu_{j-1} - \beta' X_k) - \phi(\mu_j - \beta X_k)] * \beta \tag{4}$$

where ϕ is the standard normal function.

The empirical model to be estimated is specified as

$$FSi = \alpha + \beta Xi + \varepsilon i \tag{5}$$

where FSi is our measures of seasonal hunger in terms of the number of months of seasonal hunger, Xi is a vector of covariates.

To examine the issue of early harvesting, we relate the effects of seasonal hunger following the previous agricultural season on the timing of the first

harvest in the current agricultural season. Given the available panel data, we use a household fixed effects model to control for time-invariant household characteristics, and include indicators for the households in the reference growing season.

$$FSit = \alpha + \phi i + \varphi Tit + \beta Xit + \varepsilon it \quad (6)$$

where $FSit$ is the month of first harvest of any crop from any plot in the current agricultural season in household i in wave t , ϕi is a household dummy, Tit is a count of the number of months the household was hungry in the four months preceding and including the month of first harvest, Xit is a vector of control variables, and εit is a household-specific error term.

Addressing econometric concerns

In our estimations, several variables can be considered endogenous; as such, we do not claim to establish causality. Instead, we pay attention to the correlates of the different seasonal hunger. Even for correlation estimations, there are the following econometric concerns we deal with.

Omitted variable bias arises from the fact that it is not possible to observe all factors that affect seasonal hunger, such as inadequate infrastructure, infertile soils, weather changes, and inadequate public response to seasonal food availability. Depending on the correlation between the omitted variables and the observed independent variables, the estimated coefficients may show bias in either an upward or downward direction. To deal with potential omitted variable bias, we estimate models for both a cross-section of agricultural households in each wave and a pooled sample with community and wave-level fixed effects to control for time-invariant community level characteristics such as soil quality, community storage facilities, extension, and other factors that may be associated with seasonal hunger.

4. Data and Variables Used

Data

The study utilized 4 waves of the Uganda National Panel Survey (UNPS), i.e., 2009/10, 2011/12, 2013/14, and 2015/16.³ At the proposal presentation stage, we had committed to use 5 waves of the UNPS including the UNPS 2010/11. However, we could not proceed to use this particular wave in the analysis due to a missing variable relating when the hunger experienced by household occurred i.e., month and year. Although this question of “When did you experience the hunger situation” appears in all survey questionnaires, this variable is missing from all surveys after 2015/16. This was occasioned by the transition from a paper-based questionnaire to electronic capi-based methods of collecting data after 2015/16; some variables were erroneously missed in the capi-version. Given that experience of the hunger situation is a major anchor variable for the study, we proceeded with the other four survey rounds that had the full set of variables.

The datasets were collected by the Ugandan Bureau of Statistics (UBoS). The UNPSs are part of the World Bank-supported multi-topic Living Standard Measurement Surveys -Integrated Surveys on Agriculture (LSMS-ISA).⁴ The scope of data collection, sampling design, and coverage remains consistent across the surveys. The similarity in sampling and questionnaire design allows for comparisons of seasonal hunger trends over the study period. Furthermore, the sampling design in all panel surveys is based on the two-stage stratified random sampling. In the first stage, the principal sampling unit was the Enumeration Area (EA) based on the 2002 census as the sampling frame. In the second stage, households were the primary sampling unit, with 10 households being randomly selected from each EA. Thus, the data is representative at both the national and regional levels. The UNPS is conducted over one year, from July to June.

The UNPS followed the same households based on the baseline of the 2005/6 Uganda National Household Survey (UNHS). The first wave in 2005/06 sampled 2,600 households for enumeration. To address panel attrition, we have

³

⁴ The LSMS-ISA surveys cover 7 other African countries namely: Mali, Burkina Faso, Niger, Nigeria, Ethiopia, Tanzania and Malawi.

continuously employed two approaches. First, the UBoS introduced clusters to replace the original EAs. To capture split-off households that fell outside the original EAs but could still be traced and interviewed, if they still resided within the same parish as the selected EA, the UBoS introduced clusters to replace the original EAs.⁵ As a result, the coverage is extensive even with attrition, capturing over 2,800 households by 2015/16. Second, for each wave, UBoS recalculates the panel weights to adjust for differences between the characteristics of the panel sample and the characteristics of the Ugandan population. The changes mentioned above are based on internationally recognized best practices, which are guided by the World Bank. The bank is also supporting the collection of panel data in 7 other African countries.

The socio-economic module provided detailed information on household characteristics, including household experience of hunger shocks when they occurred. On the other hand, the community module includes information on local infrastructure and social services available in the localities. The UNPS surveys have an agricultural module that captures landholdings and farming activities for households with an agricultural enterprise.

Variables used

Measures of Seasonal Hunger:

We adopt the definition by Anderson *et al.* (2018) and Bacon *et al.* (2014), who define seasonal hunger as the number of self-reported lean or hunger months experienced before the harvest. This measure is similar to the food insecurity experience scale measure promoted by FAO (Ballard *et al.*, 2013) as well as the household hunger scale by USAID (Ballard *et al.*, 2011). Its advantage lies in the ability to measure hunger in settings of high caloric adequacy.

To examine correlates of seasonal hunger, we focus on the household experience of hunger. In the panel surveys, households are specifically asked (a) *Have you been faced with a situation when you did not have enough food to feed the household in the last 12 months?* If the household indicates yes, there is a follow-up question (b) *“When did you experience this situation?”* For the follow-up question, the possible answers are the available months in the year,

⁵ Split-off arise from previously younger household members moving to establish new stand-alone households.

ranging from January to December (with a possibility for multiple responses within a year if the households experience several months of hunger periods). Following Anderson et al. (2018), we use this question to generate our key seasonal hunger variable as the “*Number of months hungry in three months before the first harvest*”. Consequently, our measure of seasonal hunger is a count variable, ranging from zero to four months.

Other variables included in the estimations

The variables used in the analysis can be grouped into three major categories. First are household characteristics. The second category of variables relates to on-farm coping mechanisms or hunger prevention mechanisms. Finally, we consider off-farm coping/prevention strategies.

Household characteristics: Following previous studies that have examined correlates of food security status in SSA as well seasonal hunger, we include the following household level control variables: household size—given that the number of household members may explain the intensity of the seasonal hunger (Bogale, 2012 for Ethiopia); gender of the household head (Kassie et al., 2014 for Kenya) as women are less mobile and as such more likely to play a positive role in ensuring long-term food security but are more likely to be credit constraint. We shall include the age of the household head (e.g., Mango et al., 2014 for Zimbabwe).

The major socio-economic characteristics relate to educational attainment (see, e.g., Kidane et al., 2005 for Ethiopia) and proxies for wealth status. Specifically, we include the highest educational attainment of the household head in years. Apart from representing the accumulated human capital of the individual, the education variables may also signal an individual’s ability to receive and process agricultural extension information. Other socio-economic characteristics included are land holding and the use of fertilisers.

On-farm coping strategies: Households can adopt both on-farm and off-farm coping strategies to deal with the threat of seasonal hunger. An important on-farm strategy includes ownership of livestock. We include livestock ownership to capture both asset holding and household coping mechanisms.⁶ Other on-farm strategies considered include engagement in commercial agriculture or

⁶ The agricultural module of the UNPS capture information on whether a household member had livestock during the past 12 months as well as the nature and number of animals kept.

crop sale, storage of crops, and cultivated crop diversification. Agricultural technologies affect agricultural productivity and hence the amount of agricultural output or food available for households that depend on their own production to meet food needs. Consequently, we include measures for the use of organic and inorganic fertilisers. Given that crop diversification may also be a potential on-farm coping strategy, we also have a variable for the Simpson index for crop diversification.

Off-farm coping strategies: Concerning off-farm strategies, we consider remittances.⁷ Given the likelihood of experiencing agricultural shocks, remittances can be important. Table 1 provides the full list of variables included in the estimation.

⁷ The UNPS captures information on whether remittances were the most important source of household earnings during the past 12 months; whether the household received remittances during the past 12 months; and the value of these remittances.

Table 1: Summary Statistics

	2009/10				2011/12				2013/14				2015/16			
	Mean	sd	Min	Max	Mean	sd	Min	Max	Mean	sd	Min	Max	Mean	sd	Min	Max
Age of household head	46.85	14.88	14	99	47.78	15.21	14	99	46.43	15.51	16	102	47.05	15.74	18	100
Male household head	0.71	0.46	0	1	0.70	0.46	0	1	0.70	0.46	0	1	0.68	0.47	0	1
<i>Education attainment of the household head</i>																
No Education	0.06	0.05	0	1	0.07	0.06	0	1	0.04	0.04	0	1	0.04	0.04	0	1
Some Primary	0.47	0.25	0	1	0.46	0.25	0	1	0.42	0.24	0	1	0.46	0.25	0	1
Complete Primary	0.16	0.13	0	1	0.18	0.15	0	1	0.17	0.14	0	1	0.16	0.14	0	1
O-level	0.23	0.18	0	1	0.22	0.17	0	1	0.25	0.19	0	1	0.24	0.18	0	1
A-level and above	0.08	0.07	0	1	0.07	0.07	0	1	0.13	0.11	0	1	0.10	0.09	0	1
Household size	5.05	2.72	1	20	5.02	2.47	1	16	5.73	2.96	1	24	5.01	2.85	1	20
Household distance to nearest road (km)	2.87	4.30	0	29	2.93	4.63	0	35	3.10	5.53	0	52	3.13	4.28	0	25
Acres	4.82	22.21	0	816	4.01	7.99	0	109	2.14	4.23	0	112	2.60	8.16	0	300
Crop count	2.82	2.22	0	10	3.99	1.66	1	11	2.14	1.95	0	10	2.22	1.92	0	9
Used any organic fertilizer	0.15	0.36	0	1	0.14	0.34	0	1	0.10	0.29	0	1	0.10	0.30	0	1
Used any inorganic fertilizer	0.03	0.17	0	1	0.01	0.11	0	1	0.03	0.18	0	1	0.03	0.17	0	1
Crop Diversity Simpson index in previous season (planted acres)	0.34	0.16	0	1	0.35	0.14	0	1	0.38	0.14	0	1	0.39	0.14	0	1
Poultry (count)	19.65	31.35	0	10,000	6.48	14.08	0	400	5.11	31.91	0	1,550	6.91	39.80	0	1,162
Other livestock (count)	21.56	58.67	0	40,001	3.93	15.42	0	597	2.32	5.35	0	111	2.68	5.17	0	74
Household stored any annual or permanent crop	0.75	0.43	0	1	0.29	0.46	0	1	0.22	0.41	0	1	0.27	0.44	0	1
Remittances and gifts (log of total cash received, UGX)	3.74	5.67	0	17	3.66	5.70	0	18	3.34	5.64	0	17	3.32	5.59	0	17
Any household member worked for a wage	0.28	0.45	0	1	0.21	0.41	0	1	0.32	0.47	0	1	0.25	0.44	0	1
Household sold any annual or permanent crop	0.56	0.50	0	1	0.65	0.48	0	1	0.58	0.49	0	1	0.55	0.50	0	1
Number of hunger months during the past 12 months	1.73	2.59	0	12	0.80	1.77	0	12	0.82	1.75	0	12	0.66	1.78	0	12
Rural household	0.79	0.41	0	1	0.89	0.31	0	1	0.73	0.44	0	1	0.83	0.38	0	1
Agricultural household	0.86	0.35	0	1	0.87	0.18	0	1	0.81	0.39	0	1	0.82	0.39	1	1
Number of Observations	2,170				1,865				2,647				2,868			

5. Results

Descriptive Statistics

Table 1 shows the summary statistics for the variables used in the analysis, specifically, the mean, standard deviation, minimum, and maximum values. Household characteristics are predominantly similar across the four waves. Starting with demographics, it is indicated that the sampled household heads are relatively older, with an average age of at least 46 years. Male household heads make up at least 70% of the sampled households throughout the 4 waves, with the rate marginally declining to 68% in Wave 4, i.e., 2015/16. With the exception of Wave 2, i.e., 2013/14, where the household size increased to 5.73 persons, for the rest of the survey waves, the household size is on average 5 persons. Concerning educational attainment, we measure the variable by considering the highest level completed by the household head. It is indicated that most household heads have incomplete primary education (46%), followed by lower secondary school attainment (i.e., O-level) at 23%. The least proportion has never been school; however, the share of household heads without education reduced from 6% in 2009/10 to about 4% by 2015/16. Also, about 10% of the heads have an A-level education or higher.

For the spatial location, at least 80% of the sampled households are based in rural areas. A similar proportion of households is also classified as agricultural households.⁸ For household assets, Table 1 shows that there has been a significant reduction in average household landholding, reducing from about 5 acres in 2009/10 to 2.6 acres by 2015/16. This may suggest that households are significantly subdividing as new households are formed. In the literature, scholars may link such a reduction to increased risk aversion as well as a decrease in the adoption of improved technologies. Related, the extent of household crop storage declined significantly after 2009/10 but stabilised in the final three waves.

The use of any organic fertilizers declined from 15% in 2009/10 to about 10% by 2015/16%. This may be explained by either the changing availability of fertilizers as the government moved to a demand-driven extension approach to a focus on input provision or changing profitability of crop enterprises, which can lead to intermittent dis-adoption of improved technologies.⁹

The trends for any household member worker for wages fluctuated over the 4 years, starting at 28% in 2009/10 and declining to 21% by 2011/12 before rising to 32% in 2013/14 and finally declining to 25% by 2015/16. On the other hand, the level of remittances declined over the 4 waves. This is contrary to the national trends, which show that, based on annual surveys of inward personal transfers conducted by the Bank of Uganda, average cash receipts have consistently increased (Bank of Uganda, 2020). For example, between 2014 and 2018, the average remittance received by households that receive transfers increased

⁸ An agricultural household is identified as one that answers the affirmation to either one or both of the following questions (i) During the second cropping season of YEAR XXXX₋₁ (2nd Season of the previous year July – December), and the first cropping season of year XXXX (i.e. 1st Season of current years: Jan. – June), has any member of your household cultivated crops including perennial crops (e.g. fruits)? (ii) during the last 12 months, has any member of your household raised livestock or poultry?

⁹ However, this is not new for Uganda; previous authors such as Kijima et al (2011) who examined adoption of new rice varieties in Eastern Uganda showed that changing profitability of agricultural enterprises led households to adopt technologies for some but not all periods.

from UGX 2,925,599 (USD 1,125) to UGX 4,685,933 (USD 1,256). The splitting of households may explain the trends in the UNPS survey regarding realized receipts. In this case, multiple households share the amount received, resulting in a lower average value, especially if the number of remitters remains unchanged.

Extent of seasonal hunger by location

As highlighted in the conceptual framework, seasonal hunger may vary between rural and urban households, depending on their sources of income and food. Therefore, it is necessary to estimate the effects of seasonal hunger separately for rural and urban households (which may not depend directly on their own agricultural production). At the same time, given the observance of one-cropping season in Northern Uganda, it is important to understand how the extent of seasonal hunger differs between this region and the rest of the country.

It is also important to explore the differences between households that face seasonal hunger and those that do not, by their location. As mentioned before, urban households may also suffer from seasonality, as food supply from faraway rural areas becomes limited and increases food prices, leading to poor food and nutrition choices. Table 2 compares the seasonal and non-seasonal hunger for urban and rural households, based on a common four-month period (January to April). Panel A shows the statistics on seasonal hunger for urban and rural households during these months. At least 8.5 per cent of urban households experienced some hunger from January to April, and the average household experienced 0.163 months of hunger. For rural households, at least 14.1 per cent experienced some seasonal hunger, and households experienced an average of 0.31 months of hunger. On the other hand, households in Northern Uganda report having a more intense hunger duration. Specifically, 20.5 percent experience seasonal hunger, and the average household in the region experienced 0.45 months of hunger.

Finally, among urban households that did not experience any hunger between May and December, about 3 per cent experienced at least one month of seasonal hunger. Among rural households, the proportion of non-chronically hungry households that experienced seasonal hunger was 4.7 per cent, while that among households in Northern Uganda 5.6 per cent.

Table 2: Extent of seasonal and chronic hunger in urban, rural and households in Northern Uganda.

	All households			Agricultural Households		
	Urban Households	Rural Households	Northern Uganda	Urban Households	Rural Households	Northern Uganda
Panel A: Seasonal Months-January through April						
Hunger in seasonal months (indicator)	0.085	0.140	0.205	0.082	0.141	0.206
<i>Number of observations</i>	1,183	6,292	2,012	933	6,175	1,960
Hunger in seasonal month (count)	0.164	0.306	0.453	0.153	0.305	0.455
Hunger in seasonal months if no hunger in seasonal months (indicator)	0.030	0.047	0.056	0.030	0.047	0.057
<i>Number of observations</i>	943	4,543	1,176	745	4,459	1,144
Panel B: Non Seasonal Months-May -December						
Hunger in seasonal months (indicator)	0.157	0.242	0.393	0.148	0.242	0.389
<i>Number of observations</i>	1,183	6,292	2,012	933	6,175	1,960
Hunger in seasonal month (count)	0.364	0.635	1.101	0.326	0.634	1.079
<i>Number of observations</i>				933	6,175	1,960
Hunger in seasonal months if no hunger in seasonal months (indicator)	0.106	0.160	0.280	0.100	0.159	0.275
<i>Number of observations</i>	1,066	5,295	1,561	845	5,189	1,516

Notes: The measure hunger in different seasons is based on two indicators: one for hunger in seasonal months and one for hunger in non-seasonal months. Seasonal months are January, February, March, and April. Non-seasonal months are May through December. The indicators are equal to one if the household experienced any hunger in those months. We also use two counts: the number of seasonal months and the number of non-seasonal months with hunger. Finally, we use a conditional indicator: hunger in seasonal months if no hunger in non-seasonal months. This is equal to one if the household had hunger only in seasonal months.

Panel B of Table 2 shows the prevalence of hunger in the eight months after the harvest season (May to December). About 16 per cent of urban households and 24 per cent of rural households experienced hunger for at least one month in this period. The situation is worse for households in Northern Uganda, where 39.3 per cent, or nearly two-fifths of them, faced hunger in the post-harvest months. This is about double the proportion of households that reported any hunger in the pre-harvest season, indicating that non-seasonal hunger is more common than seasonal hunger. Moreover, households in the post-harvest period experienced hunger for more than twice as many months on average compared to those in the pre-harvest period. Lastly, the bottom row reveals that it is rare for households to experience hunger only in the post-harvest period and not in the pre-harvest season. Among urban households that did not report any pre-harvest hunger, only 10.6 per cent reported any post-harvest hunger. The respective rates for rural and Northern Uganda households are 16 and 28 per cent. Finally, the comparison between agricultural and non-agricultural households shows that there are minimal differences, which may imply that even agricultural households rely heavily on the market to obtain food.

Estimates for correlates of seasonal hunger: Ordered probit estimation

Table 3 shows the estimates for the ordered logit estimates by each of the waves. It is worth noting that, given the study adopted fixed effects estimations, we do not include variables for the regional location; this is because the regional location, in our estimation approach, is a time-invariant area characteristic. For each wave, we estimate two models: (i) basic household characteristics and (ii) combining basic household characteristics with coping strategies available to a household in the event of seasonal hunger.

We also experimented with alternative ways of specifying variables. For example, for wave 1, the education variable in years, for wave 1, the effect is negative at 10%; each additional year of education attainment reduces the risk of seasonal hunger by about 2%. However, you include education in levels, and the impact of the education variables increases significantly. It also shows that higher education attainment has a large payoff with respect to reducing the likelihood of seasonal hunger. Hence, going forward, only results using education levels are reported for all waves.

For the baseline Wave 1, apart from educational attainment, the other significant variable is land ownership—increasing land ownership is associated with a reduced likelihood of seasonal hunger. The impact of the education variable nearly vanishes when other coping strategies are introduced; only the variable having A-level education and above remains significant, albeit at the 10 per cent level. This suggests that higher education attainment may be a substitute for appropriate coping behaviour. On the other hand, the use of inorganic fertilizer becomes significant with the addition of more variables. The use of inorganic fertilizers reduces the likelihood of seasonal hunger by 33%. For the baseline wave of 2009/10, the other two copies of strategies are important, i.e., having storage capacity and wage employment opportunity.

For Wave 2, education has no significant association with seasonal hunger.¹⁰ When captured in levels, education has no impact on seasonal. On the other hand, the use of organic fertilizers is significant prior to the addition of coping strategy variables. Once these are added, it becomes insignificant. Also, being a male head is significantly associated with seasonal hunger, prior to the addition of coping strategies. When coping strategies are included, inorganic fertilizer becomes significant. Two other coping strategies are the significant i.e., Simpson index for crop diversity and the sale of any annual or permanent crops. Specifically, having a wide variety of crops is associated with a heightened risk of seasonal hunger. Previous studies attribute such a negative association to the likelihood of declining agricultural productivity in an environment of increased crop diversity (Covarrubias, 2015).

Table 3 shows that, for Wave 3 (i.e., 3013/14), the education variable is insignificant whether in years or levels. The household size variable is significant prior to the addition of coping strategies, which indicates that large household sizes increase the susceptibility to seasonal hunger. However, the variable becomes insignificant in the presence of coping strategies. Both the use of organic and inorganic fertilizers variables are significant; however, inorganic becomes weakly significant with the addition of available coping strategies. The presence of other livestock and the variable for a household member working for wage are significant.

¹⁰ For the 2011/12 wave, the education variable is only significant when captured in years;

Table 3. Seasonal hunger and household and farm characteristics (Ordered Logit Correlates)

	2009/10		2011/12		2013/14		2015/16	
	Model 1	Model 2	Model		Model		Model 1	Model 2
			Model 1	2	Model 1	2		
Age of household head	-0.004	0	0.001	0.001	0	-0.001	-0.000**	0
	-0.003	-0.003	-0.001	-0.001	-0.001	-0.001	0	0
Education attainment of the household head								
Some Primary	-0.404**	-0.132	-0.029	-0.226	0.011	-0.152	0.009	0.004
	-0.194	-0.2	-0.081	-0.148	-0.097	-0.128	-0.007	-0.005
	-							
Complete Primary	0.581***	-0.188	-0.015	-0.14	-0.071	-0.193	-0.014	0.001
	-0.198	-0.202	-0.085	-0.133	-0.101	-0.131	-0.009	-0.002
O-level	-0.316	0.062	-0.103	-0.206	-0.026	-0.154	-0.023*	0
	-0.206	-0.231	-0.079	-0.136	-0.102	-0.14	-0.012	-0.002
	-							
A-level and above	0.665***	-0.338*	-0.124	-0.173	-0.066	-0.165	-0.020*	0.004
	-0.196	-0.2	-0.078	-0.133	-0.099	-0.13	-0.012	-0.004
Male household head	-0.024	0.077	0.072**	0.043	0.016	-0.046	0.010*	0.003
	-0.082	-0.107	-0.033	-0.032	-0.036	-0.048	-0.005	-0.003
Household size	-0.008	-0.001	-0.003	-0.003	0.009*	0.005	0.004**	0
	-0.012	-0.014	-0.006	-0.004	-0.005	-0.006	-0.002	0
Household distance to nearest road (km)	0.011	0.006	0.007	0.004	-0.001	-0.001	-0.002**	0
	-0.007	-0.008	-0.004	-0.004	-0.001	-0.001	-0.001	0
Acres	-0.001*	-0.001	0	-0.001	0.001	0.001	0	0
	-0.001	0	-0.001	-0.001	-0.002	-0.001	0	0
			-		-	-	*	
Used any organic fertilizer	-0.041	0.012	0.088***	-0.043	0.130***	0.043**	0.062**	-0.002

	-0.086	-0.106	-0.027	-0.032	-0.019	-0.015	-0.03	-0.002
		-			-			
Used any inorganic fertilizer	0.032	0.386***	-0.056	-0.110*	0.107***	-0.033*	-0.017	-0.002
	-0.219	-0.107	-0.055	-0.057	-0.022	-0.02	-0.011	-0.003
Crop Diversity Simpson index in previous season (planted acres)		-0.314		0.191**		-0.078		-0.013
		-0.246		-0.086		-0.068		-0.014
Poultry (count)		0		-0.001		0		0
		-0.003		-0.001		0		0
Other livestock (c~)		-0.002		0.001		-0.002*		0
		-0.002		-0.001		-0.001		0
Household stored any annual or permanent crop		-0.568**		-0.029		0.001		-0.004
		-0.247		-0.029		-0.025		-0.004
Remittances and gifts (log of total cash received, UGX)		-0.002		0		-0.002		0
		-0.008		-0.002		-0.002		0
		-				-		
Any household member worked for a wage		0.230***		0.028		0.047**		-0.002
		-0.079		-0.034		-0.021		-0.002
Household sold any annual or permanent crop		0.166**		-0.069*		-0.002		0.003
		-0.084		-0.036		-0.024		-0.003
Constant	0.950***	0.954***	0.042	0.261**	0.077	0.279	0.001	0.009
	-0.241	-0.31	-0.076	-0.132	-0.13	-0.193	-0.01	-0.01

For Wave 4, the education variable is significant in levels (however, for only some levels). However, the education variables become insignificant in Model 2 after the addition of coping strategies. Other results indicate that older household heads are also significantly less likely to experience seasonal hunger; even then, the age variable becomes insignificant in Model 2. Also, the variable for the gender of the household head is insignificant in coping strategies. Likewise, the variable for distance to the nearest road is only significant in Model 1, without coping strategies. Generally, Model 2 for the 2015/16 wave shows that the coping strategies are nearly all insignificant. The wage variable is significant at the 5 per cent level, suggesting that available wage opportunities may be of low value. Table 3 also shows that life cycle effects are only significant in 2015/16, albeit with a very small magnitude. In particular, in 2015/16, older household heads are significantly less likely to experience seasonal hunger. It is possible that older heads have significant asset holdings that can be used to smooth fluctuations in food availability.

Generally, the results from Table 3 suggest that the household head being older and more educated is associated with less seasonal hunger. Also, household size is associated with more seasonal hunger: increasing the size of the household by one is associated with an increase of 0.036 months of seasonal hunger in wave two. Household distance to the road is also associated with increased seasonal hunger - an increase of one km is associated with an increase of between 0.005 and 0.007 months of seasonal hunger. Ownership of poultry does not have a significant relationship with seasonal hunger, but ownership of other livestock does. Finally, engaging in wage employment opportunities is positively associated with seasonal hunger; this may suggest that farm households are more likely to rely on wage labour if they are food-insecure. Also, household members who venture to search for off-farm employment may be responding to insufficient food, a cause and effect that our data cannot clearly distinguish.

Households with greater levels of crop diversity experience more seasonal hunger, and cultivation of off-season crops is also positively associated with more months of seasonal hunger, suggesting that crop and season diversity may represent a coping mechanism for seasonally hungry households. Ownership of non-poultry livestock and storage of any crop is also associated with less seasonal hunger, and these correlations are strongly significant in both waves. The results for other livestock are generally insignificant; this may be explained by the fact that other variables in the model, notably the use of organic fertilizers, may capture the livestock influence. The availability of livestock excrement is a major factor in using organic fertilizer, sometimes called manure. Finally, the sale of crops is strongly associated with less seasonal hunger in Wave 1, but not in Wave 2.

5.4 Fixed Effects Estimates

To control for time-invariant community-level characteristics that may influence vulnerability to seasonal hunger, we estimate similar models for community and wave fixed effects. We present the results in Table 4. It is indicated that most variables are not significant. In the model without coping strategies, the significant variables relate to educational attainment and fertilizer use. Specifically, having an A-level education and above, and using organic fertilizers, reduces the risk of having seasonal hunger. In Model 2, when coping strategies are included, the significance of the organic fertilizer variable

diminishes, while the higher education attainment variable remains significant and increases in magnitude. The variable for completing primary school also becomes significant in Model 2. The other explanatory variables may be spatially correlated, hence leading to their insignificance in the pooled model.

Table 4: Seasonal hunger and household and farm characteristics, EA/wave fixed effects

	EA/Wave fixed effects, Model 1	EA/Wave fixed effects, Model 2
Age of household head	0.001	0
	-0.001	-0.001
<i>Education attainment of the household head</i>		
Some Primary	-0.029	-0.134
	-0.053	-0.089
Complete Primary	-0.067	-0.148*
	-0.057	-0.09
O-level	-0.067	-0.142
	-0.056	-0.094
A-level and above	-0.157*	-0.178*
	-0.082	-0.103
Male household head	0.012	-0.018
	-0.025	-0.026
Household size	0.004	0.001
	-0.004	-0.004
Household distance to nearest road (km)	-0.014	0
	-0.011	0
Acres	0	0
	-0.001	0
Used any organic fertilizer	-0.027	-0.015
	-0.021	-0.015
Used any inorganic fertilizer	-0.061**	-0.027
	-0.03	-0.025
Crop Diversity Simpson index in previous season (planted acres)		-0.071
		0
Poultry (count)		0
		0
Other livestock (count)		-0.001
		-0.001
Household stored any annual or permanent crop		-0.027
		-0.024
Remittances and gifts (log of total cash received, UGX)		-0.001
		-0.002
Any household member worked for a wage		-0.012
		-0.017
Household sold any annual or permanent crop		0.001
		0.014

Constant	0.119	0.231*
	-0.092	-0.121
N	2689	1329
r2_a	0.087	0.087

Table 5 presents results from household fixed-effects models, which control for within-household unobservables and, as such, attempt to identify causal relationships between household and farm management characteristics, seasonal hunger, and the date of first crop harvest. This tests the hypothesis that households affected by seasonal hunger may engage in early crop sales as a coping strategy. The first column considers the effects of seasonal hunger on the month of the first harvest of any crop. In contrast, in the second column, we explore these effects on the month of the first harvest for maize, cultivated by at least one-third of all agricultural households. In both cases, we do not find any significant association between the early sales of crops with seasonal hunger, even for the dominant staple maize. This may be explained by the extent of crop diversity in Uganda. Benson et al 2008 show that even with Maize's dominance, the majority of Ugandan households consume a variety of locally traded staples.

On the other hand, household size is strongly correlated with early crop sales for any crop, but not maize in particular. Specifically, each additional household member is associated with households harvesting their first crop at least one-fifth of a month earlier. Hence, households experiencing four months of seasonal hunger in a row may be forced to sell crops earlier by about three weeks compared to those who do not experience seasonal hunger. No other factors are significantly associated with the month of the first harvest in either model.

Table 5: Effect of seasonal hunger on the household month of the first harvest

	(1) Start of harvest	(2) Start of maize harvest
Seasonal hunger (count)	0.242 (0.174)	-0.043 (0.273)
Household size	-0.215* (0.121)	-0.144 (0.278)
Male household head	-0.591 (1.618)	0.766 (1.879)
Acres	-0.002 (0.026)	-0.028 (0.072)
Other livestock (count)	0.000 (0.000)	0.008 (0.010)
Poultry (count)	-0.000 (0.000)	-0.000 (0.001)

N	6771	3692
r2	0.936	0.958

6. Conclusions and Recommendations

Using the 2009, 2011, 2013, and 2015 UNPS datasets, this study explores correlates of seasonal hunger in Uganda. The results show that seasonal hunger is more prevalent in rural areas than in urban areas. From January to April, 14.1 per cent of rural households and 8.5 per cent of urban households experienced some hunger. The average duration of hunger was 0.31 months for rural households and 0.163 months for urban households. Inorganic fertilizers lower the risk of seasonal hunger by about one-third. As such, our results show that the adoption of improved farming practices has the largest impact on seasonal hunger in Uganda. Another factor that affects seasonal hunger is land ownership, which has a negative and significant effect.

Our results show that seasonal hunger is less prevalent among households with more educated heads, which suggests that higher education may help people cope better with seasonal hunger. The effect of education is stronger when combined with the use of organic fertilizers. The implication is that prioritizing less-educated households may yield a higher impact, while educated farmers are also more inclined to embrace improved farming methods.

We examine how coping strategies affect the experience of seasonal hunger. We find that having enough storage reduces the likelihood of facing hunger. This is because farmers with enough storage can avoid selling their surplus at a cheap price and buying back at a high price. Also, enough storage lowers the storage cost by preventing spoilage.

Seasonal hunger is more prevalent in larger households: adding one person to the household increases the duration of seasonal hunger by several weeks. The effect of household size is significant before controlling for coping strategies, suggesting that larger households are more vulnerable to seasonal hunger. However, household size also influences early crop sales for any crop, except maize. Specifically, each extra household member makes households harvest their first crop about 0.2 months earlier. Therefore, larger households that face four consecutive months of seasonal hunger may have to sell crops three weeks earlier than those who do not face seasonal hunger.

Additionally, our findings indicate that there is a positive correlation between wage employment and seasonal hunger, which is counterintuitive. This could show that farm households resort to wage labour when they face food shortages. Alternatively, it could mean that seeking off-farm work results from not having enough food. Our data does not enable us to differentiate between these two scenarios.

We recommend two types of policies that can mitigate seasonal hunger. One is to support livestock ownership, which allows households to smooth their consumption. The other is to promote fertilizer adoption, which boosts crop productivity. Higher yields, if they reflect genuine efficiency gains, can lower the prevalence of hunger in all forms.

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