Improving diets and reducing food scarcity with the help of local food plants in Central, Southern and Lusaka provinces of Zambia

Local food plants for nutrition
Series #1

SD=HS Sowing Diversity = Harvesting Security

Community Technology Development Trust

OXFAM Novib

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Acronyms

ASOCUCH	Asociación de Organizaciones de los Cuchumatanes
CTDT	Community Technology Development Trust
CSI	Cognitive Salience Index
DSR	Dietary Species Richness
ESAFF	Eastern and Southern Africa Small Scale Farmers' Forum
FFS	Farmer Field School
FOVIDA	Fomento de la Vida
FVS	Food Variety Score
HDDS	Household Dietary Diversity Score
HFIAS	Household Food Insecurity Access Scale
HHS	Household Hunger Scale
Li Bird	Local Initiatives for Biodiversity, Research and Development
MAHFP	Months of Adequate Household Food Provisioning
MsHDDS	Micronutrient Sensitive Household Dietary Diversity Score
NAFRI	National Agricultural and Forestry Research Institute
NUS	Neglected and Underutilized Species
PELUM	Participatory Ecological Land Use Management
SD=HS	Sowing Diversity = Harvesting Security
ZAAB	Zambia Alliance for Agroecology and Biodiversity

Forward

This document presents the main household-level findings of the baseline survey conducted between 2019-2021, during the second phase of the Sowing Diversity = Harvesting Security (SD=HS) programme (2019-2023). The results of the baseline are complemented with the main findings of the diagnostic exercises conducted by SD=HS' Farmer Field Schools (FFS). Both activities are part of SD=HS' work on Local Food Plants for Nutrition. SD=HS is a global program, and our work on local food plants is currently implemented by Oxfam Country Offices and partner organizations in seven countries. These partners are the National Agricultural and Forestry Research Institute (NAFRI) and the Agricultural Research Center (ARC) in Laos, *the Local Initiatives for Biodiversity, Research and Development (Li Bird) in Nepal, the Asociación de Organizaciones de los Cuchumatanes (ASOCUCH) in Guatemala, the Participatory Ecological Land Use Management (PELUM) and the Eastern and Southern Africa Small Scale Farmers' Forum (ESAFF) in Uganda, the Zambia Alliance for Agroecology and Biodiversity (ZAAB) in Zambia, the Community Technology Development Trust (CTDT) in Zambia and Zimbabwe, and the Fomento de la Vida (FOVIDA)* in Peru. SD=HS is coordinated by Oxfam Novib.

The use of the baseline data and FFS diagnosis conducted by farmers allowed us to establish the local and regional nutritional and agro-ecological conditions in the communities where the Farmer Field Schools (FFS) on Nutrition and Local Food Plants were implemented. The baseline data served to advise and guide the development of a country-specific FFS curriculum and the implementation of FFS activities, by informing FFS participants, collaborators, and other stakeholders about the potential role of local food plants in improving local diets and reducing the food scarcity period.

This Briefing Note is part of a series of briefing notes summarizing the program's findings on nutrition. Additional publications include the 'Champion species help to tackle main nutritional problems in Central, Southern, and Lusaka provinces of Zambia', which presents the main nutrition data of the species concerned and provides recommendations of key nutritious species to be promoted locally. The comparison of the baseline and FFS diagnosis results across the seven program countries will be consolidated in global SD=HS publications.

We are grateful for the funding support from the Swedish International Development Cooperation Agency (Sida).

We hope this document, which provides new and detailed data, contributes to increased attention on the role of local food plants for healthy and affordable diets, and improved nutrition of indigenous peoples and smallholder farmers.

1 Introduction

1.1 Malnutrition

Malnutrition remains one of the greatest global health challenges, and women and children are its most visible and vulnerable victims. People are malnourished when: (a) their diet does not provide adequate calories or nutrients for their body growth and normal function, (b) they are unable to fully utilize the food they eat due to illness, or (c) they take in too much energy, saturated or trans fat, salt, and sugar (overnutrition). In all cases, malnutrition is closely linked to disease as it affects the function and recovery of every organ system. Poverty exacerbates the likelihood and effects of malnutrition. Furthermore, malnutrition contributes to higher healthcare expenses, decreased productivity, and hindered economic growth, fostering an ongoing cycle of poverty and ill-health[1].

Zambia faces significant challenges with poverty, as over half of its population lives below the poverty line. The COVID-19 pandemic worsened an already fragile economy, which had been affected by recurrent climate shocks, declining copper prices, and unsustainable fiscal policies. As a result, the government's initiatives to provide social protection, reduce poverty, combat malnutrition, and achieve food security have been hindered. Malnutrition rates in Zambia are among the highest globally, with 48 percent of the population unable to meet their minimum caloric requirements, and more than one-third of children under five years experiencing stunted growth. The primary factors contributing to this situation include limited nutrition knowledge, poor feeding practices, and inadequate access to nutritious diets[2]. Micronutrient deficiencies are common among children in Zambia. One major concern is anemia, which over the past twenty years has not shown any substantial decrease in children aged 6 to 59 months. A staggering 6 out of 10 children are anemic. Furthermore, the most recent national survey on micronutrient uptake reveals that 54 percent of children under five have a vitamin A deficiency. Additionally, the 2013 National Iodine Deficiency Impact Survey indicated that only 53 percent of households consume adequately iodized salt, highlighting the prevalence of iodine deficiency[3].

Despite the fact that national-level food production consistently surpasses domestic needs, many poor households still struggle to access sufficient and nutritious food. This challenge is exacerbated by the country's heavy reliance on maize as a staple crop. The issue of overweight and obesity, particularly among women, has become more prominent due to the consumption of unhealthy food. Zambia's reliance on 1.5 million smallholder farmers who produce the majority of domestic food makes the country vulnerable to climate-related shocks, given their heavy reliance on rain-fed agriculture. Smallholder farmers also face difficulties in accessing high-quality production inputs, reliable climate and post-harvest management facilities and information, sustainable markets, and financial services. Additionally, despite the fact that women comprise 80 percent of all farmer food producers, they receive fewer resources and have smaller land holdings compared to men[2].

1.2 Food scarcity

For many people, the availability of food is driven by seasonal cycles, and availability of food is least in the pre-harvest months. During food scarcity periods, household food stocks from the last harvest have dwindled. This may coincide with food shortages in the local market, meaning that food that is still available is sold at inflated prices. In this period of the year, the nutrition security of the family is most at stake. Rural households may be forced to resort to various coping strategies to deal with food scarcity, such as reducing the diversity and quantity of their meals, which has an effect on macro- and micronutrient deficiencies of household members. Other strategies to which farmers resort when food scarcity really hits them, such as mortgaging or selling the land, livestock, and other household assets, may result in further spiraling into poverty. The challenges experienced during the scarcity period can be increasingly aggravated by the consequences of climate change. The psychological effects of food scarcity challenges are profound, and all family members may experience high levels of anxiety and stress during this period. Women are especially affected, as their responsibilities often comprise both food production, income-generating activities, and care for other household members (including food preparation). The effects of food scarcity periods tend to be overlooked by policy makers, or may only get attention when these result from natural or human-made calamities.

In 2022, the World Bank reclassified Zambia as a low-income country after a decade in the lower middle-income category. The reclassification followed sustained poor economic performance exacerbated by the COVID-19 pandemic. More than half of the country's 19.6 million people live below the poverty line. In addition, during the last decade, Zambia has suffered from the impact of climate change, with frequent, prolonged dry spells, extremely high temperatures, and floods that have undermined food security and threatened the livelihoods of many smallholder farming households. Meanwhile, smallholders are the country's largest population of food producers, responsible for up to 90 percent of the food produced in Zambia [4].

1.3 Objectives

The objectives of SD=HS work on Local Food Plants for Nutrition are twofold: 1. To enhance dietary diversity[a] and food security; 2. To reduce the duration and severity of climate-related food scarcity seasons. This is achieved through promoting the access to and consumption of diverse and nutritious local food plants, while safeguarding local biodiversity and optimizing the management of these crucial plant resources. By achieving these goals, the initiative aims to improve overall nutrition security and resilience to climate challenges.

In order to improve the nutrition status of smallholder farmers and indigenous peoples, the following questions were addressed:

- Which are, according to farmers, the local causes and consequences of malnutrition?
- What characterizes the food scarcity period and which strategies do farmers implement to cope with it?
- What is the role of local food plants in improving the diversity of the diet during the food scarcity and sufficiency periods?
- What is the role of the agro-ecosystems and local environments in the provision of local food plants?
- Are households that consume more local food plants less prone to suffer from food insecurity, food scarcity, lower dietary diversity and quality?
- How can we best measure this? What are the implications of local food plant consumption for the most vulnerable households?
- What are the local food plants on which knowledge is shared by men and/or women in the communities?
- Which are the local food plants that are consumed during the food scarcity period?
- Who are the most powerful household members in terms of access to food?
- What are the roles of women and men in the acquisition of local food plants?
- Does gender affect the knowledge of local food plants?

This Briefing Note is an attempt to answer these questions, by comparing the consumption of local food plants in food scarcity and sufficiency periods, and its effects on achieving dietary diversity and quality throughout the year. It further addresses the role of local food plants in strengthening communities' coping strategies, against their demographic and socio-economic profiles. It also reflects the intention to raise awareness, stimulate discussions and trigger feedback from a wider audience of stakeholders on the role that local food plants may play in improving nutrition and ensuring healthy and affordable diets. Finally, it provides information to support such policies and legislation that promote diverse and healthy diets through the improved and sustainable use of biodiversity available in the environment.

[a] *Diverse diets include a variety of foods from different food groups, including cereals; white roots and tubers; vitamin A-rich vegetables and tubers; dark green leafy vegetables; other vegetables; vitamin A-rich fruits; other fruits; organ meat; flesh meat; eggs; fish and seafood; legumes, nuts and seeds; milk and milk products; oils and fats; sweets; spices, herbs and beverages. A diverse diet is important to ensure the intake of a wide variety of nutrients, which is needed for a healthy life.*

2 Methodology

2.1 Household survey

The household survey took place from 2019 to 2021 at two different periods (scarcity season and sufficiency season) in four districts [Table 1]. Data was collected by local enumerators who speak the local language. They were trained by Community Technology Development Trust (CTDT) and pilot-tested the questionnaire before collecting the data. The household survey was conducted in a representative sample of communities, representing each agro-ecosystem and ethnic group in the project region. In each selected community, a random household sampling equivalent to 30% of all households living in the community took place to ensure statistical representativeness. For villages with 30 to 100 households, a sample of 30 households was used; for villages with 30 or less households, all households were interviewed. Households that had been living for less than one year in the community, or households that had not been engaged in farming were excluded from the sample. All informants participated freely and with prior informed consent.

Table 1. *Data collection periods during scarcity and sufficiency seasons in the four surveyed districts*

Districts	Scarcity season (round 1)	Sufficiency season (round 2)
Shibuyunji	December 2019 – January 2020	August 2021
Rufunsa	March 2021	September – October 2021
Chirundu	March – April 2021	September – October 2021
Chikankata	July – October 2020	December 2020 – February 2021

This Briefing Note presents the results of the following survey modules: demographic and socio-economic characteristics, severity of food insecurity, dietary diversity, local food plant acquisition, free-listings of local food plants, features of the food scarcity season, and sources of information modules of the household survey[b] . The demographic and socio-economic module includes collected data that allowed the calculation of variables related to gender and household vulnerability, and that gave a general indication of the main productive activities of the household, among others. All modules (except for the demographic and socio-economic module) were conducted in both food scarcity and sufficiency periods.

Food insecurity was measured using the Household Food Insecurity Access Scale (HFIAS) and the Household Hunger Scale (HHS)[5] [Table 2]. According to the HFIAS indicator guide[6], a food secure household experiences no food insecurity conditions, or it might rarely experience worry on sufficient access to food. A mildly food insecure household often worries about not having enough food, it might be unable to eat preferred foods and have a more monotonous diet than desired, or it can even consume some foods considered undesirable. A moderately food insecure household often sacrifices quality more frequently, by eating a monotonous diet or undesirable foods and can start to cut back on quantity by reducing the size of meals or number of meals. Finally, a severely food insecure household has graduated to cutting back on meal size or number of meals and its members can still run out of food, go to bed hungry, or go a whole day without eating[6].

[b] *The detailed explanation of each module, including the survey questionnaire, are accessible in the Baseline Tool document (http://bit.ly/2WSHfTf). The tool was revised and agreed upon with all partner organizations.*

Table 2. *Food insecurity indicators and their definitions*

Food Insecurity Indicators	Abbreviation	Definition
Household Food Insecurity Access Scale	HFIAS	It measures the severity of household food insecurity during the past four weeks (30 days). It ranges from 0 to 27, indicating the degree of insecure food access. Households are categorized as food secure, mildly food insecure, moderately food insecure, or severely food insecure[5].
Household Hunger Scale	HHS	It is derived directly from the HFIAS and it includes only three hunger-related aspects of insecure food access: "little to no hunger in the household", "moderate hunger in the household", or "severe hunger in the household"[5].

A 24-hour dietary recall based interview was also conducted to capture detailed information about all foods and beverages consumed by the respondent in the past 24 hours[7]. Based on the results of the 24-hour recall, the Household Dietary Diversity Score (HDDS), Micronutrient Sensitive HDDS (MsHDDS), the Food Variety Score (FVS) and Dietary Species Richness (DSR), were all calculated [Table 3].

Table 3. *Dietary diversity indicators calculated based on the 24-hour recalls, and their definitions*

Dietary Diversity Indicators	Abbreviation	Definition
Household Dietary Diversity Score	HDDS	It assesses a household's economic access to food (i.e. its ability to produce, purchase or otherwise secure food for consumption by all household members). The potential score range is 0-12[8].
Micronutrient Sensitive HDDS	MsHDDS	It disaggregates and reorganizes the HDDS food groups into 16 micronutrient based groups[9].
Food Variety Score	FVS	It measures the number of different food items consumed from all possible items eaten (individual foods, food mixtures, food categories, or a combination of these)[10].
Dietary Species Richness	DSR	It measures the number of different species consumed per day, assessing both nutritional adequacy and food biodiversity[11].

Local food plant acquisition events, based on a recall period of seven days, also captured the multiple environments from which local food plants were acquired, and gender roles related to their harvesting or gathering. A detailed explanation of how each index was calculated, alongside the rationale of each survey module, and the survey questionnaire itself are accessible upon request. The tools were revised and agreed upon by all partner organizations. Each partner could adapt, test the tools and include specific sections relevant to their own context.

The free listings of the food plants aim to provide an overview of local knowledge, and was used for the development of a list of species based on the knowledge that is shared by community members. Given that knowledge is intrinsically related to gender, free listings were requested from the head of household and his/her spouse separately. The results of the free listings were analyzed by using the cognitive salience index (CSI). The CSI combines frequency and order of mention across men's and women's lists for each plant species and reflects the knowledge of a specific plant (the higher the CSI, the higher the knowledge of that specific plant[12]. In addition, the species that are more widely used among households during the food scarcity season were identified using the traffic light exercise[13]. For that, the enumerator asked men and women to give a color to each plant in relation to the period when it is consumed, as follows:

- Green light: Food plant is consumed during the sufficiency period, or when food may not be plentiful but generally available to the community in adequate quantities and qualities.
- Amber light: Food plant is consumed during a period in which food reserves are alarmingly low.

- Red light: Food plant is consumed during a situation in which the food supply is depleted, which condition requires emergency measures.

The food scarcity module not only assessed the months in which households have reduced access to food[14], but also captured the variety of local food plants, as well as unusual crop parts[c] and crop residues consumed in times of food scarcity. The sources of information module captured the current and preferred sources of information for the community households on health, sanitation and nutrition issues, to help design strategies to communicate with farmers by using preferred channels.

The data was analyzed with descriptive and non-parametric statistics. Spearman rank correlations were calculated between ordinal or continuous variables. Kruskal-Wallis ranked test estimated correlations between one nominal variable that has two or more categories and a continuous variable. Mann-Whitney tests estimated correlations between one nominal variable that has two categories and a continuous variable. Finally, Chi Square tests were calculated between two nominal variables.

2.2 FFS diagnostic exercises

The FFS diagnosis took place in 2021 for 19 FFS established during that year in the Central, Southern, and Lusaka provinces of Zambia. Data was collected by FFS facilitators who speak the local language. They were trained on the FFS approach for the work on nutrition and local food plants, including the conduction of diagnostic exercises and FFS activities, by the Community Technology Development Trust (CTDT) as part of the training of trainers. All FFS members participated freely and with prior informed consent.

This Briefing Note presents the results of the malnutrition problem tree, decision-making with respect to intra-household food distribution, and timeline analysis of local food plants and nutrition exercises from 19 FFS for which we had complete and good-quality data. The analysis of the data was mainly a descriptive exercise, showing patterns, frequencies, and means, where applicable. The FFS diagnostic exercises are detailed in the illustrated module 'Diagnostic Phase' of the FFS Field Guide, which also includes the forms by which results were reported. More information on the FFS work on Nutrition and Local Food Plants is provided in the SD=HS website and is summarized in the Online Course, accessible through the SD=HS website.

2.3 Household and FFS locations

In total, data were collected from 634 households for the baseline survey and 19 FFS for the Diagnostic exercise. Table 4 presents the distribution of the households and FFS surveyed across four districts of the Central, Southern, and Lusaka provinces of Zambia. The districts of Chikankata and Chirundu are located in Southern Province, Rufunsa district is in Lusaka Province, and Shibuyunji is a district of Central Province.

Table 4. *Distribution of sampled households and FFS across the four districts, involved in the activities indicated*

	FFS diagnostic exercise		Baseline survey	
Districts	Number of FFS	Percentage of total number of FFS	Number of households	Percentage of total number of households
Chikankata	5	26%	98	15%
Chirundu	5	26%	125	19%
Rufunsa	4	21%	119	18%
Shibuyunji	5	26%	292	46%
Total	19	100%	634	100%

[c] *Crop parts that are not used for human consumption under normal conditions.*

Figures 1, 2 and 3 below show the location of the surveyed households within the different provinces of Zambia.

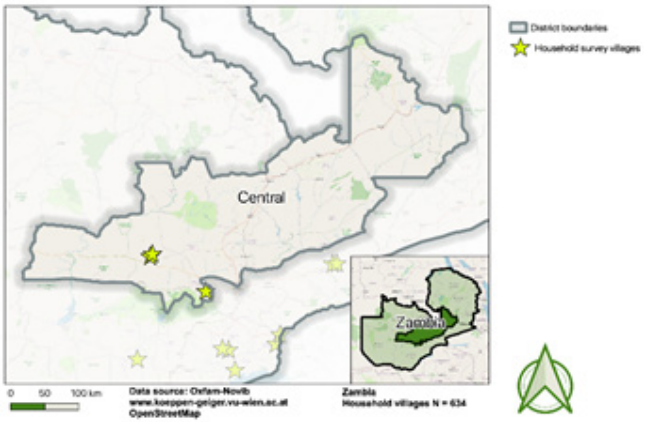

Figure 1. *Map indicating the location of households in Central province*

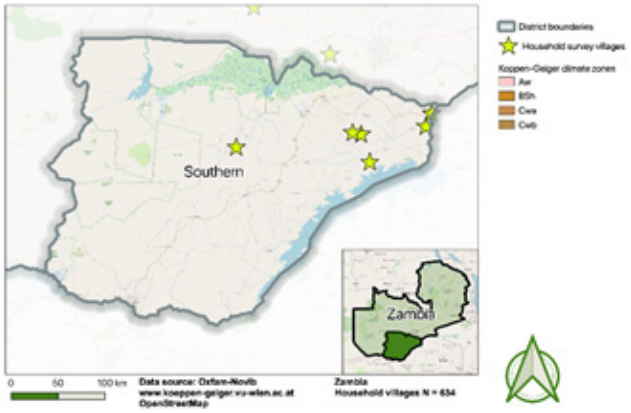

Figure 2. *Map indicating the location of households in Southern province*

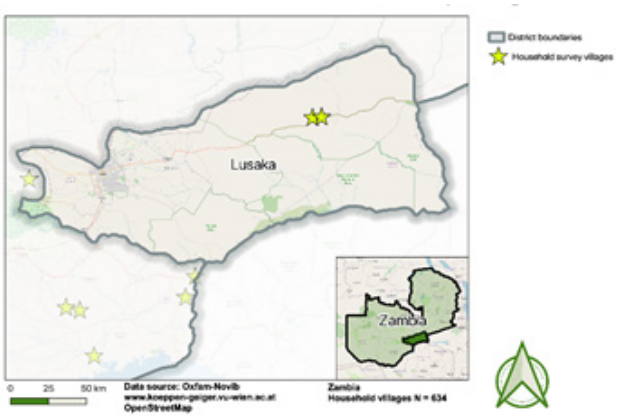

Figure 3. *Map indicating the location of households in Lusaka province*

3 Results

3.1 Socio-economic and demographic characteristics

Agroecological conditions determine largely which crops can be successfully grown and which farming conditions need to be fulfilled, e.g. irrigation, maximum time to maturity, dependence on fertilizers. Recently, climate change has caused the agroecosystems to become drier and rainfall patterns to become more irregular. Such changes bear heavily on crop production and food security.

Indigenous peoples and smallholder farmers surveyed in Zambia live in agroecological regions 1 and 2, which are characterized by low rainfall and medium rainfall respectively. More specifically, Chirundu – with ethnical groups of Tonga – falls within agroecological region 1 with less than 400mm annual rainfall and high temperatures with an average annual maximum of 35°C. Shibuyunji is in agroecological region 2 with rainfall of 400-800mm while Chikankata and Rufunsa are situated on the fringes of region 1. According to the Holdridge Life Zone classification[15,16], 81% of the communities involved are situated in the subtropical dry forests zone, while the location of the remaining 19% of the areas classified are in the tropical dry forests zone. Köppen Climate classification[17] indicates that the majority (77%) of the implementing areas have a climate of warm temperate winters and dry hot summers. The other communities reside in an arid steppe/ hot arid climate (19%), or an equatorial winter dry climate (4%).

The surveyed communities mostly rely on maize, groundnut, pumpkin, and sweet potato farming to sustain their livelihoods. However, Chirundu, due to its different and drier agroecology, mainly relies

on the crops sorghum, pearl millet, cowpea, and groundnut. More than 90% of these crops are cultivated for household consumption.

Table 5 presents the socio-demographic characteristics of the participating communities. The majority of the households investigated had an average size of almost six household members and belonged to the ethnic group Tonga (60.7%). Ethnic groups in Chikankata include mostly Tonga, while in Shibuyunji they include Sala and Ila. In Rufunsa the original ethnic group is Soli. Male household heads were present in more than 70% of the households interviewed, indicating the gender disparity in household dynamics. The educational level and literacy rates of the surveyed households showed that 59% of household heads have completed primary education, although 66% do not know how to read or write. Almost 10% of the household heads have never attended formal education, while a surprising 34% have completed secondary education. The results point out a strong divergence in literacy and formal education levels within and between these communities. Agroecological conditions determine largely which crops can be successfully grown and which farming conditions need to be fulfilled, e.g. irrigation, maximum time to maturity, dependence on fertilizers. Recently, climate change causes the agroecosystems to become drier and rainfall patterns to become more irregular. Such changes bear heavily on crop production and food security.

Table 5. *Results from socio-demographic module of baseline survey*

Socio-demographic variables	Scarcity season interviews (R1)			
	N	%	Mean	St. D.
Ethnic Groups	506			
Tumbuka	2	0%		
Tonga	307	61%		
Soli	1	0%		
Shona	50	10%		
Sala	43	9%		
Nyika	1	0%		
Nyanja	23	5%		
Nkoya	1	0%		
Mambwe	2	0%		
Luvale	13	3%		
Lozi	23	5%		
Lenje	19	4%		
Kaonde	3	1%		
Ila	7	2%		
Bemba	11	2%		
Household size	628		6	2.6
Sex of household head	633			
Man	445	70%		
Woman	188	30%		
Main occupation of household head	628			
On farm	403	64%		
Outside farm	20	3%		
Both	205	33%		
Age of household head	627		48	13.7
Literacy of household head	631			
Only read	137	22%		
Only write	26	4%		

Both	51	8%		
None	417	66%		
Education of household head	627			
Never attended formal education	60	10%		
Primary	344	55%		
Secondary	210	34%		
Highest education	13	2%		
Number of migrants per household	632		1	1.4
Number of children (incl. orphans) per household	626		2	11.5
Number of chronically ill people per household	630		0	0.7
Number of women in child-bearing age per household	632		1	0.9
Total land area (ha) per household	624		4	6.2
Main productive activities per household	633			
Agriculture	631	51%		
Livestock farming	428	35%		
Fishing	11	1%		
Hunting	2	0%		
Gathering	63	5%		
Other	98	8%		
Farm ownership	631			
Owned	438	69%		
Rented	33	5%		
Borrowed from family or friends	88	14%		
Communal land	74	12%		
Other	1	0%		
Number of crops grown in the past 12 months, and for what use	633		7	4.6
Sales	633		4	3.6
Consumption in the household	633		6	4.4
Barter	633		0	0.9
Sharing with relatives and friends	633		0	0.1
Other	633		0	0.1
Market orientation				
(proportion of harvest for sale)	633		0	0.3
Presence of income from				
non-agricultural activities	322	51%		
Presence of home garden	254	40%		

** The results are based on the baseline household survey, in which 634 households participated. Ethnic groups: N=506 (missing values=128); Household size: N=628 (missing value=6) ; Sex of household head: N=633 (missing value=1); Main occupation of household head: N=628 (missing values=6); Age of household head: N=627 (missing values=7); Literacy of household head: N=631 (missing values=3); Education of household head: N=627 (missing values=7); Number of migrants: N=632 (missing values=2); Number of children: N=628 (missing values=6); Number of chronically ill people: N=630 (missing values=4); Number of women in child-bearing age: N=632 (missing values=2); Total land area: N=624 (missing values=10); Main productive activities: N=633 (missing value=1); Farm ownership: N=631 (missing values=3); Number of crops grown on the past 12 months: N=633 (missing value=1); Market orientation: N=633 (missing value=1); Presence of income from non-agricultural activities: N=628 (missing values=6); Presence of home garden: N=632 (missing values=2).*

In terms of their productive activities, it is interesting to see that more that 50% of the households investigated work on agriculture, more than 30% of them in livestock farming and an almost 70% also owns a farm. On average, 7 crops were grown by the households in the past 12 months and the average sale proportion from their harvest is 45%. That means that a 45% of their produce was sold while the rest was mostly consumed. Interestingly, more than 50% of the households have an income from non-farming activities and 40% of them possess a home garden.

3.2 Local causes and consequences of malnutrition

The diagnostic exercises addressed causes and consequences of malnutrition using the Malnutrition Tree as a tool. An important cause of malnutrition mentioned by the FFS involved was the lack of knowledge on the management of local food plants (NUS) and of ways to prepare food from local food plants [Table 6]. Low yields, poor cooking skills, cultural stigma of local food plant consumption, and lack of seed of local food plants scored also high in their importance, with each cause being mentioned more than ten times by the FFS participants. Low yields, lack of proper seed, as well as poor cooking skills can be interpreted as specifications of the wider causes lack of knowledge on the management and of ways to prepare food from LFPs. Responses like "lack of balanced diet" and "overeating", that do not reveal the root causes of malnutrition, were reported 15 times from the FFS participants. In conclusion, lack of knowledge, regarding both the management and ways to prepare food of LFPs, is the major argument listed.

Table 6. *Causes of malnutrition as reported by FFS participants*

Malnutrition cause	Number of answers	Percentage of answers	Details and examples
Knowledge lack or gap	17	17%	Lack of knowledge, lack of knowledge on the management of NUS, lack of knowledge on how to prepare foods
Poor/imbalanced diet	15	15%	Lack of balanced diet, eating the same type of food, feeding on one type of food, overeating
Low yields	14	14%	low productivity
Poor cooking skills	13	13%	Poor cooking habits
Cultural attitude/stigma	12	12%	Looking down on local plants
Lack of seed	11	11%	lack of seed for production
Lack of diversity	9	9%	-
Laziness	6	6%	Bad attitude towards working
Hygiene	5	5%	Poor hygiene
Decision making problems	1	1%	Inappropriate decision making within the household
Total	103	100%	

**The details and examples are taken directly from the FFS diagnostic reports. The way the question was asked allowed FFS to give more than one open responses. During data analysis, the responses were then grouped into categories. The percentages are calculated over the total number of answers (N=103) collected from the 19 FFS.*

The most important consequence of malnutrition, reported by all surveyed FFS, was the loss of weight and (resulting) underweight [Table 7]. Poor life expectancy, weakness and inactivity, illness and obesity were also scored as very important malnutrition consequences with each one being mentioned more than 10 times by the FFS participants. Most likely, except for obesity, these latter consequences may be closely related to loss of weight and underweight. Obesity might result from consumption of cheap, calorie-rich but vitamin-poor food items, which are consumed by lack of better-quality food and regular proper meals.

Table 7. *Consequences of malnutrition as reported by FFS participants.*

Malnutrition consequence	Number of answers	Percentage of answers	Details and examples
Weight loss	19	20%	Thin bodies especially in scarcity period
Poor life expectancy or death	17	18%	Death, miscarriages
Weakness and inactivity	16	17%	Inactive children, weak bodies
Illnesses	12	13%	More people getting sick
Obesity	10	11%	-
Stunted growth	8	9%	Stunting
Social and household challenges	6	6%	Theft, crime

Changes in body appearance	5	5%	Swollen legs, frail hair
Total	93	100%	

**The details and examples are taken directly from the FFS diagnostic reports. The way the question was asked allowed FFS to give more than one open responses. During data analysis, the responses were then grouped into categories. The percentages are calculated over the total number of answers (N=93) collected from the 19 FFS.*

The vast majority of the FFS (84%) reported that the nutrition status has worsened in their village in the last 30 years [Table 8]. Only one FFS reported that nutrition has improved over the past 30 years, while two said that it had stayed the same. Such qualification may be related to an increased share of staple crops in the diet and a decreased access to additional minor crops, including local food plants.

Table 8. *Nutrition changes in the village in the last 30 years*

Changes in nutrition	Number of FFS	Percentage of FFS
Worsened	16	84%
Stayed the same	2	11%
Improved	1	5%
Total	19	100%

** The details and examples are taken directly from the FFS diagnostic reports. The question asked was "Has the nutrition in the village changed in the last 30 years?". The percentages are calculated over the total number of the 19 FFS participated.*

Poverty and access to land or food (20%) as well as the lack of knowledge (20%) are the main factors that affected the nutritional status of the household [Table 9]. Globalization and westernized eating habits was a major influencing factor, mentioned 15 times by the FFS participants, while lack of crop diversity (12%), poor productivity (11%) and poor cooking skills (11%) were also mentioned at least 10 times. These causal factors are likely interrelated, as already pointed out above.

Table 9. *Major factors that affected the nutritional status of the households*

Factors influencing the change	Number of answers	Percentage of answers	Details and examples
Poverty and access to land/food	19	20%	Lack of money, lack of income, poor food distribution in the HH
Lack of knowledge	19	20%	Lack of knowledge on nutrition, poor cooking skills, poor cooking methods
Globalization and change in habits	15	16%	Modern way of eating, culture
Lack of crop diversity	11	12%	Failure to cultivate local plants
Low productivity	10	11%	-
Poor cooking skills	10	11%	-
Lack of seed	7	7%	Lack of seed for production
Climate change and environmental degradation	2	2%	Changing weather patterns
Gender issues	2	2%	-
Total	95	100%	

** The details and examples are taken directly from the FFS diagnostic reports. The way the question was asked ("What were the major factors that affected the nutritional status of the households?") allowed FFS to give more than one open responses. During data analysis, the responses were then grouped into categories. The percentages are calculated over the total number of answers (N=95) collected from the 19 FFS.*

3.3 Understanding local diets

The baseline survey showed that household dietary diversity was not statistically different between the scarcity and sufficiency seasons [Table 10]. It is important to note however that both the HDDS and MsHDDS indicators simply group food plants in categories such as cereals, tubers, vegetables, fruits, and legumes and

measure to which extent the household diet contains crops from these groups. That means that unfortunately these indicators cannot capture the diversity of food plants consumed within each food group, e.g. diversity of vegetables, fruits, etc. FVS and DSR[10,11] indicators have to help us to capture this level of information but the data collected on them are not fully sufficient.

Table 10. *Dietary diversity (HDDS, MsHDDS, FVS and DSR) differences between scarcity and sufficiency seasons*

Dietary diversity	Scarcity season (mean ± sd)	Sufficiency season (mean ± sd)
HDDS (0-12)	6.2 ± 1.9	6.3 ± 2.2
MsHDDS (0-16)	6.3 ± 2.0	6.1 ± 2.1

** The results come out the baseline household survey, in which 634 households participated. During the first survey round (scarcity season) 3 values were missing (N=631), while during the second survey round (sufficiency season), 22 values were missing for HDDS (N=612), and 21 values were missing for MsHDDS (N=613). Data collection errors did not allow for the analysis of the FVS and DSR indicators.*

Regarding the dietary diversity captured among the specific food groups, we see that cereals and vegetables are the most consumed food groups during both the scarcity and sufficiency seasons, while fruits are consumed slightly more frequently during the scarcity season [Table 11]. Whereas available food quantity might be less during the scarcity periods, the dietary diversity appeared not statistically different between these seasons, suggesting that to improve the role of Local Food Plants in local diets might be equally important throughout the year and regardless the nature of the season.

Table 11. *Main food groups consumed during the scarcity and sufficiency seasons*

Food Group	Scarcity season		Sufficiency season	
	N	% HHS	N	% HHS
Cereals	621	16%	544	14%
White tubers and roots	212	5%	280	7%
Vegetables	604	16%	548	14%
Fruits	511	13%	414	11%
Meat	130	3%	142	4%
Eggs	157	4%	169	4%
Fish and other seafood	171	4%	210	6%
Legumes, nuts, and seeds	346	9%	333	9%
Milk and milk products	180	5%	190	5%
Oils and fats	433	11%	433	11%
Sweets	230	6%	331	9%
Spices, condiments and beverages	312	8%	241	6%
Total	3907	100%	3835	100%

** The results are deduced from the baseline household survey, in which 634 households participated. During the first survey round (scarcity season) 4 households were missing (N=630), while during the second survey round (sufficiency season), 42 households were missing (N=592).*

3.4 Local food plants diversifying the diet

Table 12 presents the food groups in which some important local food plants in Central, Southern, and Lusaka provinces of Zambia are categorized. As discussed above, the food groups do not measure the diversity of consumption within each category, e.g. the variety of different vegetables, fruits, legumes, cereals, and tubers consumed.

Table 12. *Important local food plants and food groups*

Scientific name	English name	Local name	Food group
Hibiscus sabdariffa	roselle	lumanda	vegetables

Phaseolus vulgaris	common bean, haricot	bean	legumes
Vigna unguiculata	cowpea	cowpea	legumes
Abelmoschus esculentus	okra	okra	vegetables
Cleome gynandra	spider flower; cat's whiskers	lubanga	vegetables
Manihot esculenta	cassava, tapioca	cassava	roots and tubers
Sorghum bicolor	sorghum	sorghum	cereals
Psidium guajava	guava	guava	fruits
Carica papaya	papaya	paw paw	fruits
Rhoicissus tomentosus	African grape, bush	malamba lamba	fruits
Sesamum sesamoides	false sesame	katate	vegetables
Dioscorea villosa	water yam	impama	roots and tubers
Dioscorea hirtiflora	wild yam , guinea yam	busala	roots and tubers
Thespesia garckeana	African chewing gum	matobo	fruits
Amaranthus cruentus	wild spinach	bondwe	vegetables
Bidens pilosa	black jack, spanish needle	kanunkha, kampuku	vegetables

3.5 Measuring the severity of food insecurity

The baseline survey showed that household food insecurity was higher during the scarcity season compared to the sufficiency season [Table 13]. As expected, this demonstrates the crucial negative impact that lean periods, linked to growing seasons, have on household food security.

Table 13. *Food insecurity (HFIAS, HHS) differences between scarcity and sufficiency seasons*

Food Insecurity	Scarcity season (mean ± sd)	Sufficiency season (mean ± sd)
HFIAS (0-27)	5.9 ± 7.1	2.4 ± 4.1
HHS (0-6)	0.7 ± 1.2	0.2 ± 0.6

** The results come out the baseline household survey, in which 634 household participated. During the first survey round (scarcity season) 39 values were missing for HHS (N=595) and 40 values were missing for HFIAS (N=594), while during the second survey round (sufficiency season) 21 values were missing (N=613).*

Similarly, Table 14 shows that during the scarcity season, more than 20% of the interviewed household were experiencing moderate or severe food insecurity. No household experienced severe food scarcity during the sufficiency season, with only 5% of the households experiencing moderate food insecurity. Again, this demonstrates the crucial impact a change in climate and lean periods will have on household food security.

Table 14. *Percentage of households that suffer from food scarcity throughout the year*

Household Hunger Scale (HHS)	Scarcity season		Sufficiency season	
	N	% Hhs	N	% Hhs
Little to no hunger (% total Hhs)	464	78%	580	95%
Moderate hunger (% total Hhs)	115	19%	33	5%
Severe hunger (% total Hhs)	16	3%	0	0%

** The results are calculated based on the data from the baseline household survey, in which 634 households participated. During the first survey round (scarcity season) 39 values were missing (N=595), while during the second survey round (sufficiency season) 21 values were missing (N=613).*

3.6 The food scarcity period

Given the important links between food scarcity and food insecurity, it was important to look into the current length of the scarcity period within the investigated areas in Zambia. Table 15 presents the percentage of households in Shibuyunji district that suffer from food scarcity throughout the year. Similar data from the other investigated districts were not sufficient for further analysis. In Shibuyunji, although November and December seem to be the months showing the largest shortages, with more than 50% of households experiencing food scarcity, food shortages are already mentioned from August onwards. Considering that, the main results suggest that some minor crops can be harvested earlier and relax scarcity conditions.

Table 15. *Percentage of households in Shibuyunji that suffer from food scarcity indicated per calendar month*

Months	Percentage of households
January	11%
February	7%
March	3%
April	4%
May	7%
June	9%
July	9%
August	17%
September	24%
October	35%
November	50%
December	67%

**The results come out the first round baseline household survey in Shibuyunji, in which 292 household participated and 57 values (Hhs) were missing (N=235). No such data are available from Chirundu, Chikankata or Rufunsa.*

The most important characteristic of the food scarcity season, mentioned 28 times within the 19 FFS, was the consumption of local food plants that are sometimes stigmatized [Table 16]. Perhaps, this is linked to some perceptions related to the consumption of the local food plants, e.g. that they are consumed by very poor people. Responses relevant to reduced food intake or limited dietary diversity were mentioned 18 times by the FFS participants. What is interesting is that more than 33% of the responses mentioned that the food scarcity season is characterized by temporary migration (11%), selling assets (11%) and buying food on credit (11%).

Table 16. *Characteristics and definition of the scarcity season as mentioned by the FFS participants*

Characteristics of the scarcity season	Number of answers	Percentage of answers	Details and examples
Consumption of local/wild plants (sometimes stigmatized)	28	31%	Wild fruits like masau are turned into porridge; eating sorghum bran by using it to prepare nshima (porridge); consumption of foods which are looked down upon
Reduced food intake/limited dietary diversity	18	20%	Reduced number of meals
HH/social unrest	13	15%	Head of households easily angered; frequent quarrels in homes; theft; pupils fail to go to school
Temporal migration	10	11%	-
Selling assets for food	10	11%	-
Buying food on credit	10	11%	-
Total	89	100%	

** The details and examples are taken directly from the FFS diagnostic reports. The way the question was asked allowed FFS to give more than one open responses. During data analysis, the responses were then grouped into categories. The percentages are calculated over the total number of answers (N=89) collected from the 19 FFS.*

3.7 The role of local food plants during the food scarcity season

The average number of food plant species used in times of food scarcity per household was 4.6 (± 3.0). Table 17 presents the most frequently used food plants in times of scarcity. Traffic light scores are also indicated as well as any available comments from the FFS diagnostic exercise on why participants think these plants are popular during scarcity. Maize, mango, water yam, wild yam, and amaranth seem to be the plants mentioned with the highest frequencies (<20% of the households). Although maize is considered to be a major staple food, rather than a local food plant, it seems to play an important role during food scarcity, perhaps in reduced volumes. A great number of households have also indicated that maize (67%) and yam (44%) are important plants during severe food scarcity periods, whereas nshima produced from either maize, sorghum, or pearl millet formed a major dish (89%).

Table 17. *Key local food plants used during food scarcity period*

Local food plants used in times of food scarcity	Number of households	Percentage of households
maize	195	34%
mango	138	24%
impama	133	23%
busala	121	21%
bondwe	113	20%
sozwe	96	17%
rape	81	14%
buuyu	80	14%
cassava	74	13%
busika	67	12%
mabuyu	62	11%
pumpkin	61	11%
sweet potato wild	59	10%
kanunkha	58	10%
nshima	53	9%
sweet potato	50	9%

**The results come out the baseline household survey, in which 634 households participated. In total, 59 values were missing (N=575).*

It is important to note that out of the 144 local food plants identified in the 19 FFS, 82 of them were mentioned because of their nutritional importance [Table 18]. Few of these 144 plants were mentioned because they are a source of energy (3%) and due to their important role in food security (3%). It shows that local food plants can play a major role in combatting food and nutrition insecurity during the entire year, which includes the scarcity periods when they are mostly needed.

Table 18. *Perceived importance of local food plants used in times of food scarcity*

Perceived importance	Number of plants	Percentage of plants
Provides important nutrients	82	57%
Food security	4	3%
Source of energy	4	3%

**The results come out the FFS diagnostic exercise, for which data was collected out of 19 FFS. In total, 144 local food plants were identified. Percentages reflect the number of plants divided by the total number of plants identified in this exercise (N=144). For some plants, no perceived importance was assigned.*

3.8 Multiple environments can support diverse diets: Local food plant acquisition

Sourcing of local food plants

In the scarcity period, a significant number of households (32.8%) are reported to have purchased at least one of the local food plants they mentioned. An almost equal number said they sourced the local food plants they mentioned through gathering (30.8%) or harvesting from their own fields or home gardens (29.0%). Interestingly, the figures reported for the sufficiency period are highly similar. This means that food scarcity does not influence the extent to which households source local food plants for consumption.

In the scarcity period, a significantly greater variety of species (147) was reported to be gathered compared to the sufficiency season (109). This difference between the seasons did not appear for plants that were purchased or harvested. This highlights the importance of gathering local food plants from the wild during the food scarcity period.

Sites where the local food plants originate from

The majority of the local food plants listed are collected from the agricultural field or the forest with small variations between the scarcity and sufficiency periods [Table 19]. Interestingly, during the scarcity season, only 23% of the mentioned plant species are brought from the home gardens, compared to 32% during the sufficiency season. This might mean that despite the important role of home gardens in food provision during the scarcity season, their yields might be lower, perhaps due to lack of water and other inputs.

Table 19. *Number of plant species and sites where they originate from*

Place of origin	Scarcity season		Sufficiency season	
	N	%	N	%
Agricultural field	106	48%	95	55%
Home garden	52	23%	56	32%
Forest	128	57%	88	51%
Public spaces	69	31%	58	33%
Roadside	52	23%	47	27%
Lake	1	0%	0	0%
Riverside	16	7%	11	6%
Market	66	30%	55	32%
Other	41	18%	35	20%

** The results come out the baseline household survey, in which 634 households participated. In total, 9 households were missing in the scarcity period (N=625), and 155 during the sufficiency period (N=479). During the first survey round (scarcity season), 223 plant species were mentioned, while during the second survey round (sufficiency season) 174 species were mentioned. Percentages reflect the number of species brought from each different place, divided by the total number of different species mentioned.*

3.9 Women's and men's roles: Local food plant acquisition

Household members that acquire local food plants for the household

Baseline survey data showed that women bring home the majority of species during both the scarcity (80%) and sufficiency (82%) seasons, compared to other family members [Table 20]. Men and children also bring quite a variety of local food plants to their households, without important variations during the two seasons. Whereas the species provided by women and men show considerable overlap, the total number provided by women is substantially larger. This demonstrates the important role women have in sourcing local food plants and nourishing the family.

Table 20. *Number of plant species that are acquired by various family members*

Family members	Scarcity season		Sufficiency season	
	N	%	N	%
Man	131	59%	114	66%
Woman	179	80%	143	82%
Both genders	21	9%	27	16%
Children	70	31%	52	30%
Family	30	13%	20	11%
Others	13	6%	15	9%

**The results are based on the baseline household surveys, in which 634 households participated. In total, 9 households were missing in the scarcity period (N=625), and 155 during the sufficiency period (N=479). Percentages reflect the number of species brought from each different place, divided by the total number of different species mentioned per season. During the first survey round (scarcity season) 223 different plant species were mentioned, while during the second survey round (sufficiency season), 174 different species were mentioned..*

3.10 Women's and men's knowledge on local food plants (Free listings)

Individual men (9.0 ± 5.3) listed a slightly lower number of plants than individual women (9.8 ± 5.1), indicating that women have slightly bigger knowledge of local food plants. However, as a group men reported a similar total number of different plant species (111 different species/ 444 men), compared to women (128 different species /485 women). Almost all plant species were listed by the two genders with similar frequencies. Interestingly, the Sutrop CSI indicator[12] which also takes into account the order a plant is mentioned, indicated that women and men have a different knowledge of the plant species concerned. Annex 1 presents the full list of plants and the frequencies in which they were mentioned by men and women.

3.11 Relationships with dietary diversity and food insecurity indicators

A significantly positive relationship was found between the number of crops grown in the past 12 months for consumption and the household food insecurity indicator HFIAS ($p<0.001$) during the food scarcity season. No significant correlation was found for this relationship during the sufficiency season [Table 23]. This suggests that during the scarcity season when food security is threatened, the more food-insecure households grow a larger number of crops for household consumption. This does not appear to happen during the food sufficiency season.

Similarly, a significantly positive relationship was found between the number of local food plants that were acquired and the HFIAS indicator ($p<0.01$), but this time the correlation was significant during both seasons. This might suggest that regardless of the time of the year, the more food-insecure households consume a larger number of local food plants.

A significantly positive relationship between the number of crops grown in the past 12 months for consumption and the micronutrient-sensitive household dietary diversity, during both the food scarcity period ($p<0.001$) and the food sufficiency period ($p<0.01$). This indicates that the households that grow a larger number of crops for consumption have higher dietary diversity.

Likewise, during both seasons, a significantly positive relationship was found between the number of local food plants that were brought home and the micronutrient-sensitive household dietary diversity ($p<0.001$), meaning that the households that acquire more local food plants have a higher dietary diversity.

3.12 More aspects of gender roles

Women play a key role in safeguarding the nutrition of their families through their wide knowledge of local food plants, which allows diversification of diets and higher nutrient intake. Empowering them can contribute to their own food and nutrition security and that of their families[18]. However, in many cultures, there are major gender inequalities in relation to the access and control of resources, including food, with major consequences for the nutrition of women and children. Land is traditionally passed on to male family members as they reach adulthood, as according to local culture female family members will not need it after their marriage. In addition, men are usually in charge of the staple crops that are produced for both consumption and sale, such as maize. Women, on the other hand, tend to take responsibility for smaller crops like legumes that are mostly grown for household consumption (e.g. cowpea and Bambara nut). Women are also the ones who usually decide what to cook as they will know better what is available in the household.

Indeed, all FFS indicated that mothers are the ones who decide what to eat in the household, while only four FFS reported that fathers are also involved in such decisions [Table 22].

Table 22. *Decision making member regarding what to eat in the household*

Decision making member	Number of FFS	Percentage of FFS
Mother	19	100%
Father	4	21%

** The details and examples are taken directly from the FFS diagnostic reports. The way the question was asked ("Who are the most powerful household members in terms of access to food?") allowed FFS to give more than one responses: 1= Father, 2= Mother, 3= Children, 99= Other, please specify [multiple options allowed]. During data analysis, the responses were then grouped into categories. The percentages are calculated over the 19 FFS analyzed.*

All FFS reported that fathers were the most powerful household members in providing access to food at large, including from other sources than the owned farm, whereas a large majority (79%) also recognized a major role for mothers, pointing to joint decision-making [Table 23].

Table 23. *Most powerful household members in terms of access to food*

Weakest members	Number of FFS	Percentage of FFS
children	16	84%
mother	3	16%

** The details and examples are taken directly from the FFS diagnostic reports. The way the question was asked ("Who are the most powerful household members in terms of access to food?") allowed FFS to give more than one responses: 1= Father, 2= Mother, 3= Children, 99= Other, please specify [multiple options allowed]. During data analysis, the responses were then grouped into categories. The percentages are calculated over the 19 FFS analyzed.*

The vast majority of FFS (84.2%) reported that children are the least powerful household members in terms of access to food, while three FFS reported that mothers are the least powerful household members [Table 24].

Table 24. *Who are the least powerful household members in terms of access to food?*

Weakest members	Number of FFS	Percentage of FFS
children	16	84%
mother	3	16%

** The details and examples are taken directly from the FFS diagnostic reports. The way the question was asked ("Who are the least powerful household members in terms of access to food?") allowed FFS to give more than one response: 1= Father, 2= Mother, 3= Children, 99= Other, please specify [multiple options allowed]. During data analysis, the responses were then grouped into categories. The percentages are calculated over the 19 FFS analyzed.*

Overall, Tables 22, 23, and 24 indicate that although women are most important in the intra-household food distribution, that is they decide what to do with the food that is already available, men have more power in accessing food from any source and providing it to their household.

The baseline analysis further showed that the length of the women's list of plants was significantly longer (more plants reported) in female-headed households compared to male-headed households ($p<0.001$). This finding reconfirms the notion that women have a prime role in maintaining knowledge of local food plants and highlights the important role they play in providing food and nutrition security at the household level.

Interestingly, a relationship is suggested between the gender of the household member that decides about the income from the main farming or non-farming activities and the number of plants listed by the two genders of each household. More specifically, the length of the men's list of plants was significantly higher (more plants mentioned) in the households where men decided what to do with the income from farming or non-farming activities ($p<0.001$). However, in a similar way, the length of the women's list of plants was significantly higher (more plants mentioned) in the households where women decided what to do with the income from the same farming ($p<0.001$) and non-farming activities ($p<0.05$). This indicates that decision-making power is well linked with local knowledge and that if women have more decision-making power, their knowledge of local food plants will be more extensive (and vice versa).

3.13 Evaluation of coping strategies and possible solutions

The main coping strategies to fight food insecurity are casual labor, migration, and buying food on credit, as they were reported 39 times throughout the 19 FFS [Table 25]. Selling or renting out assets was mentioned 30 times, while consumption of local food plants was only mentioned 7 times across the 19 participating FFS. This could mean that many participants are unaware of their nutritional benefits, and therefore do not use them as much as they could. Skipping meals and eating a less diverse diet as a coping strategy was reported 6 times while growing food crops in home gardens and hunting or fishing was mentioned 5 times within the 19 FFS. It is important to note that agriculture-related coping strategies are mentioned less frequently than non-agriculture-related ones. This might be an artifact of the way the question was asked to the FFS participants.

Table 25. *Main strategies used to cope with the scarcity season and their severity as reported by the FFS participants*

Coping strategies	Number of answers	Percentage of total answers	Details and examples
Casual labor, migration or buying food on credit	39	41%	Charcoal burning; migration into town; buying food on credit; piece work
Renting or selling farm/HH assets	30	32%	Selling of livestock; selling land; selling of farm implements
Consumption of local/wild plants	7	7%	Increased gathering of wild food plants
Worsening of diet and nutrition	6	6%	Missing meals; eating one meal per day
Growing home gardens	5	5%	-
Hunting/fishing	5	5%	-
Relying on neighbors and family for food/money	3	3%	Asking from family members
Total	95	100%	

** The details and examples are taken directly from the FFS diagnostic reports. The way the question was asked allowed FFS to give more than one open responses. During data analysis, the responses were then grouped into categories. The percentages are calculated over the total number of responses (N=95) collected from the 19 participating FFS.*

Malnutrition is often associated with food scarcity and focuses on the particular consequences of the latter. The most popular counter strategies to combat malnutrition according to FFS participants were better food preparation and cooking demonstrations [Table 26]. Better access to seed, seed management, and the organization of seed or food fairs was mentioned 13 times by the FFS participants. Improving food preservation and food quality during the food scarcity periods was also considered an important remedy to fight malnutrition for the majority of the FFS. In general, practical demonstrations of applicable knowledge (including growing or managing food plants, processing, and cooking) were often reported as a desired contribution to better nutrition, indicating their significance in knowledge sharing.

Table 26. *Possible solutions to malnutrition by farmers*

Solutions	Number of answers	Percentage of answers	Related research objective
Food preparation and cooking demonstrations	22	27%	To promote the use of local food plants
Seed fairs and food fairs	13	16%	To produce and spread seeds; to exchange seed knowledge; to increase seed stock among farmers
Food preservation	11	13%	To make available quality food items during scarcity period; to improve food preservation methods
Growing local food plants	9	11%	To promote the use of local food plants; to reduce underweight among children under 5 years of age
Harvesting wild food plants	9	11%	
Improved seed storage	6	7%	To maintain local seed stocks
Improving seed germination and breaking seed dormancy	6	7%	
Creating school gardens	4	5%	To promote the use of local food plants; To reduce underweight among children under 5 years of age
Other activities	2	2%	To improve bitter taste
Total	82	100%	

** The details and examples are taken directly from the FFS diagnostic reports. The way the question was asked allowed FFS to give more than one open responses. During data analysis, the responses were then grouped into categories. The percentages are calculated over the total number of responses (N=82) collected from the 19 participating FFS. Other activities category includes answers like the creation of home gardens and special nutrition topics.*

3.14 Preferred ways to promote the use of local food plants by local communities

Health facilities and community health services are the channels by which most households obtain information, and these are also most preferred [Table 27]. Radio is the next source of information that is being used and acknowledged by 46% and 31% of the responding households, respectively. It is important to notice that no reference is made to extension services and that agriculture-related information sources are only preferred by 18% of the interviewed households. This suggests that support to cope with food scarcity and dietary needs is better received when obtained from health providers.

Table 27. *Current and preferred sources of information*

Sources of information	Current sources		Preferred sources	
	N	% Hhs	N	% Hhs
Neighbor	95	15%	64	10%
Health facilities	484	76%	293	46%
Community health	485	77%	329	52%
Support group, farmer group, FFS	174	27%	117	18%
NGOs	101	16%	45	7%
Radio	294	46%	198	31%
School children	114	18%	47	7%
TV	42	7%	24	4%
Pamphlet	12	2%	8	1%
Cell phone	135	21%	87	14%
Other	9	1%	5	1%

** The results come out the first round of baseline household survey, in which 634 household participated and 1 value is missing (N=633). The questions were asked in a way that allowed households to provide multiple responses. Percentages reflect the number of households that mentioned the source of information, divided by the number of households that responded the question (N=633).*

4 Conclusions

The information presented above shows how important it is to re-establish local food plants in the diets for both food and nutrition security, and for providing relief during periods of food scarcity. The interviews with FFS participants provided a clear picture of the staple crops cultivated in the interviewed communities. Household consumption of these crops was the primary use, compared to sale and barter. Local food plants only serve a minor role in the diet due to a lack of knowledge on several aspects regarding these plants, e.g. on their nutritional benefits, on ways to prepare them, and on proper agronomic practices. Cultural stigmatization of local food plant consumption also explains parts of their limited use. In the scarcity period, more local food plants are grown for consumption than in the sufficiency period, but the number of local food plants accessed per household showed no significant difference between the scarcity and sufficiency periods. Communities were well aware of the relation between local diets and malnutrition. Coping strategies in response to food scarcity were mainly economic rather than of a dietary nature. Not surprisingly, women exhibited more knowledge of local food plants than men and were able to access more local food plant species than men. Again unsurprisingly, more food-insecure households tend to pay more attention to the use of local food plants in their diets. Finally, FFS participants listed numerous measures to promote and improve nutrition and increase the consumption of local food plants, in particular during the food scarcity period.

5 References

1. Fact sheets - Malnutrition. https://www.who.int/news-room/fact-sheets/detail/malnutrition.
2. WFP Zambia Country Brief Operational Context. (2023).
3. Nutrition | UNICEF Zambia. https://www.unicef.org/zambia/nutrition.
4. WFP. WFP Zambia Country Brief Operational Context. www.wfp.org/countries/zambia (2023).
5. Coates, J., Swindale, A. & Bilinsky, P. Food and Nutrition Technical Assistance Project (FANTA) Academy for Educational Development 1825 Connecticut Ave. (2000).
6. Coates, J., Swindale, A. & Bilinsky, P. Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide: Version 3. (2007).
7. 24-hour Dietary Recall (24HR) At a Glance | Dietary Assessment Primer. https://dietassessmentprimer.cancer.gov/profiles/recall/.
8. Fao. Guidelines for measuring household and individual dietary diversity.
9. Aberman, N.-L., Meerman, J. & Benson, T. MAPPING THE LINKAGES BETWEEN AGRICULTURE, FOOD SECURITY & NUTRITION IN MALAWI.
10. NP, S., JH, N., G, N., G, K. & D, L. Food variety and dietary diversity scores in children: are they good indicators of dietary adequacy? Public Health Nutr. 9, 644–650 (2006).
11. Lachat, C. et al. Dietary species richness as a measure of food biodiversity and nutritional quality of diets. Proc. Natl. Acad. Sci. U. S. A. 115, 127–132 (2018).
12. Sutrop, U. List Task and a Cognitive Salience Index. http://dx.doi.org/10.1177/1525822X010130030313, 263–276 (2001).
13. Ocho, D. L., Struik, P. C., Price, L. L., Kelbessa, E. & Kolo, K. Assessing the levels of food shortage using the traffic light metaphor by analyzing the gathering and consumption of wild food plants, crop parts and crop residues in Konso, Ethiopia. J. Ethnobiol. Ethnomed. 8, 1–17 (2012).
14. Bilinsky, P. & Swindale, A. Months of Adequate Household Food Provisioning (MAHFP) for Measurement of Household Food Access: Indicator Guide (Version 4). (2010).
15. Jungkunst, H. F., Goepel, J., Horvath, T., Ott, S. & Brunn, M. New uses for old tools: Reviving Holdridge Life Zones in soil carbon persistence research. J. Plant Nutr. Soil Sci. 184, 5–11 (2021).
16. Post, W. M., Emanuel, W. R., Zinke, P. J. & Stangenberger, A. G. Soil carbon pools and world life zones. Nat. 1982 2985870 298, 156–159 (1982).
17. Peel, M. C., Finlayson, B. L. & Mcmahon, T. A. Hydrology and Earth System Sciences Updated world map of the Köppen-Geiger climate classification. Hydrol. Earth Syst. Sci 11, 1633–1644 (2007).
18. Smith, L. C., Ramakrishnan, U., Ndiaye, A., Haddad, L. & Martorell, R. The Importance of Women's Status for Child Nutrition in Developing Countries About This Report. (2002).

6 ANNEX 1: KNOWLEDGE OF LOCAL FOOD PLANTS

		Freelistings											Food Scarcity		
Food plant	English name	Total number (men + women)	Number of men	Number of women	Sutrop CSI men	Sutrop CSI wom-en	% of men that indicated traffic light:			% of women that indicated traffic light:			% of hh that indicated traffic light:		
							green	amber	red	green	amber	red	green	amber	red
anyenze		3%	7%	0%	0.24	0.00	7%	0%	0%	0%	0%	0%			
apple	apple	4%	4%	3%	0.00	0.00	53%	37%	11%	56%	25%	19%	33%	67%	0%
avocado	avocado	5%	5%	5%	0.01	0.01	20%	5%	20%	22%	4%	13%	100%	0%	0%
bambara nut	bambara nut	11%	8%	14%	0.02	0.07	9%	9%	21%	9%	0%	24%	0%	0%	100%
banana	banana	30%	34%	26%	0.19	0.12	16%	4%	4%	19%	6%	2%	64%	9%	27%
bean	bean	35%	37%	33%	0.25	0.16	13%	2%	11%	20%	4%	9%	6%	18%	76%
black jack	black jack	17%	14%	20%	0.27	3.96	5%	5%	0%	0%	1%	0%	60%	0%	40%
bondwe	amaranth	32%	31%	34%	0.08	0.08	39%	1%	1%	39%	4%	4%	83%	13%	4%
boonko		11%	0%	20%	0.00	0.37	0%	0%	0%	6%	3%	1%	64%	36%	0%
bowa		6%	7%	6%	0.11	0.02	7%	0%	0%	37%	13%	0%	20%	60%	20%
broccoli	broccoli	0%	0%	0%	0.00	0.00	0%	0%	0%	0%	0%	100%			
buck wheat	buck wheat	0%	0%	0%	0.00	0.00	0%	0%	0%	0%	0%	0%			
busala		17%	18%	17%	0.02	0.02	21%	12%	68%	22%	13%	65%	39%	17%	44%
busenga													0%	13%	88%
busika		13%	17%	9%	0.05	0.02	40%	43%	15%	27%	40%	31%	22%	42%	39%
butter nut	butter nut	1%	0%	1%	0.00	0.00	0%	0%	0%	0%	20%	80%	0%	100%	0%
buuyu		12%	12%	12%	0.01	0.01	93%	2%	4%	93%	2%	5%	93%	5%	3%
cabbage	cabbage	18%	13%	24%	0.03	0.14	14%	20%	11%	12%	7%	5%	5%	70%	25%
cabbage chinese	cabbage chinese	0%	0%	0%	0.00	0.00	0%	50%	50%	50%	50%	0%	100%	0%	0%
cabbage wild	cabbage wild	1%	2%	0%	0.00	0.00	75%	25%	0%	100%	0%	0%	100%	0%	0%
carrot	carrot	1%	1%	0%	0.00	0.00	0%	67%	33%	0%	50%	50%			
cashew nut	cashew nut	0%	0%	0%	0.00	0.00	0%	0%	0%	0%	0%	100%			
cassava	cassava	20%	17%	22%	0.03	0.04	30%	19%	16%	40%	15%	9%	77%	18%	5%
cattle melon		0%	0%	0%	0.00	0.00	0%	0%	0%	0%	0%	100%	0%	0%	100%
chakaka		2%	0%	4%	0.00	0.06	0%	0%	0%	0%	12%	6%	100%	0%	0%
chama		24%	13%	35%	0.12	0.41	2%	0%	16%	2%	1%	10%	6%	0%	94%

		Freelistings											Food Scarcity		
Food plant	English name	Total number (men + women)	Number of men	Number of women	Sutrop CSI men	Sutrop CSI wom-en	% of men that indicated traffic light:			% of women that indicated traffic light:			% of hh that indicated traffic light:		
							green	amber	red	green	amber	red	green	amber	red
chambulwe		6%	6%	6%	0.44	0.02	4%	0%	0%	46%	4%	0%			
chibwabwa		8%	7%	8%	0.06	0.04	23%	0%	3%	59%	5%	0%			
chikanda		2%	0%	4%	0.00	0.03	0%	0%	0%	18%	0%	0%			
chikunka		5%	6%	5%	0.01	0.00	76%	16%	8%	83%	13%	4%	90%	10%	0%
chikunkumwanza		4%	0%	7%	0.00	0.20	0%	0%	0%	0%	0%	6%			
chilli	chilli	1%	1%	1%	0.00	0.00	0%	100%	0%	33%	33%	33%	0%	100%	0%
chimowa		27%	7%	46%	0.11	1.21	0%	3%	10%	3%	2%	2%	0%	33%	33%
chimpama		1%	3%	0%	0.01	0.00	0%	0%	100%	0%	0%	0%	0%	0%	100%
chimumbu		1%	2%	1%	0.00	0.00	80%	10%	10%	67%	0%	33%	100%	0%	0%
chinandolyo		2%	3%	2%	0.00	0.00	75%	0%	17%	44%	22%	33%	67%	33%	0%
chinga chinga		15%	15%	14%	0.02	0.02	43%	10%	46%	23%	7%	70%	67%	33%	0%
chinunka													100%	0%	0%
chinvuma		0%	0%	0%	0.00	0.00	0%	0%	0%	100%	0%	0%			
chinyansa		0%	0%	0%	0.00	0.00	0%	0%	0%	100%	0%	0%			
chipama		3%	7%	0%	0.41	0.00	10%	0%	0%	0%	0%	0%			
chitilindilibbu		2%	0%	4%	0.00	0.01	0%	0%	0%	10%	20%	65%	0%	0%	100%
chitindi		0%	0%	0%	0.00	0.00	100%	0%	0%	0%	0%	0%			
chuwe		8%	0%	15%	0.00	0.71	0%	0%	0%	1%	0%	0%			
coconut	coconut	0%	0%	0%	0.00	0.00	100%	0%	0%	0%	100%	0%			
cowpea	cowpea	46%	32%	58%	0.11	0.27	18%	6%	24%	14%	5%	17%	21%	34%	45%
cucumber	cucumber	15%	13%	16%	0.10	0.14	2%	7%	7%	1%	0%	9%	0%	67%	33%
delele ya katate		4%	9%	0%	0.05	0.00	38%	3%	3%	0%	0%	0%			
eggplant	eggplant	6%	7%	6%	0.02	0.01	7%	7%	14%	14%	21%	14%	25%	50%	25%
finger millet	finger millet	10%	1%	18%	0.00	0.21	17%	17%	67%	0%	1%	7%			
fyowo		6%	7%	5%	0.10	0.02	16%	0%	0%	42%	0%	0%			
galamatongo		0%	0%	0%	0.00	0.00	0%	0%	100%	0%	0%	0%			
gourd	gourd	19%	18%	20%	0.05	0.08	3%	0%	27%	2%	2%	25%	75%	25%	0%

		Freelistings											Food Scarcity		
Food plant	English name	Total number (men + women)	Number of men	Number of women	Sutrop CSI men	Sutrop CSI wom-en	% of men that indicated traffic light:			% of women that indicated traffic light:			% of hh that indicated traffic light:		
							green	amber	red	green	amber	red	green	amber	red
granadilla	granadilla	0%	0%	0%	0.00	0.00	0%	0%	100%	0%	0%	0%			
green bean	green bean	1%	1%	0%	0.00	0.00	0%	50%	50%	100%	0%	0%	0%	100%	0%
green gram	green gram	0%	0%	0%	0.00	0.00	0%	0%	0%	0%	0%	100%			
green pepper	green pepper	1%	1%	0%	0.00	0.00	0%	100%	0%	0%	50%	50%	100%	0%	0%
groundnut	groundnut	31%	26%	35%	0.09	0.16	20%	8%	24%	20%	5%	18%	60%	8%	32%
guava	guava	21%	16%	26%	0.03	0.13	34%	3%	24%	18%	2%	6%	75%	25%	0%
hahipa		6%	13%	0%	0.52	0.00	4%	0%	0%	0%	0%	0%			
haluboola		0%	0%	0%	0.00	0.00	0%	0%	100%	0%	0%	0%			
hampogani		0%	0%	0%	0.00	0.00	0%	0%	100%	0%	0%	0%			
hatweembe		12%	4%	20%	0.19	0.33	0%	6%	0%	4%	5%	6%	0%	0%	100%
hitende													83%	17%	0%
imatwelane		9%	0%	17%	0.00	0.27	0%	0%	0%	4%	2%	4%	0%	100%	0%
imbula		4%	8%	0%	0.01	0.00	22%	11%	67%	0%	0%	0%	67%	0%	33%
impama		18%	18%	18%	0.02	0.02	43%	13%	44%	25%	16%	59%	50%	19%	31%
impoko		8%	0%	16%	0.00	0.61	0%	0%	0%	3%	1%	0%			
impwa		25%	18%	31%	0.04	0.12	28%	26%	8%	15%	13%	9%	29%	57%	14%
ingai		22%	16%	27%	0.04	0.09	34%	4%	23%	22%	6%	16%	60%	20%	20%
insolo													100%	0%	0%
kabuyubuyu		2%	0%	5%	0.00	0.01	0%	0%	0%	13%	22%	61%	0%	25%	75%
kadonkola mpoto		0%	0%	0%	0.00	0.00	100%	0%	0%	0%	0%	0%			
kafeya-feya		0%	0%	0%	0.00	0.00	0%	0%	0%	50%	0%	0%			
kakwanka		0%	0%	0%	0.00	0.00	0%	0%	0%	100%	0%	0%			
kalubabwanga		17%	0%	33%	0.00	2.14	0%	0%	0%	0%	1%	1%			
kalulalula		0%	0%	0%	0.00	0.00	0%	0%	0%	100%	0%	0%	100%	0%	0%
kalundika		3%	6%	0%	0.29	0.00	0%	4%	0%	0%	0%	0%			
kambolokonya		3%	6%	0%	0.20	0.00	0%	4%	0%	0%	0%	0%			
kambwali		1%	0%	2%	0.00	0.00	0%	0%	0%	67%	11%	0%			
kampuku		23%	11%	35%	0.06	0.25	9%	15%	9%	14%	7%	5%	50%	43%	7%

		Freelistings											Food Scarcity		
Food plant	English name	Total number (men + women)	Number of men	Number of women	Sutrop CSI men	Sutrop CSI women	% of men that indicated traffic light:			% of women that indicated traffic light:			% of hh that indicated traffic light:		
							green	amber	red	green	amber	red	green	amber	red
kamulya kamuse-ka		1%	0%	1%	0.00	0.00	0%	0%	0%	60%	20%	20%	100%	0%	0%
kamupubu		2%	0%	4%	0.00	0.05	0%	0%	0%	0%	0%	12%	0%	0%	100%
kanemanema		8%	0%	16%	0.00	0.99	0%	0%	0%	0%	1%	1%	0%	33%	67%
kanembe		7%	3%	11%	0.01	0.03	0%	25%	75%	2%	13%	83%	4%	4%	92%
kanombe		9%	0%	18%	0.00	0.68	0%	0%	0%	1%	0%	2%			
kanunkha		16%	14%	18%	0.03	0.03	53%	5%	0%	63%	20%	0%	97%	3%	0%
kanyense		2%	0%	4%	0.00	0.02	0%	0%	0%	22%	0%	0%			
kaomaoma		0%	0%	0%	0.00	0.00	0%	0%	100%	0%	0%	0%			
kapulanga		1%	0%	1%	0.00	0.00	0%	0%	0%	100%	0%	0%			
kasiili		5%	1%	8%	0.00	0.02	67%	33%	0%	64%	33%	0%	0%	100%	0%
katanda balume		0%	0%	0%	0.00	0.00	100%	0%	0%	0%	0%	0%			
katapa		7%	9%	5%	0.07	0.02	24%	5%	0%	46%	0%	0%			
kawii													100%	0%	0%
kayimbwi		8%	0%	16%	0.00	0.56	0%	0%	0%	0%	1%	1%			
kombwekombwe		0%	0%	0%	0.00	0.00	0%	0%	0%	0%	0%	50%			
kona													0%	0%	100%
lemon	lemon	18%	11%	24%	0.03	0.13	26%	0%	17%	10%	0%	8%			
lubanga	cleome	6%	5%	7%	0.01	0.01	100%	0%	0%	82%	15%	3%	95%	5%	0%
lumanda	roselle	21%	14%	26%	0.05	0.10	16%	13%	6%	21%	8%	2%	33%	67%	0%
lumya		0%	0%	1%	0.00	0.00	0%	0%	0%	50%	25%	0%			
lungu		15%	11%	18%	0.11	0.36	12%	12%	0%	7%	2%	1%	40%	50%	10%
lunkhomba		2%	0%	4%	0.00	0.01	0%	0%	0%	6%	82%	6%	0%	0%	100%
lupoko		0%	0%	0%	0.00	0.00	0%	0%	0%	0%	0%	100%			
lusala		17%	13%	22%	0.67	0.19	0%	0%	4%	19%	6%	3%	71%	14%	14%
luyuni		24%	13%	34%	0.13	0.31	5%	19%	9%	5%	12%	5%	13%	46%	42%
lwiidi		21%	12%	29%	0.05	0.21	4%	15%	29%	9%	9%	10%	13%	63%	25%
maabo		3%	2%	4%	0.00	0.01	0%	27%	73%	16%	0%	26%			
mabungo		7%	9%	6%	0.01	0.01	76%	18%	5%	47%	40%	13%	60%	40%	0%

		Freelistings											Food Scarcity		
Food plant	English name	Total number (men + women)	Number of men	Number of women	Sutrop CSI men	Sutrop CSI wom-en	% of men that indicated traffic light:			% of women that indicated traffic light:			% of hh that indicated traffic light:		
							green	amber	red	green	amber	red	green	amber	red
mabuyu		37%	48%	28%	0.09	0.05	40%	29%	18%	35%	24%	31%	50%	42%	11%
madinkolo		13%	13%	14%	1.01	0.30	0%	0%	2%	0%	3%	6%	0%	0%	100%
madodo		0%	0%	0%	0.00	0.00	0%	0%	0%	0%	100%	0%			
mafu		0%	0%	0%	0.00	0.00	0%	0%	0%	0%	0%	100%			
mafwufwe		3%	5%	1%	0.02	0.00	0%	9%	87%	17%	17%	50%	0%	22%	78%
magabo		1%	1%	0%	0.00	0.00	60%	0%	40%	0%	0%	100%			
magunduwa		1%	0%	2%	0.00	0.00	0%	0%	0%	10%	60%	20%			
magwilidi		0%	0%	0%	0.00	0.00	100%	0%	0%	0%	0%	0%			
mahabe													0%	100%	0%
mahaha		0%	0%	0%	0.00	0.00	0%	0%	100%	0%	0%	0%			
maheu													0%	100%	0%
mahumu		1%	1%	1%	0.00	0.00	80%	0%	20%	0%	33%	67%	100%	0%	0%
mahutwe		0%	0%	0%	0.00	0.00	0%	0%	0%	100%	0%	0%			
maize	maize	48%	52%	45%	0.31	0.27	19%	5%	30%	29%	2%	32%	27%	6%	67%
makole		2%	0%	4%	0.00	0.03	50%	0%	50%	17%	6%	0%	0%	100%	0%
makowa	local cu-cumber	29%	24%	34%	0.11	0.22	10%	9%	17%	11%	12%	7%	59%	24%	18%
makuli													0%	0%	100%
makunka		7%	11%	4%	0.03	0.01	8%	50%	40%	26%	26%	42%	23%	41%	41%
malamba		14%	18%	11%	0.11	0.04	8%	15%	8%	9%	25%	15%	0%	80%	20%
malamba lamba		7%	6%	7%	0.01	0.01	62%	4%	35%	43%	11%	46%	91%	9%	0%
malbery		3%	3%	3%	0.00	0.00	29%	0%	71%	31%	19%	50%	0%	100%	0%
malolo		4%	5%	3%	0.01	0.00	80%	5%	15%	81%	13%	6%	100%	0%	0%
malubeni		5%	6%	3%	0.44	0.09	4%	0%	0%	7%	0%	0%			
mamfwumo		0%	0%	0%	0.00	0.00	0%	0%	100%	0%	0%	0%			
manchebele		6%	7%	5%	0.09	0.02	15%	0%	0%	32%	0%	5%	0%	100%	0%
mango		47%	56%	38%	0.19	0.10	39%	11%	2%	42%	4%	3%	91%	9%	1%
mang'omba		22%	14%	29%	0.02	0.06	80%	9%	11%	47%	6%	3%	74%	19%	7%
mang'ombyo		1%	2%	0%	0.01	0.00	36%	45%	18%	0%	0%	0%	0%	100%	0%

		Freelistings											Food Scarcity		
Food plant	English name	Total number (men + women)	Number of men	Number of women	Sutrop CSI men	Sutrop CSI women	% of men that indicated traffic light:			% of women that indicated traffic light:			% of hh that indicated traffic light:		
							green	amber	red	green	amber	red	green	amber	red
mang'ongo		12%	11%	12%	0.01	0.01	80%	8%	12%	72%	18%	11%	91%	9%	0%
mangwiliti		0%	0%	0%	0.00	0.00	0%	0%	0%	0%	0%	100%			
mankande		7%	8%	6%	0.08	0.03	19%	3%	3%	43%	7%	0%	0%	100%	0%
mankomona		0%	0%	0%	0.00	0.00	0%	0%	100%	0%	0%	0%			
mankondolo													0%	0%	100%
mansangwa		0%	0%	0%	0.00	0.00	0%	0%	100%	0%	0%	0%			
mantamba		0%	0%	1%	0.00	0.00	0%	0%	0%	0%	50%	50%			
mantambwati		5%	7%	3%	0.16	0.05	10%	0%	0%	7%	0%	0%			
manteme		0%	0%	1%	0.00	0.00	0%	0%	0%	25%	25%	50%			
mao		5%	7%	3%	0.11	0.09	0%	3%	3%	0%	7%	0%			
mapandu													0%	0%	100%
mapila		19%	20%	17%	0.13	0.08	11%	18%	12%	18%	23%	8%	0%	100%	0%
maponde		8%	10%	6%	0.07	0.04	30%	2%	5%	47%	3%	3%	67%	0%	33%
mapopo		6%	13%	0%	0.24	0.00	5%	2%	0%	0%	0%	0%			
masanze		1%	0%	2%	0.00	0.00	0%	0%	0%	33%	42%	17%			
masau		17%	21%	13%	0.08	0.05	27%	38%	6%	36%	17%	9%	34%	32%	34%
masenga		0%	0%	0%	0.00	0.00	50%	0%	50%	0%	0%	0%			
mashabeshabe		0%	0%	1%	0.00	0.00	0%	0%	0%	67%	0%	33%			
mashimbilili		2%	4%	0%	0.00	0.00	17%	6%	78%	0%	0%	0%			
masuku		27%	29%	25%	0.26	0.12	10%	8%	2%	20%	13%	2%	61%	22%	17%
masumu		5%	0%	10%	0.00	0.16	0%	0%	0%	4%	0%	2%	50%	50%	0%
matako		2%	2%	2%	0.00	0.00	44%	11%	44%	42%	17%	42%	100%	0%	0%
mataletale		5%	6%	3%	0.88	0.08	4%	0%	0%	6%	6%	0%			
matamba		0%	0%	0%	0.00	0.00	0%	0%	100%	0%	0%	0%			
mateme		4%	6%	3%	0.01	0.01	28%	44%	28%	38%	31%	25%	13%	38%	50%
matobo		30%	32%	27%	0.13	0.07	14%	4%	18%	10%	8%	29%	43%	43%	14%
matondo		9%	13%	5%	0.07	0.01	26%	17%	5%	45%	27%	23%	33%	50%	17%
matwii a sulwe		3%	4%	3%	0.00	0.00	78%	11%	11%	92%	8%	0%	67%	33%	0%
mawii		9%	13%	5%	0.03	0.00	8%	2%	42%	27%	0%	73%	33%	0%	67%
mbubu		9%	11%	7%	0.04	0.02	54%	38%	8%	50%	28%	19%	15%	62%	31%

		Freelistings											Food Scarcity		
Food plant	English name	Total number (men + women)	Number of men	Number of women	Sutrop CSI men	Sutrop CSI wom-en	% of men that indicated traffic light:			% of women that indicated traffic light:			% of hh that indicated traffic light:		
							green	amber	red	green	amber	red	green	amber	red
mbula		28%	29%	27%	0.58	0.10	5%	1%	7%	5%	2%	27%	10%	10%	80%
mbulukutu		8%	9%	7%	0.05	0.02	25%	8%	0%	31%	25%	0%			
mbwabwa													0%	100%	0%
menso a pongo		3%	4%	3%	0.00	0.00	89%	6%	6%	100%	0%	0%			
mfulimununga		2%	3%	2%	0.01	0.00	38%	23%	38%	50%	13%	25%			
millet		2%	5%	0%	1.09	0.00	0%	5%	0%	0%	0%	0%			
minyombela		5%	7%	4%	0.15	0.04	7%	0%	0%	24%	5%	5%			
misale		15%	8%	22%	0.10	0.21	18%	3%	0%	14%	0%	1%	0%	0%	100%
moringa		1%	2%	1%	0.00	0.00	100%	0%	0%	50%	25%	25%	0%	100%	0%
mpama		3%	0%	5%	0.00	0.03	0%	0%	0%	29%	4%	8%	60%	40%	0%
mphonda		3%	7%	0%	0.14	0.00	10%	0%	0%	0%	0%	0%			
mpoko		2%	0%	4%	0.00	0.01	0%	0%	0%	6%	22%	67%	0%	25%	75%
mpumpule		1%	0%	1%	0.00	0.00	100%	0%	0%	100%	0%	0%	100%	0%	0%
mpundu		2%	1%	2%	0.00	0.00	33%	0%	67%	33%	17%	50%	0%	100%	0%
mpunga		2%	0%	4%	0.00	0.01	0%	0%	0%	0%	5%	89%	0%	0%	100%
mubele		17%	20%	15%	0.27	0.09	14%	13%	5%	31%	15%	3%	29%	43%	21%
muchenjwa													0%	0%	100%
muchingachinga		7%	9%	6%	0.04	0.03	28%	8%	5%	21%	24%	3%	33%	33%	33%
mufungu													0%	100%	0%
mugunduwa		1%	1%	0%	0.00	0.00	17%	0%	83%	0%	0%	0%			
mukambo		0%	0%	1%	0.00	0.00	0%	0%	0%	0%	67%	0%			
mukasibuku		4%	3%	5%	0.00	0.00	100%	0%	0%	100%	0%	0%	100%	0%	0%
mulberry		0%	0%	0%	0.00	0.00	0%	0%	0%	100%	0%	0%			
mulolo		5%	0%	9%	0.00	0.06	0%	0%	0%	31%	2%	0%	50%	25%	25%
mulungu		2%	0%	4%	0.00	0.17	0%	0%	0%	6%	0%	0%			
mulya bembela		1%	1%	0%	0.00	0.00	100%	0%	0%	100%	0%	0%			
mumbole													100%	0%	0%
mumbu		7%	11%	4%	0.07	0.01	6%	2%	8%	14%	5%	14%	0%	33%	67%
mundambi		4%	5%	4%	0.01	0.00	13%	13%	13%	53%	41%	6%	0%	100%	0%

		Freelistings											Food Scarcity		
Food plant	English name	Total number (men + women)	Number of men	Number of women	Sutrop CSI men	Sutrop CSI wom-en	% of men that indicated traffic light:			% of women that indicated traffic light:			% of hh that indicated traffic light:		
							green	amber	red	green	amber	red	green	amber	red
mundyoli		1%	0%	1%	0.00	0.00	0%	0%	0%	20%	0%	60%			
munemena		4%	2%	6%	0.00	0.01	100%	0%	0%	96%	4%	0%	94%	6%	0%
mung bean	mung bean	1%	0%	2%	0.00	0.00	0%	0%	100%	0%	8%	92%	100%	0%	0%
mungo		0%	0%	0%	0.00	0.00	100%	0%	0%	0%	0%	0%			
munkoyo		0%	0%	0%	0.00	0.00	0%	0%	0%	100%	0%	0%			
munthopo		2%	0%	4%	0.00	0.05	0%	0%	0%	18%	0%	0%			
muntili		16%	12%	20%	0.03	0.06	33%	4%	0%	36%	5%	5%	94%	6%	0%
munyama waluba		1%	0%	1%	0.00	0.00	0%	0%	0%	100%	0%	0%	100%	0%	0%
munyonyo		0%	0%	0%	0.00	0.00	50%	50%	0%	50%	50%	0%			
mupama													0%	67%	33%
mupepu		9%	10%	7%	0.06	0.03	11%	24%	4%	6%	37%	17%	0%	100%	0%
musangusangu													0%	0%	100%
musekese		2%	1%	3%	0.00	0.00	0%	0%	100%	14%	0%	86%	50%	0%	50%
mushimbilili		2%	0%	3%	0.00	0.00	0%	0%	0%	21%	0%	79%			
musinyika		5%	7%	3%	0.07	0.05	7%	0%	0%	7%	0%	0%	0%	0%	100%
mutezi		7%	5%	9%	0.09	0.16	4%	4%	0%	7%	4%	2%			
mutoya		0%	0%	0%	0.00	0.00	50%	0%	50%	0%	0%	0%			
muumbu													100%	0%	0%
muunga													0%	100%	0%
nabuya		4%	0%	7%	0.00	0.02	0%	0%	0%	0%	6%	91%	0%	8%	92%
nakalembwe		9%	0%	17%	0.00	6.76	0%	0%	0%	0%	1%	0%	0%	100%	0%
namaywa		0%	0%	0%	0.00	0.00	0%	0%	0%	100%	0%	0%	100%	0%	0%
namusabala		2%	0%	3%	0.00	0.09	0%	0%	0%	0%	0%	6%			
nchenje		20%	23%	18%	0.05	0.03	16%	16%	33%	24%	13%	38%	26%	30%	48%
nchoomvwa		4%	5%	3%	0.01	0.01	30%	48%	17%	62%	8%	15%	0%	50%	50%
ndiya		15%	13%	18%	0.20	0.22	4%	4%	2%	0%	0%	8%	0%	0%	100%
ndubani		0%	0%	0%	0.00	0.00	0%	0%	0%	0%	0%	0%			
ndulwe		10%	0%	18%	0.00	0.44	0%	0%	0%	1%	1%	3%			
ndundi		2%	0%	5%	0.00	0.11	0%	0%	0%	0%	9%	0%			

		Freelistings											Food Scarcity		
Food plant	English name	Total number (men + women)	Number of men	Number of women	Sutrop CSI men	Sutrop CSI wom-en	% of men that indicated traffic light:			% of women that indicated traffic light:			% of hh that indicated traffic light:		
							green	amber	red	green	amber	red	green	amber	red
ndyabavwimi		9%	8%	9%	0.15	2.18	3%	0%	6%	0%	2%	0%			
ndyanondo		0%	0%	1%	0.00	0.00	0%	0%	0%	25%	0%	50%			
nengo		3%	7%	0%	0.09	0.00	10%	0%	0%	0%	0%	0%			
ngoongwa		1%	0%	2%	0.00	0.00	0%	0%	0%	13%	50%	25%	0%	50%	50%
njenjwa		3%	6%	0%	0.88	0.00	0%	0%	4%	0%	0%	0%			
nji		2%	2%	1%	0.00	0.00	40%	0%	60%	25%	0%	75%	0%	100%	0%
njiiyi		5%	7%	4%	0.02	0.01	42%	48%	10%	60%	25%	10%	70%	20%	10%
nkholokolo		4%	8%	0%	0.10	0.00	18%	3%	0%	0%	0%	0%			
nkhomwa		3%	6%	0%	1.77	0.00	4%	0%	0%	0%	0%	0%			
nkolondo		14%	6%	22%	0.01	0.07	16%	8%	76%	7%	2%	25%	100%	0%	0%
nkomba		1%	1%	0%	0.00	0.00	20%	80%	0%	0%	0%	0%			
nkononga		0%	1%	0%	0.00	0.00	33%	33%	33%	0%	0%	0%			
nkunyunkunyu		6%	9%	4%	0.02	0.01	29%	47%	24%	15%	40%	40%	18%	47%	35%
nkuyu		7%	8%	7%	0.02	0.01	29%	17%	20%	55%	15%	27%	50%	50%	0%
nonenge		0%	0%	0%	0.00	0.00	0%	0%	100%	0%	0%	0%			
nseza		0%	0%	0%	0.00	0.00	0%	0%	0%	0%	0%	100%			
nshama		2%	0%	3%	0.00	0.05	0%	0%	0%	6%	6%	0%			
nshima													0%	11%	89%
nsikili		2%	2%	2%	0.00	0.00	14%	86%	0%	33%	33%	22%	0%	100%	0%
nsiku		1%	1%	1%	0.00	0.01	0%	75%	25%	0%	17%	67%	0%	100%	0%
nsoboyo		2%	0%	4%	0.00	0.01	0%	0%	0%	5%	68%	21%	0%	20%	80%
nsole		15%	16%	14%	0.02	0.02	60%	15%	25%	44%	19%	37%	85%	15%	0%
nsombo		5%	4%	7%	0.00	0.01	65%	24%	12%	48%	6%	3%	50%	50%	0%
ntaalala		1%	1%	0%	0.00	0.00	60%	40%	0%	0%	0%	0%	0%	0%	100%
ntikeshile		0%	0%	0%	0.00	0.00	100%	0%	0%	0%	0%	0%			
nundu		2%	0%	4%	0.00	0.03	0%	0%	0%	10%	10%	5%	0%	100%	0%
nyabavwimi		2%	0%	3%	0.00	#DIV/0!	0%	0%	0%	0%	0%	0%			
nyakasongo		3%	6%	0%	0.35	0.00	0%	0%	4%	0%	0%	0%			
nyamundolo		7%	10%	5%	0.04	0.02	33%	5%	0%	28%	12%	4%			
nyanganya		0%	0%	0%	0.00	0.00	0%	0%	0%	100%	0%	0%			

		Freelistings											Food Scarcity		
Food plant	English name	Total number (men + women)	Number of men	Number of women	Sutrop CSI men	Sutrop CSI wom-en	% of men that indicated traffic light:			% of women that indicated traffic light:			% of hh that indicated traffic light:		
							green	amber	red	green	amber	red	green	amber	red
nyengo		2%	0%	4%	0.00	0.04	0%	0%	0%	17%	6%	0%			
okra	okra	27%	17%	36%	0.04	0.11	26%	28%	9%	34%	10%	11%	37%	46%	17%
okra wild	okra wild	8%	5%	11%	0.00	0.02	64%	23%	14%	34%	21%	17%	73%	20%	7%
omoma		0%	0%	0%	0.00	0.00	0%	0%	0%	100%	0%	0%			
onion	onion	6%	11%	1%	0.03	0.00	19%	15%	4%	0%	29%	71%	17%	83%	0%
orange	orange	20%	12%	27%	0.03	0.12	41%	0%	17%	18%	1%	9%	100%	0%	0%
pa banda		0%	0%	0%	0.00	0.00	100%	0%	0%	0%	0%	0%			
papaya	papaya	9%	11%	7%	0.06	0.02	30%	9%	2%	53%	0%	3%			
paprika	paprika	1%	1%	0%	0.00	0.00	0%	50%	50%	0%	0%	100%			
paw paw	papaya	13%	5%	21%	0.00	0.11	55%	10%	35%	7%	7%	5%	29%	29%	43%
peach	peach	0%	0%	0%	0.00	0.00	0%	0%	100%	0%	0%	0%			
pearl millet	pearl millet	2%	0%	3%	0.00	0.00	0%	100%	0%	0%	0%	100%	0%	100%	0%
peas	peas												100%	0%	0%
pigeon pea	pigeon pea	1%	0%	1%	0.00	0.00	0%	0%	100%	0%	0%	100%			
porrige	porrige												0%	0%	100%
potato	potato	28%	20%	35%	0.26	0.74	7%	1%	2%	4%	1%	1%	50%	0%	50%
pumpkin	pumpkin	45%	37%	52%	0.15	0.27	8%	9%	17%	11%	7%	11%	26%	52%	23%
rape	rape	36%	42%	30%	0.19	0.13	14%	15%	5%	33%	10%	4%	20%	60%	20%
relish													0%	25%	75%
shamusozye		0%	0%	0%	0.00	0.00	0%	0%	0%	100%	0%	0%			
shungwa		3%	0%	6%	0.00	0.01	50%	50%	0%	38%	48%	10%	22%	44%	44%
shunkilo		0%	0%	1%	0.00	0.00	0%	0%	0%	25%	25%	25%			
shunku		2%	0%	5%	0.00	0.03	0%	0%	0%	0%	17%	17%	0%	67%	33%
sialundu		0%	0%	1%	0.00	0.00	0%	0%	0%	50%	25%	0%			
siashipa		2%	0%	4%	0.00	0.03	0%	0%	0%	5%	16%	0%			
sombo													0%	0%	100%
sorghum	sorghum	11%	2%	19%	0.00	0.11	0%	9%	91%	5%	3%	16%	33%	33%	33%
soybean	soybean	15%	19%	11%	0.06	0.03	5%	2%	41%	7%	2%	65%	11%	11%	78%
sozwe		8%	5%	11%	0.02	0.04	5%	9%	86%	2%	2%	94%	0%	6%	94%

		Freelistings											Food Scarcity		
Food plant	English name	Total number (men + women)	Number of men	Number of women	Sutrop CSI men	Sutrop CSI women	% of men that indicated traffic light:			% of women that indicated traffic light:			% of hh that indicated traffic light:		
							green	amber	red	green	amber	red	green	amber	red
spinach	spinach	0%	0%	0%	0.00	0.00	0%	100%	0%	0%	100%	0%	0%	0%	100%
sugarcane	sugarcane	11%	15%	7%	0.23	0.04	11%	0%	0%	27%	3%	12%	100%	0%	0%
sunflower	sunflower	20%	13%	26%	0.05	0.18	7%	3%	39%	5%	2%	21%			
suntha		5%	5%	5%	0.10	0.03	8%	0%	0%	42%	0%	0%			
suumu		2%	4%	0%	0.04	0.00	6%	6%	6%	0%	0%	0%			
sweet berry	sweet berry	6%	13%	0%	0.35	0.00	5%	0%	2%	0%	0%	0%			
sweet cane	sweet cane	3%	2%	4%	0.00	0.00	0%	0%	100%	0%	0%	100%			
sweet potato	sweet potato	37%	32%	42%	0.07	0.12	37%	7%	14%	32%	10%	12%	54%	38%	8%
sweet potato wild	sweet potato wild	11%	12%	11%	0.01	0.01	94%	0%	4%	91%	4%	6%	92%	7%	2%
tanta chuulu		9%	7%	11%	0.00	0.17	0%	0%	0%	8%	0%	4%			
tembulusunka		1%	0%	1%	0.00	0.00	0%	0%	0%	17%	67%	0%			
tindingoma		7%	7%	6%	0.02	0.02	27%	0%	0%	48%	3%	3%	87%	13%	0%
tomato	tomato	23%	25%	21%	0.09	0.10	13%	17%	5%	11%	6%	6%	9%	82%	9%
tumbulwa		35%	37%	33%	0.13	0.10	37%	9%	8%	23%	9%	17%	59%	18%	24%
tunguza		6%	8%	4%	0.05	0.02	9%	3%	11%	25%	5%	0%	100%	0%	0%
tungwa		2%	0%	3%	0.00	0.04	0%	0%	0%	13%	7%	0%			
tute													33%	67%	0%
twembe													0%	0%	100%
usala		5%	5%	5%	0.15	0.06	10%	10%	0%	18%	9%	9%	60%	20%	20%
ushika		8%	10%	6%	0.10	0.04	28%	7%	7%	34%	7%	10%	50%	50%	0%
vegetables													33%	67%	0%
vibimbi		5%	7%	4%	0.07	0.05	18%	0%	0%	18%	0%	0%			
vimbwale		3%	7%	0%	0.32	0.00	3%	3%	0%	0%	0%	0%			
vipama													0%	100%	0%
visese		6%	8%	4%	0.05	0.02	21%	0%	0%	33%	0%	0%			
viyowo		3%	7%	0%	0.21	0.00	9%	6%	0%	0%	0%	0%			
wakaka		8%	8%	8%	0.07	0.07	23%	0%	0%	28%	3%	0%			

		Freelistings											Food Scarcity		
Food plant	English name	Total number (men + women)	Number of men	Number of women	Sutrop CSI men	Sutrop CSI wom-en	% of men that indicated traffic light:			% of women that indicated traffic light:			% of hh that indicated traffic light:		
							green	amber	red	green	amber	red	green	amber	red
watermelon	watermel-on	8%	3%	12%	0.00	0.06	14%	21%	64%	5%	7%	16%	0%	0%	100%
wengo		2%	0%	3%	0.00	0.05	0%	0%	0%	6%	6%	0%			
yam	yam	0%	0%	0%	0.00	0.00	0%	100%	0%	0%	0%	100%	25%	75%	0%

**The table presents the results of the 'free listing' module, and the 'plants in food scarcity' module of the baseline analysis; In total, 444 men and 485 women out of 634 participating households, responded to the 'free listing' module and listed 111 (men) and 128 (women) species; Regarding the 'plants in food scarcity' module, out of the 634 households, 59 were missing and 575 did actually participate and listed a total of 188 species; Sutrop CSI reflects the knowledge of a specific plant (the higher the CSI, the higher the knowledge of the specific plant); Color visualization: Green= used in affluent period, Amber= used in moderate food scarcity period, Red= used during severe food scarcity period.*