CGIAR

INITIATIVE ON
Diversification in East and Southern Africa

UKAMA USTAWI

BASELINE SURVEY REPORT FOR ZAMBIA

Maize harvesting in Zambia
Photo credit: David Brazier/IWMI

WorldFish

CIMMYT

IFPRI INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

ILRI INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

IITA Transforming African Agriculture

UKAMA USTAWI:

Diversification for Resilient Agribusiness Ecosystems in East and Southern Africa (ESA

2022 Baseline Survey Report for Zambia

February 2023

Report by Simon Kimenju, Philip Kamau and Rahma Adam

TABLE OF CONTENTS

List of Tables

List of Figures

Acronyms and abbreviations

CAPI	Computer-Assisted Personal Interviewing
CASU	Conservation Agriculture Scaling-up Project
CGIAR	Consultative Group on International Agricultural Research
COMACO	Community Market for Conservation
CSA	Climate Smart Agriculture
CFU	Conservation Farming Unit
ERES	Excellence Research Ethics & Science
FISP	Farmer Input Support Program
FRA	Food Reserve Agency
HDDS	Household Dietary Diversity Score
ISFM	Integrated Soil Fertility Management
MOA	Ministry of Agriculture
OFSP	Orange Fleshed Sweet Potato
RIF	Rural Investment Fund
SIP	Sustainable Intensification Practice
SME	Small and medium-sized enterprises
TIMP	Technology, Innovation, And Management Practice
UU	Ukama Ustawi
ZNFU	Zambia National Farmers Union

EXECUTIVE SUMMARY

Ukama Ustawi (UU) aims to support climate-resilient agricultural livelihoods and agribusiness systems in 12 countries in East and Southern Africa, by helping millions of smallholder farmers to transition from maize-mixed systems to sustainably intensified, diversified, and de-risked agri-food systems with a strong maize base, through improved extension services, enterprise development, and private investment. As part of the impact assessment, baseline surveys are to be undertaken in 3 of the four phase one countries (Kenya, Zambia, Zimbabwe) in the first year of implementation.

A baseline survey for Zambia was undertaken November 2022. A total of 705 households were interviewed in this survey from 7th to 19th November, in 8 camps within 5 districts in Southern and Eastern provinces. These sites are earmarked for intervention by the UU initiative. The questionnaire focused on the October 2021-May 2022 rainy season targeting 5 main crops. The baseline report summarizes the main descriptive findings of the analysis of this baseline data. The study was led by WorldFish, and it was done in partnership with Kula Vyema Center of Food Economics and BrandComm Ltd Zambia.

Results show that the average age of the household head is 48 years, and that these heads are mostly male (73%). Most of them have either primary school as highest level of formal schooling completed (48%), or secondary school (41%).

Parcels of land accessed by these households in the reference period were mainly customarily owned (77%), with half (49%) of the non-rented parcels being owned by the head individually. Slightly over a third (36%) of the parcels are jointly owned by the head and spouse. Out of all parcels access, 78% were cultivated, with the most common method of land tillage being ploughing (45%), followed by land hoeing (24%) and ripping (7%).

Maize is the most cultivated crop, being grown in 37% of cultivated plots, followed by groundnuts (20%) and sunflower (18%). Other major crops are soyabean and cowpeas. Seed used in maize production is mainly certified seed (79% of all maize plots), while for groundnuts and sunflower, the largest seed type was recycled, used in 50% and 54% plots respectively. Cowpea seed is more of a balanced mix between certified (39%) and recycled (36%). Seed rates was highest for groundnuts and soyabeans at 37 kg/ha, and 21 kg/ha and 12 kg/ha respectively for maize and sunflower. Fertilizers, herbicides, and insecticides/pesticides were used on 37%, 11%, 9% of cultivated plots respectively. Most common fertilizer is inorganic, used on 88% of all fertilized plots, with usage averaging 177 kg/ha. Mechanization is very low among the surveyed households, at only in 3.2% in land preparation, and almost non-existent for subsequent cropping activities.

The most popular sustainable intensification practice (SIP) is maize-groundnut rotation, practiced by 50% of the farmers. This is followed by direct seeding (29%), maize-soybean rotation (22%) and maize-cowpea rotation (9%). On the other hand, the most popular NRM TIMP is conservation agriculture, being implemented by 53% of the households during that season. The most popular CSA practice that households ever practiced was leaving crop residues in the field (58%) followed by applying animal manure (32%), minimum tillage (26%) and rotating cereals

with legumes (24%). Field days (28%), demonstration plots (26%), informal conversations (24%) and meetings (23%) are the most popular sources of learning about various CSA practices. These are also considered the most important sources or organizers of various CSA practices.

Only 38% of households received or accessed advisory/extension on SI/CSA technologies in the last 1 year, with almost half (48%) indicating that there are advisory/extension services they desired but they were not getting/accessing. Most important purposes for the various accessed extension services were crop production practices (58%) followed by weather/rainfall forecast (41%) and pest and disease monitoring (31%). Main source of extension is government extension agents (73%), which is also viewed by households as the most important source. Other mentioned sources include field days (16%) and radio programs (11%). Field days (34%) and demonstrations (32%) are the main channels through which the extension services were delivered. Mobile phones and internet were rarely used as sources. Indeed, only 25% of the households owned a smart phone, and only 7% of households indicated having a member trained on digital technology. The highest number of households (34%) received extension advise on monthly basis.

The most common type of group that households have been a part of was registered farmers' cooperative society, with 66% of the households indicating that they have been a member. Savings and credit, and input access/marketing were the most important functions of social groups that households belonged to, being mentioned 30% and 27% of the times respectively. These groups are viewed as very important sources of information on agricultural technologies (65%), and farmers trust the information they get from them (79%). On access to credit, majority of households (87%) did not take a loan for agricultural production purposes from any source within the last 1 year. Only 12% took agricultural loan, mostly from informal sources.

Male heads were the majority main decision makers in almost all activities: use of farm plots (64%), management of cultivated crops (58%), sale of crops (61%) and use of income from sales (60%). Male household heads are also the major main decision makers for most of the activities regarding the 5 major crops (such as seed selection, pest control, harvesting), making more than 50% of all decisions for all activities apart from cooking, where female heads were the main decision makers (66%). Female head also have substantial contribution in decision making in sorting (42%), weeding (39%), storing (38%), among others.

Household dietary diversity score (HDDS) is a proxy measure of household food access, calculated by summing all of the 12 food groups consumed by a household in the preceding 24 hours. While a large number of households consumed cereals and oils/fats (99% and 65% respectively), all other food groups (such as meats, pulses, fruits and roots and tubers) were consumed by less than 30% of the households. The average HDDS is 4.33, which is below the mid-point (6), indicating low food access for the surveyed households. Indeed the highest proportion of households have either low or medium HDDS (41% and 45% respectively), with only 14% of the households having high HDDS. Additionally, only 17% and 7% of the sampled households farmed OFSP and high Iron/Zinc beans respectively

The report concludes with the observation that there is much room for improving inputs use, crop productivity, adoption of SIPs and CSA practices, adoption of mechanization, extension access, female participation in decision making, credit access, and household nutrition.

1. BACKGROUND

1.1. Ukama Ustawi initiative

This baseline report for Zambia is for the One (1) Consultative Group on International Agricultural Research (CGIAR) initiative "Ukama Ustawi: Diversification for Resilient Agribusiness Ecosystems in East and Southern Africa". Ukama Ustawi (UU) aims to support climate-resilient agricultural livelihoods and agribusiness systems in 12 countries in East and Southern Africa, by helping millions of smallholder farmers to transition from maize-mixed systems to sustainably intensified, diversified, and de-risked agri-food systems with a strong maize base, through improved extension services, enterprise development, and private investment. The outcomes of the initiative by the year 2024 are:

I. 50,000 farmers, value chain actors, and consumers (40% women, 40% youth) in maize-mixed systems are using climate smart intensification and diversification practices with improved water and land management.

II. 1 million farmers and other value chain actors (40% women, 40% youth) are accessing bundled digital agro-advisory and agricultural risk management (ARM) products and services that support their response to climate risks and manage land and water systems more sustainable for climate resilience.

III. At least 50 start-ups and small and medium-sized enterprises (SMEs)—40% run by women and 40% by youth—will have scaled climate-smart solutions supporting diversification and intensification of maize systems through at least USD 5 million of new finance

IV. 20,000 hectares under improved and sustainable management from USD100 million of investments enabled by 4 strategies/policies and ex-ante analysis which supports collaborative governance and management of multifunctional landscapes.

Four countries - Kenya, Ethiopia, Zambia, Zimbabwe - are earmarked for implementation in the period 2022-2024 (Phase 1).

1.2. Purpose of the baseline report

As part of the impact assessment, baseline surveys are to be undertaken in 3 of the four phase one countries (Kenya, Zambia, Zimbabwe) in the first year of implementation. A baseline survey for Zambia was undertaken in November 2022. This baseline report is based on the analysis of data collected in that survey. The report gives a picture of current farming systems practiced by surveyed farmers in Zambia, as well as the status of various other indicators that are of interest to UU initiative. The report can form a benchmark against which to base efforts and investments aimed at transitioning farmers from maize-mixed systems to sustainably intensified, diversified, and de-risked strong maize-based agri-food systems. It could also help the initiative in setting and modifying indicator targets in the results framework. As such, the report can form a crucial yardstick in both monitoring & evaluation, as well as impact assessment.

2. METHODOLOGY

Three main activities were undertaken preceding the development of this report. These are: development of the baseline questionnaire, data collection, and data management & analysis. Two consultants were engaged in 2022 for these activities: Simon Kimenju, who developed the baseline questionnaire and undertook data analysis; and Brandcomm Ltd, who undertook the data collection. The two consultants reported to Dr. Rahma Adam.

2.1. Questionnaire development

Questionnaire development followed a participatory approach, where the consultant first shared an outline and incorporated comments from some UU team members. Once the outline was agreed upon, the consultant developed a draft questionnaire, and later the final version (Appendix 1) after incorporating feedback from the UU team. The questionnaire was intended to be a household-level questionnaire focusing on the October 2021-May 2022 rainy season.

2.2. Primary data collection

Bandcomm Ltd undertook several activities in preparation for primary data collection. These included CAPI programming of the questionnaire; ethical review application; sample size calculation; site selection and sampling; recruitment and training of enumerators; and piloting of the questionnaire. The process and outcome of these activities, as well as data collection, are described below.

2.2.1. Preparatory activities

2.2.1.1. CAPI programming

Data were collected electronically using computer-assisted personal interviewing (CAPI). Upon receiving the final questionnaire, Brandcomm Ltd developed a script within SurveyCTO platform for this purpose.

2.2.1.2. Ethical review application

Ethical approval was sought from ERES Converge, an ethical board based in Zambia. The submission included the English questionnaire and consent forms, as well as those translated to Tongan and Nyanja languages.

2.2.1.3. Site selection and sampling

Discussions with UU team informed on the sites for the survey. These were to be the eight sites (camps) where the UU project planned to have interventions. The project interventions were targeting men and women eighteen (18) years and above, within farming communities, and practicing smallholder farming. The eight sites, within 5 districts in Southern and Eastern provinces, are shown in Table 2.1.

Table 2. 1 Selected sites for the baseline survey

Province	District	Camp
Southern	Mazabuka	Mbiya
Southern	Mazabuka	Ngwezi B
Southern	Monze	Malende
Southern	Monze	Chisuyo
Eastern	Sinda	Chafulu
Eastern	Chipata	Chanje
Eastern	Lundazi	Vuu
Eastern	Lundazi	Mapara

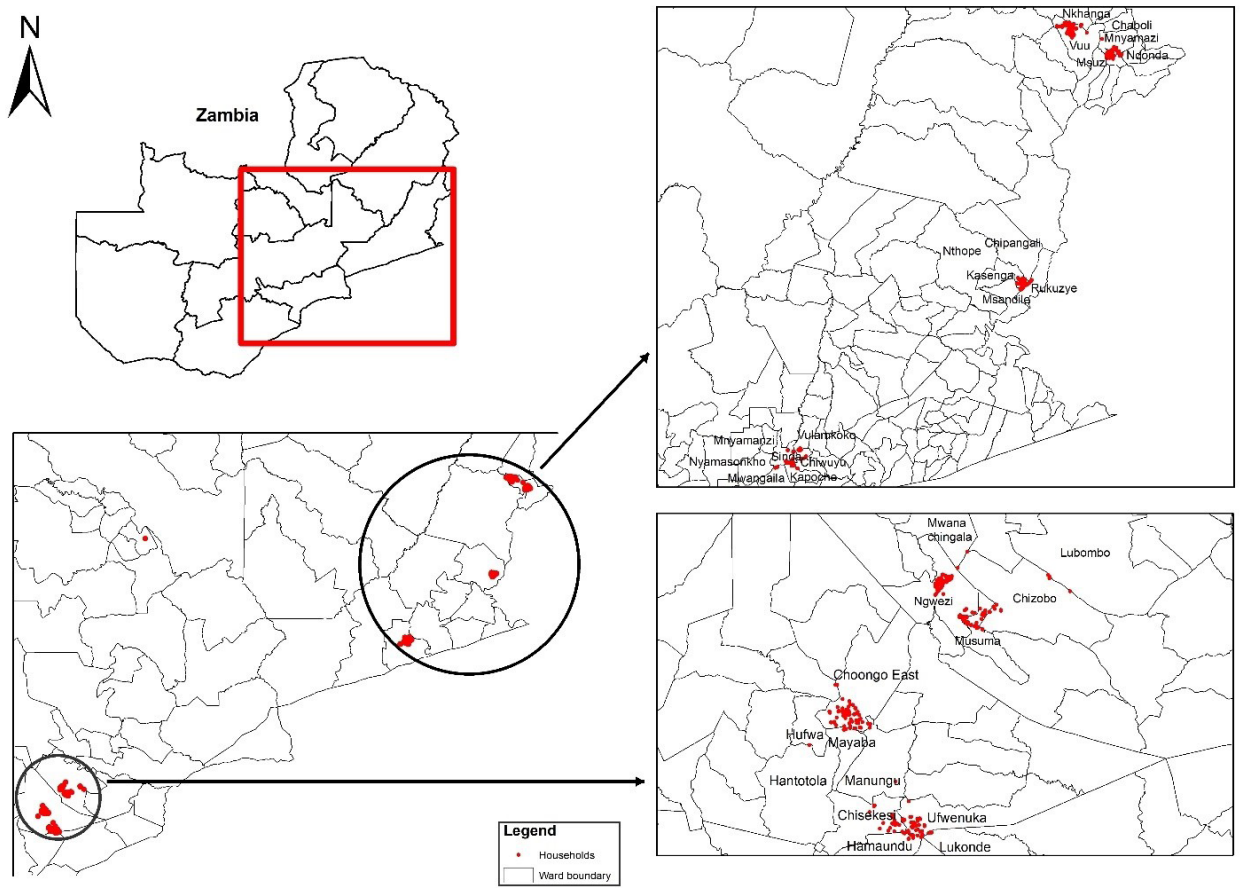


Figure 2. 1 Selected research areas in Zambia

2.2.1.4. Survey sample and size

Data was to be collected at household level. The UU project intervention sites have about 1975 households each. The proposed sample size was 700 households, based on power calculation and available budget. Sample distribution was proportional to the number of households in each intervention site. Prior to the survey, a comprehensive list of households in each site was developed with the help of village Camp Officers. Households to participate in the survey were then selected from this list using simple random sampling.

2.2.1.5. Interviewers' training

The fieldwork team included 18 research assistants and 4 supervisors. Before data collection began, all members of the research team including interviewers reviewed the survey questionnaire to ensure understanding for a smooth data collection process. Training, which took 3 days, included instructing the interviewers on how to use and administer the tool, as well as collecting feedback from respondents, including administration of the survey in accordance with the ethical protocol and data management procedures. The team was also trained on how to upload data onto SurveyCTO server.

2.2.1.6. Pre-testing the survey

The survey tool was piloted with a small sample of qualifying smallholder farmers in Kanakantapa camp, Chongwe district. This camp was selected as it had similar characteristics with the UU project camps. Two pilots were conducted; with the initial one being a pre-test where each supervisor conducted three interviews. The final pre-test involved all the interviewers and supervisors who in total conducted 65 interviews. The pretest interviews were not part of the final baseline data submitted.

2.2.2. Data collection

2.2.2.1. Target members for interviews and selection

Farmers were selected from farmer registers that were provided by the Ministry of Agriculture officers. These registers had all household members that were 18 years of age and above. These household members were all eligible for the Farmer Input Support Program (FISP). The list was then sent to the camp officers to verify the availability of the selected farmers. The camp officer later communicated on the missing households, which were replaced by existing households.

One of the challenges faced was that the farmer listings provided by camp officers were not up to date and contained duplicates, posing a challenge in sample selection. The discrepancy in farmer listing and reality on the ground affected more than half of the listed households. This made household replacement common. As a mitigation measure, both random sampling based on the list provided and use of the left-hand rule selection technique were applied. In the latter, the list was used to locate at least one farmer, then using this farmer as a focal point, the next household was selected using the left-hand rule, while skipping at least four households after each successful interview.

2.2.2.2. Summary of data collected

Data was collected from 7th to 19th November 2022. The average time for an interview was 2.5 hours, resulting to an average completion of 3 interviews per interviewer per day. Verbal informed consent was obtained from each respondent prior to questionnaire administration. Participation in the study was voluntary and selected respondents were informed that they are free to opt out of the study at any time. A total of 705 households were interviewed, as shown in Table 2.2.

Table 2. 2 Achieved interviews by district and camp

Province	District	Camp	Target Sample	Interviewed Households
Eastern	Sinda	Chafulu	97	97
	Chipata	Chanje	52	52
	Lundazi	Vuu	191	194
	Lundazi	Mapara	66	63
Southern	Mazabuka	Mbiya	55	63
	Mazabuka	Ngwezi B	60	55
	Monze	Malende	87	87
	Monze	Chisuyo	93	94
Total			700	705

Data collection process was largely smooth. To ensure enumerators achieved their target of 3 interviews per day, the team held debrief meetings every morning with the camp managers to discuss means of locating the selected households. This helped manage total time spent in data collection.

2.2.3. Data management and analysis

The data analysis consultant had to work with raw data as he was unable to fully comprehend the cleaning undertaken by the data collection team. The main data management process involved correcting seemingly incorrect figures, labelling some variables, checking for outliers, and generation of new variables for analysis. Standardized z-score values of greater than 3 rule was used to check for outliers, which were excluded from the analysis for some variables. Data management and analysis was done using SPSS. The main form of analysis undertaken was descriptive.

3.

DESCRIPTIVE RESULTS

3.1. Household head characteristics

Table 3.1 shows characteristics of the household head. The mean age is 48 years, with majority of the household heads being male (73%). Majority of them are married (75%), mostly monogamously. The highest proportion had primary school as highest level of formal schooling completed (48%), closely followed by secondary school (41%). The overwhelming majority were self-employed in the agricultural sector.

Table 3. 1 Characteristics of the household head

Description	(%)	Mean
Age (years)		48.04 (14.51)
Gender (Female)	27	
Marital status		
Single (never married)	4.3	
Monogamously married	64.1	
Polygamous married	10.4	
Widowed	13.6	
Others (divorced, separated, cohabiting)	7.7	
Highest education level completed		
No education	8.5	
Primary	48.4	
Secondary	40.7	
Post-secondary	2.4	
Main economic activity		
Self-employment	94.8	
Permanent (long-term) employment	0.9	
Formal contract (short-term) employment	1.7	
Temporary (casual) employment	2.6	
Sector of the main economic activity for the HHH		
Agricultural	90.1	
Non agricultural	9.9	
Observations		705

Note: Standard deviation in parentheses

3.2. Land access, tenure status and ownership

A total of 1,762 were accessed by the interviewed households during the October 2021-May 2022 rainy season. More than three quarters (77%) of these parcels were customarily owned (Table 3.2). This is consistent with previous literature that shows that customarily owned land is the most prominent tenure system in Zambia (Chapoto and Subakanya, 2019), and getting a title land is a bureaucratic and costly process (Sitko, Chamberlin, & Hichaambwa, 2014). Almost half (49%) of non-rented parcels are individually owned by the head, with slightly over a third (36%) of the parcels being jointly owned by the head and spouse.

Table 3. 2 Land parcels tenure and ownership

Description	%	Mean
Parcel size (hectares)		3.8 (2.96)
Parcel tenure (N=1762)		
Customarily owned land	76.6	
State land titled (title already given)	9	
State land titled (title still being processed)	3.3	
State land (not titled)	1.1	
Rented	5	
Given for free/caretaking	4.6	
Ownership arrangement (N=1674)		
Individually by the head	49.2	
Jointly with spouse	36.4	
Jointly with someone other than spouse	9	

3.3. Land preparation and crop productivity

A total of 2,614 plots were accessed parcels during the October 2021-May 2022 rainy season, and 78% of these were cultivated. The most common method of land tillage in the cultivated parcels was ploughing, practiced in 45% of these plots (Table 3.3). On the other hand, conventional land hoeing and ripping were used as tillage methods in 24% of the plots each, and ridging on only 7% of the plots.

Table 3. 3 Main tillage methods used

Tillage method	% of plots
Ploughing	45.1
Conventional hand hoeing	23.6
Ripping	23.5
Ridging (before planting)	7.2
Others (planting basins, mounding)	0.7

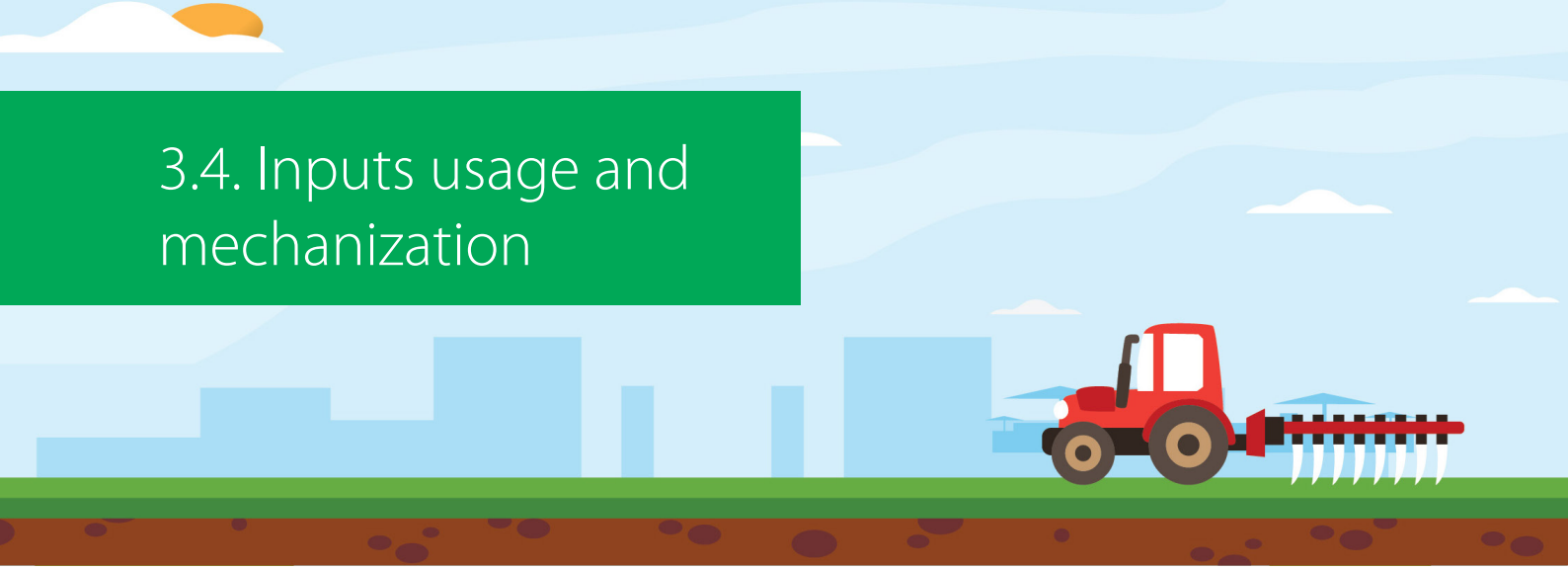
Maize is the crop cultivated in the majority of plots (37%) followed by groundnuts (20%) and sunflower (18%) (Table 3.4). Followed by soya beans and cowpeas, these were the five main crops grown by the farmers surveyed. Beans was only grown in 1% of the cultivated plots (25 plots), which is inconsistent with earlier expectations that it is one of the main 5 crops grown. In terms of acreage per household, soya beans (0.94 ha) and maize (0.93) were the crops occupying the largest acreage of cultivated land, followed by sunflower and cowpeas.

Table 3. 4 Five main crops cultivated, acreage and productivity

Crop	% of cultivated plots with crop	Acreage (Ha)	Productivity (Kg/ha)
Maize	36.6	0.93 (0.853)	1387.01 (974.16)
Groundnuts	19.7	0.67 (0.59)	1059.28 (712.35)
Sunflower	18.4	0.78 (0.782)	518.26 (395.6)
Soya Beans	11.1	0.94 (0.917)	451.61 (333.58)
Cowpeas	4.8	0.37 (0.336)	246.07 (207.61)
Other Crops	9.2	0.5	-

Maize had a mean yield of 1,387 kg/ha for the October 2021-May 2022 season, which is below the Zambian average of about 2 t/ha (Chapoto & Subakanya, 2019). On the other hand, groundnut registered a yield of 1059 kg/ha, which is above the Zambian average yield of 0.6 t/ha. Similarly, sunflower and soya beans registered yields that were below the Zambian average, while cowpeas yield is within the Zambian average of 200 – 800 kg/ha (Mwila et al., 2022).

3.4. Inputs usage and mechanization



This section contains results of seed and fertilizer usage, as well as mechanization of the various activities for the study sample. Certified seed was used in the majority (79%) of maize plots that were cultivated in the October 2021-May 2022 season (Table 3.5).

Table 3. 5 Types of seed planted

Crop	Seed type (%)		
	Certified	Recycled	Local seeds
Maize (n=956)	78.8	9.6	13.8
Groundnuts (n=514)	12.1	49.8	38.9
Sunflower (n=482)	23.4	54.4	31.1
Soya beans (n=290)	25.5	41	32.1
Cowpeas (n=125)	39.2	36	24

Notes: n=no of plots crop is grown

This was followed by local seeds (14%) and recycled seed (10%). The seed type was not exclusive and there was combination of different types of seed in same plots. For groundnuts and sunflower however, the largest seed type was recycled, used in 50% and 54% respectively. For these two crops, certified seed was only used in about a quarter of the cultivated plots. For cowpea, the seed type used in the majority of plots were certified (39%) closely followed by the recycled type (36%).

Figure 3.1 shows seed rate for the 5 main crops. Maize production across all plots planted with maize used 20.7 kg/ha of seed on average. Maize had the second lowest seed rate after sunflower (12%), while groundnuts and soyabeans had the highest at 37 kg/ha.

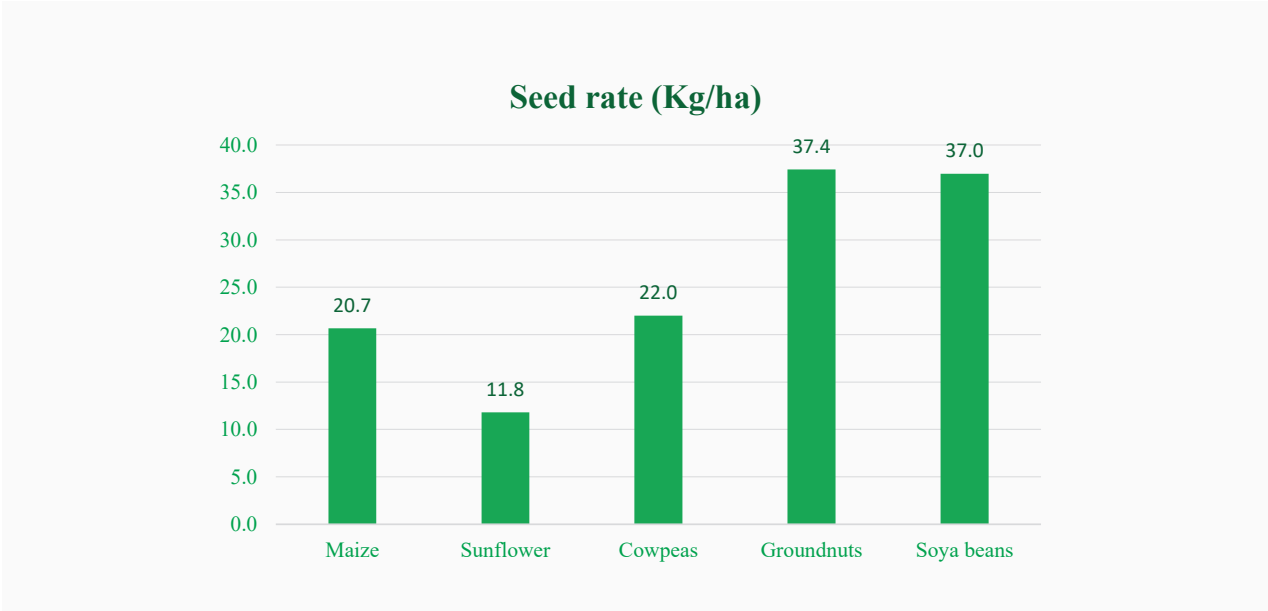


Figure 3. 1 Seed rate for the 5 main crops

Usage of other productivity enhancing inputs is presented in Table 3.6. Out of all the plots that were cultivated, fertilizers, herbicides, and insecticides/pesticides were used on 37%, 11%, 9% of them respectively.

Table 3. 6 Input use by percentage of plots

Input	% of plots
Fertilizer	36.6
Herbicides	11
Pesticides	8.7

For the plots where fertilizer was used, inorganic fertilizes were the majority, used on 88% of these plots (Table 3.7). All other fertilizers were used on less than 10% of the fertilized plots. It is worth noting that more than one fertilizer type was used in some plots. Fertilizer application averaged 177 kg/ha for inorganic fertilizer and 720 kg/ha.

Table 3. 7 Types of fertilizers used

Fertilizer type	% usage among fertilized plots	Fertilizer rate (Kg/ha)
Inorganic	88.4	176.6 (92.94)
Processed organic	4.3	
Organic + inorganic	6	
Manure	5.5	720.1 (485.81)

Table 3.8 shows level of mechanization for various activities. Only in 3.2% of cultivated parcels was land preparation mechanized. When farmers were also asked which cropping activities were mechanized, the overwhelming response was none for almost all of the cultivated plots.

Table 3. 8 Mechanization of various activities by percentage of plots

Activity	%
Land preparation	3.2
Mechanized cropping activity	
None	99.7
Planting	0.2
Weeding	0.2
Fertilizer application	0
Harvesting	0.1
Transport	0.1

3.5. Sustainable intensification practices

Respondents were asked if any member of their household practiced any of the sustainable intensification practices (SIPs) during Oct 2021-May 2022 season. More than half of the households (57%) responded that they practiced one SIP, with 26% practicing two, and 7% three practices (Figure 3.2). About 10% of the households were not implementing any SIP.

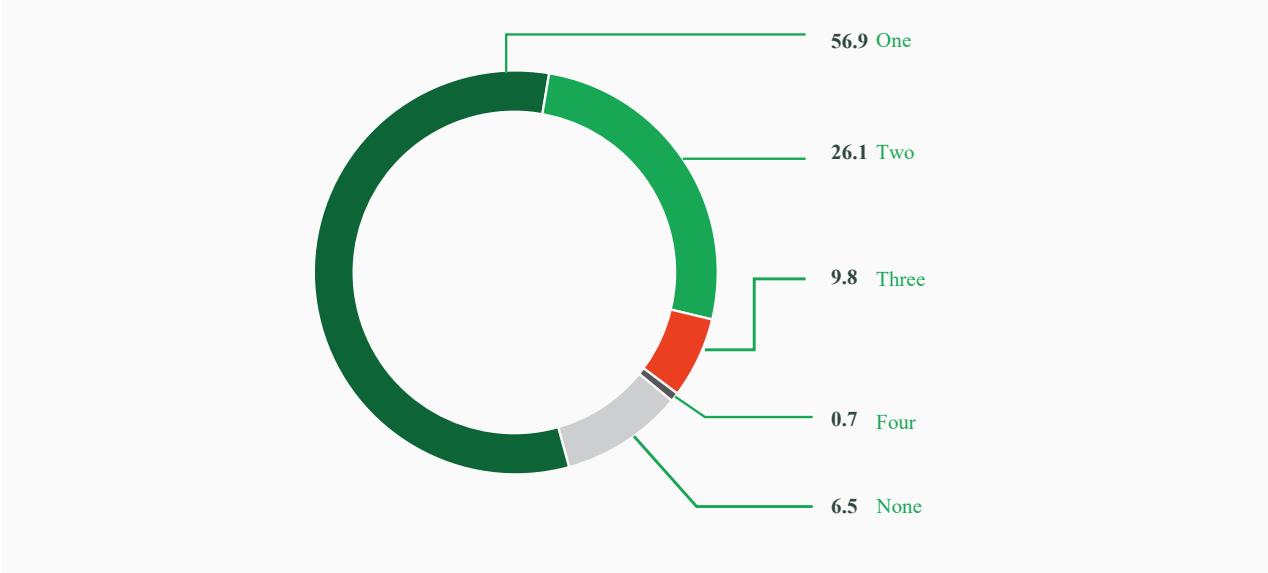


Figure 3. 2 % no. households practicing different number of SIPs

The most popular SIP was maize-groundnut rotation, practiced by 50% of the farmers during that season (Table 3.9). This is followed by direct seeding (29%), maize-soybean rotation (22%) and maize-cowpea rotation (9%). The least practiced SIP category includes those practices with very minimal usage such as maize-cowpea intercropping, maize-soybean intercropping, strip cropping, maize-bean intercropping, and maize-gliricidia intercropping. Other practices such as cassava-groundnut intercropping and cassava-beans intercropping were not practiced at all by the studied households.

Table 3. 9 Different SIPs implemented

SIP	% households practicing
Maize-groundnut rotation	49.9
Direct seeding	29.4
Maize-soybean rotation	22.3
None	9.8
Maize-cowpea rotation	9.1
Mechanical weed control	6.2
Chemical weed control	5.1
Relay cropping	2.4
Maize-bean rotation	2.1
Small and wide bed planting (permanent raised bed)	2.1
Maize-groundnut intercropping	1.8
Least practiced SIPs	1.9

Majority of the households (95%) implementing different SIPs intended to continue practicing them, with only a small proportion (6%) indicating they would not continue. Plan to discontinue was for several reasons, but mostly to enhance soil fertility. For instance, some households who planned to discontinue chemical weed control gave the reason of restoring soil fertility and plans to start crop rotation as a way to manage weeds. Households intending to discontinue direct seeding gave similar reasons on improving soil fertility and hence higher yields.

Respondents were also asked if any member of their household practiced any natural resource management technology, innovation, management practices (TIMPs) during Oct 2021-May 2022 season. Conservation agriculture was by far the most popular TIMP, implemented by 53% of the households during that season (Table 3.10) .

Agroforestry for soil fertility and ISFM were practiced by 8% of the households each, with Zai pits and tied ridges following (5% for each). Most unpopular TIMPs, implemented by less than 2% of the households, include biogas, drip irrigation, grass strips, windbreaks and hedges, sprinkler irrigation, stone lines, solar for small scale irrigation, bench terraces, gabions, roof catchment, and agroforestry for fodder.

Table 3. 10 Various NRM TIMPs implemented

TIMP	% households practicing
Conservation Agriculture	52.8
Agroforestry for soil fertility	7.8
Integrated Soil fertility Management (mulching, cover cropping etc.)	7.7
Zai Pits	5.2
Tied Ridges	4.7
Contour bands	4.4
Integrated manure management (biodigester, composting etc.)	4.3
Biogas	1.3
Drip Irrigation	1.1

The most mentioned period that households have been practicing TIMPs is more than 2 years, mentioned for various TIMPs 65% times (Figure 3.3).

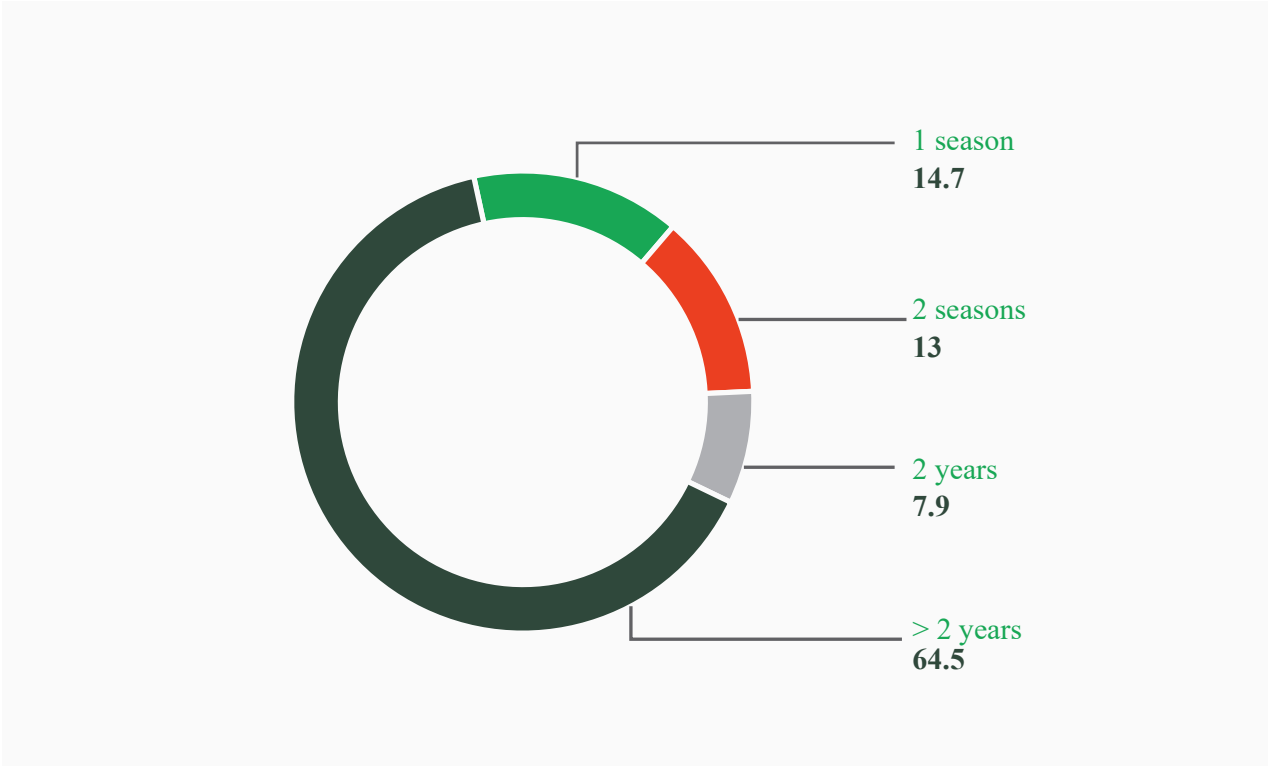


Figure 3. 3 How long various TIMPs have been practiced by households

3.6. Climate Smart Agriculture (CSA) practices

Respondents were asked if any member of their household ever practiced any CSA practice. Approximately 40% of the households had practiced only one CSA practice. Almost a third (30%) had ever implemented two CSA practices, and 16% three practices (Table 3.11).

Table 3. 11 Number of CSA practices implemented

No. of different CSA practices	% households that ever practiced
1	39.6
2	30.4
3	15.9
4	8.2
5	3.4
6 - 8	2.6

The most popular CSA practice was leaving crop residues in the field, having ever been practiced by 58% of the households. This is followed by applying animal manure (32%), minimum tillage (26%) and rotating cereals with legumes (24%) (Table 3.12).

Table 3. 12 Various CSA practices that households had ever implemented

CSA practice	% households that ever implemented
Leaving crop residues in the field and incorporating it into the soil	58.2
Applying animal manure	31.5
Minimum tillage using ripping	25.7
Rotating cereals with legumes/nitrogen-fixing crops	23.7
Growing crops suited to soil and weather conditions	15.9
Minimum tillage using planting basins (potholes)	13.2
Using crop residues as mulch (cut and spread on field)	10.9
Leaving land fallow to rest the soil	10.4
Zero tillage (excluding chitemene)	9.6
Chemical grain protectants to protect maize in storage from weevils	4.1
Intercropping cereals with legumes/nitrogen-fixing crops	3.5
Applying manure (plant/green or compost)	3.1
Agroforestry	3
Applying lime	1.6
Information on food/produce contamination	0.3

For the various CSA practices implemented, respondents were asked when was the first time they implemented them. Table 3.13 shows that more than half (52%) of the practices were implemented at least 4 years ago. Only 8% of the mentioned practices were implemented the first time in the current season.

Table 3. 13 First time a household implemented the mentioned CSA practice

Time	%
>4 years ago	36.5
4 Years ago	25
2 years ago	23.4
Oct 2021 - May 2022 season	7.8
Oct 2020 - May 2021 season	7.3

Majority of the CSA practices were also implemented during the reference season (Oct 2021 – May 2022 (87%) (Figure 3.4).

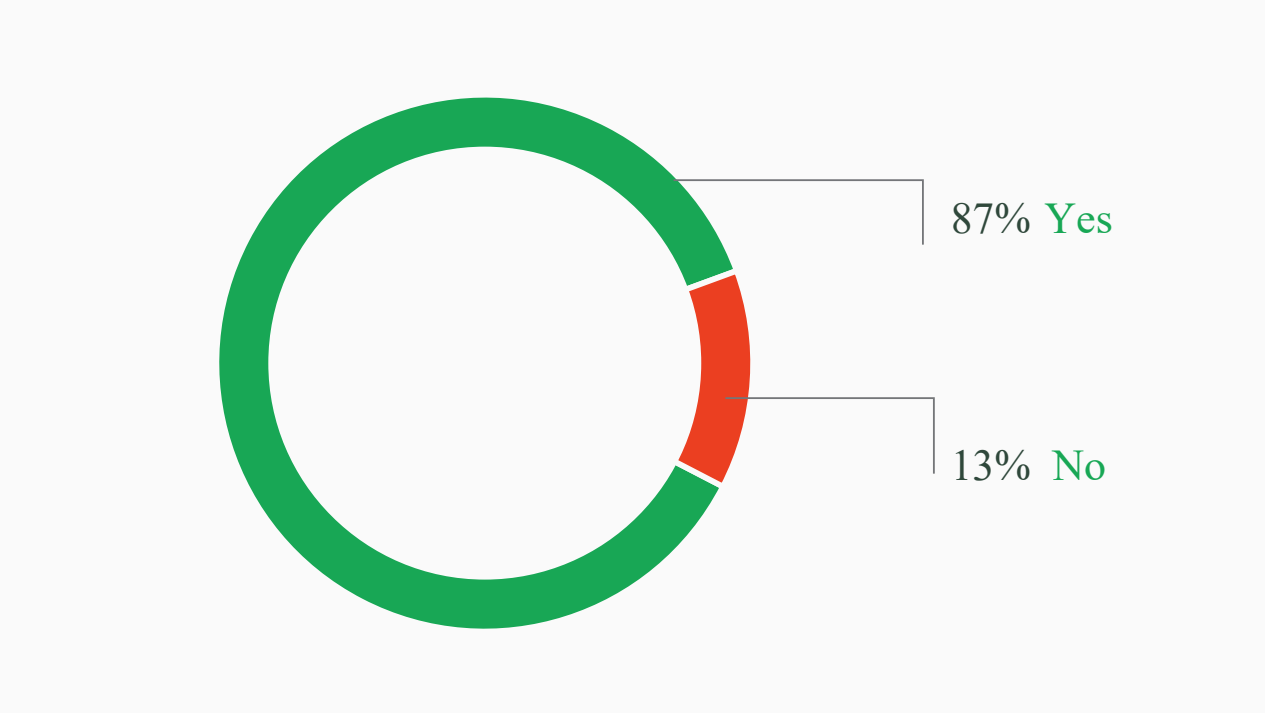


Figure 3. 4 If CSA practice was implemented in Oct 2021 - May 2022 season

When households were asked how they learnt about the various CSA practices, field days, demonstration plots, informal conversations and meetings were the most popular sources, mentioned 28%, 26%, 24%, and 23% of the times, respectively (Table 3.14).

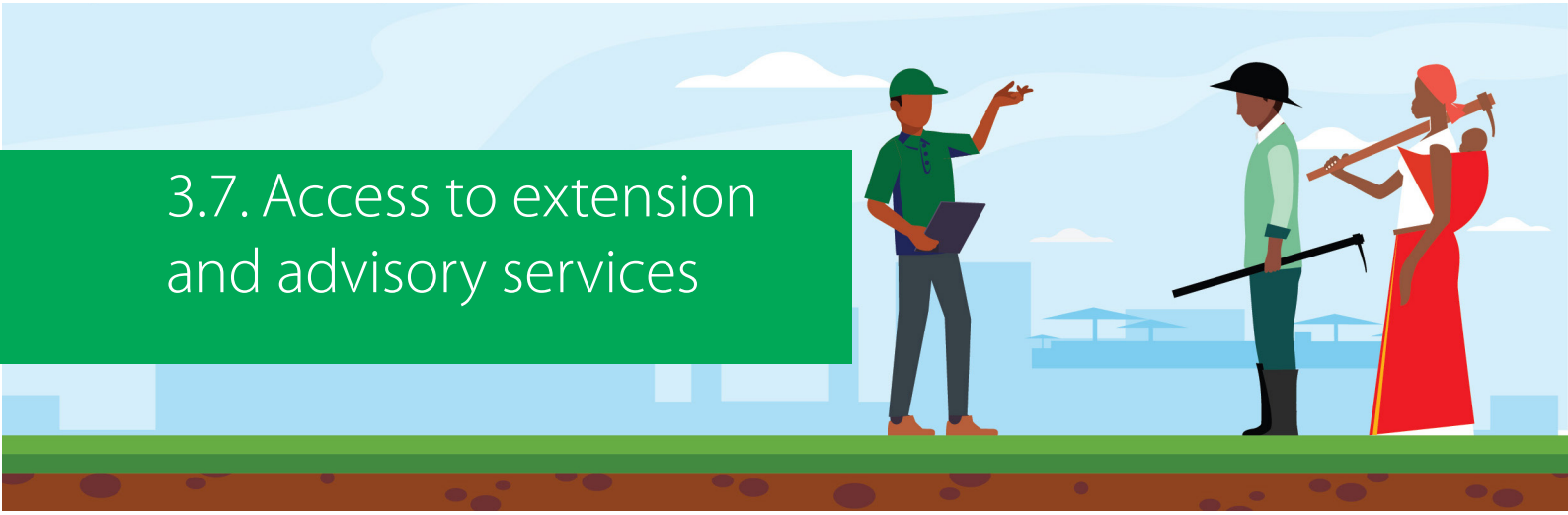
Table 3. 14 How household learnt about the CSA

Method	% times mentioned
Field Day	28.1
Demonstration plot	26.3
Informal conversations	23.9
Meetings	23.3
Training program	19.8
Radio program	18
Other learning sources	4.1
Workshop	3.8
Visits	3.2
Pamphlet /newspaper	0.2

The methods through which households learnt about various CSA practices were also the most important source or organizer of the CSA (Table 3.15). Field day was the most important source/organizer of the various CSAs, being mentioned 21% of the times. This is followed by demonstration plots (18%) and informal conversations (17%).

Table 3. 15 Ranking of CSA sources/organizers by importance

Source/organizer	% times mentioned
Field Day	20.5
Demonstration plot	17.6
Informal conversations	17.3
Training program	14.2
Meeting	12.7
Radio program	11.1
Others	3.7
Workshop	2.5
Visits	0.5
Pamphlet /newspaper	0



3.7. Access to extension and advisory services

Only 38% of households received or accessed advisory/extension on SI/CSA technologies in the last 1 year preceding the survey (Figure 3.5). Among all households, almost half (48%) indicated that there are advisory/ extension services they desired but they were not getting/accessing.

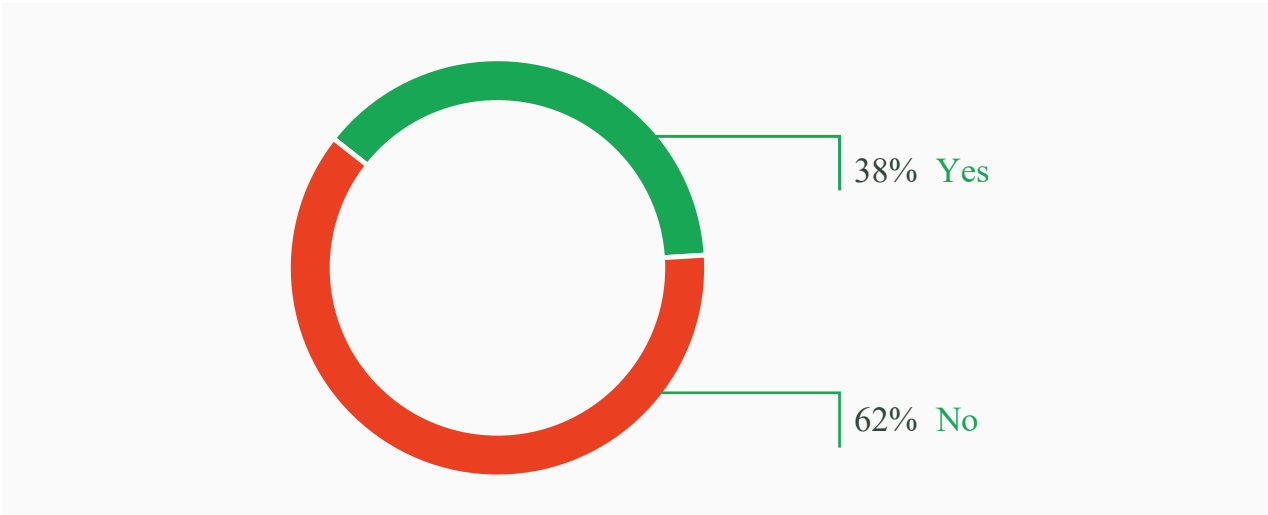


Figure 3. 5 Access to extension/advisory in the last 1 year

For those that accessed extension, the most important targeted purpose of the advisory was crop production practices, mentioned by 58% of these households as a target purpose (Table 3.16). Households could mention more than one target purpose. About 41% of these households also mentioned weather/rainfall forecast as targeted purpose, followed by pest and disease monitoring (31%).

Table 3. 16 Purpose of extension information/service

Target purpose	% households
Crop production practices	58.3
Weather / rainfall forecast	41.3
Pest and disease monitoring	31.4
Value addition	10.7
Crop/livestock insurance	9.2
Livestock production	8.9
Other purpose of information	8.9
Markets	4.8
Credit and loans	4.1
Microfinance and credit	3

Government extension agents are the main sources for the extension/advisory services that farmers received, mentioned as a source by 73% of all households that accessed extension (Table 3.17). Other mentioned sources include field days (16%), radio programs (11%), and CFUs (8%).

Table 3. 17 Source of extension/advisory received

Extension source	%
Government extension agent	73.4
Field day	15.5
Radio programs	10.7
Conservation Farming Unit (CFU)	8.1
NGO/ faith-based organization / church	5.2
Farmer group - cooperative	5.2
COMACO (Community Market for Conservation)	4.4
Other advisory service providers	4.1
Workshops	2.2
Televisions	1.5
Private extension agent	1.1
Health clinic	2.3

Households that accessed extension services were also asked about the most important source for the extension they received. Ministry of Agriculture extension is by far the most important source of extension services, mentioned by 71% of households as the most important (71%).

Table 3. 18 Important sources for extension received

Source	Percentage
MoA Extension	71.2
ZNFU/CFU	4.8
Other MoA Agents (including veterinarians)	3.3
NGO	3.3
Others	2.6
MoH/health officer/facility/National Food and Nutrition Council	2.2
Food Reserve Agency (FRA) cooperative	1.5
Agricultural support program	1.5
Cooperative/farmer group	1.5
Community Markets for Conservation (COMACO)	1.5
Locally organized Group	1.1
Fellow farmers	1.1
Radio/TV	1.1

Main channels through which the extension/advisory services were delivered are mainly field days and demonstrations, mentioned by 34% and 32% of the households respectively (Table 3.19). The least used channels include mobile phones (SMS), others, mobile phones (voice call), internet, and on-farm trials, each mentioned by less than 1% of the households that accessed extension.

Table 3. 19 Main channel of extension service delivery

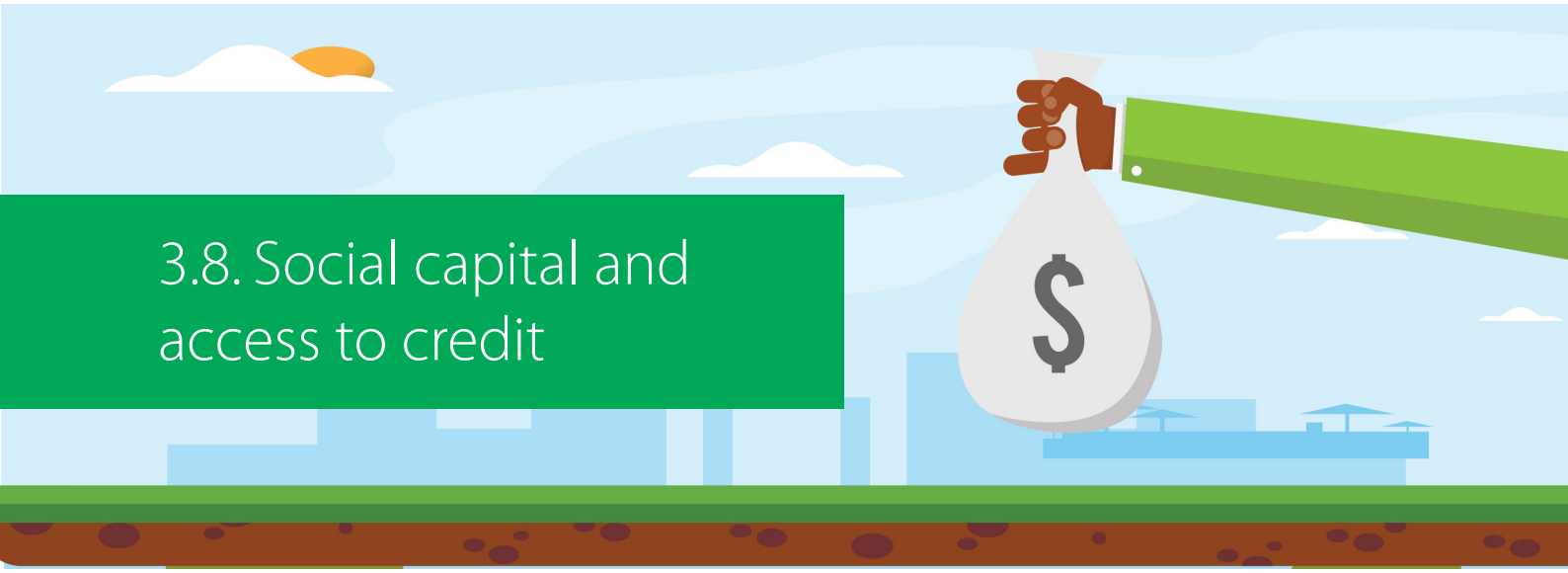
Main channel	%
Field days	33.9
Demonstrations	31.7
Group meetings/ discussion	7.7
Seminar/Training	7.7
Radio/television	7
Farm visit	4.4
Public gathering organized by government administration	3.3
Farmer field School (FFS)	1.5
Least used channels	2.6

Table 3.20 presents other gathered information regarding agricultural extension among the households that accessed. The highest number of households (34%), received the extension advise on monthly basis. Only a small proportion received extension on demand basis (4%) or on weekly basis (11%). In fact, about 23% of the households indicated receiving the extension service only once a year. On the other hand, only 4% of the households indicated to have paid for the extension, while the overwhelming majority indicated that they implemented the extension advise they received. Majority of those that received extension were satisfied with the service, with 71% indicating they were very satisfied, 19% satisfied, and 9% moderately satisfied.

Table 3. 20 Frequency, use and satisfaction with extension

Description	%
Frequency of receiving the service	
Weekly	11.4
Monthly	33.8
Occasionally	19.6
Annually	22.5
On demand basis	4.1
Implemented the extension service	88.9
Paid for the extension service	4.4
Satisfied with the service	
Very satisfied	70.8
Satisfied/ moderately satisfied	27.7
Dissatisfied	1.5

In addition to receiving extension, households were also asked if anyone in the household owned a smart phone, with only a quarter (25%) responding in the affirmative. Among those do not own a smart phone, only 12% have access to one. Additionally, only 7% of households indicated having a member trained on digital technology.



3.8. Social capital and access to credit

On social capital, respondents were first asked if anyone in their household has been a part of the four types of groups in the past 5 years. The most common type of group that households have been a part of was registered farmers' cooperative society, with 66% of the households indicating that they have been a member (Table 3.21). The responses differed depending with if it was the main male (72%) or main female (64%) being interviewed. Savings group had the second highest number of households belonging to (27%), followed by religious groups (22%).

Responses differ by who was the respondent, being higher for main female respondents for savings groups (30%) compared to responses from male heads (20%). This is unlike the case of registered farmer's cooperatives, where main male respondents indicated a higher number.

Table 3. 21 Types of groups household have been members to

Group	% belonging to group		
	All respondents	Main male respondents	Main female respondents
Farmers' Cooperative society (registered)	66.4	71.8	63.8
Savings' group	26.5	19.7	29.9
Religious group	21.8	24.4	20.5
Farmers' group (unregistered)	11.5	9.8	12.4

Farmers who belonged to different social groups were further asked about the two most important agriculture-related functions of these groups. Savings and credit, and input access/marketing were the most important functions, being mentioned 30% and 27% of the times respectively (Table 3.22). This is followed by seed production (15%) and produce marketing (13%). Responses are mostly in the same range for main female and main male respondents.

Table 3. 22 Important agriculture-related functions of various groups

Function	% no of times mentioned		
	All respondents	Main male respondents	Main female respondents
Savings and credit	29.7	25.9	31.5
Input access/marketing	26.9	27.2	26.8
Seed production	15.4	11.9	17.2
Other functions	15	16.3	14.3
Produce marketing	12.7	13.9	12.1
Input credit	9.2	12.6	7.6
Soil & water conservation	9	9.5	8.8
Don't know/remember	8.3	8.2	8.4
Farmer research group	6.9	11.2	4.7
Tree planting and nurseries	3.4	3.1	3.5

Table 3.23 contains more information regarding social group membership. The period between 1 and five years was the most common period that households joined these groups, having been mentioned 47% of the times. Less than one year was only mentioned 12% of the times. For the majority of these groups, household member still belonged to the group (90%), but only about in 30% of the groups did they hold a leadership position.

Asked if the groups were important sources of information on agricultural technologies, most respondents indicated they were very most important, which was mentioned 65% of the times. Additionally, majority trusted the information they got from the groups, with "complete" and "a lot" being mentioned 40% and 39% of the times.

Table 3. 23 Belonging to groups, importance and trust

Description	% times mentioned
Year a household member joined the social group	
< 1 year	11.8
Between 1 and 5 years	47.1
Between 5 and 10 years	19.2
> 10 years	21.9
Member still belong the group	89.5
Member holding leadership position	30.6
Group's importance on agricultural technologies	
Very important	65.2
Moderately important	17.8
Not important	10.3
Don't know	6.8
Trust information from the group	
Completely	39.9
A lot	38.7
Somewhat/ a little	19.3
Not at all/ Don't know	2.1

Table 3.24 shows results of access to agricultural and consumer credits among interviewed households. Majority of households (87%) did not take a loan for agricultural production purposes from any source within the last 1 year. Only 12% took agricultural loan, mostly from informal sources. Similarly, only 13% of the households took consumption loans, and this was also mainly from informal sources (10%).

Table 3. 24 Access to agricultural and consumption credit

Loan taken in the last one year	% households
Agricultural loan	
Formal source (banks, microfinance institutions, NGO, SACCOs)	2.7
Informal source (local money lender, relative, neighbor, friend)	10.2
None	87.1
Consumption loan	
Formal source (banks, microfinance institutions, NGO, SACCOs)	2.7
Informal source (local money lender, relative, neighbor, friend)	9.8
None	87.5

3.9. Household decision making roles

The questionnaire contained questions about decision makers regarding various farming and household activities. Male heads were the main decision makers regarding the use of farm plots, making decision on 64% of all cultivated plots (Table 3.25). Female heads come a distant second at 30%. Similarly in regard to management of cultivated crops, the higher percent of decision makers were male heads (58%). The same picture appears regarding sale of crops and use of income from the sales, with the main decision makers being male heads (61% and 60%) respectively. Female heads decision making is in the range of 30-31% for these activities, apart from crop management where it is higher at 36%.

Table 3. 25 Main decision maker in use of farm plots, crop management, and sales

Decision maker	%			
	Use of agricultural plots	Crop management	Crop sales	Use of income from sales
Male household head	63.5	57.5	61.4	60.1
Female household head	30.4	35.7	30.8	31.9
Other male household member	1.2	1.2	1.3	1.5
Other female household member	0.9	1	0.8	0.7
Other decision makers	4.1	4.5	5.6	5.8

Respondents were also asked about the main decision makers for specific cropping activities for five major crops: maize, soybean, beans, groundnuts and sunflower. These activities ranged from land preparation to harvesting to cooking. For all these activities and activities, households made decision. Table 3.26 shows the results for all the 5 crops combined.

Table 3. 26 Main decision makers for activities for five main crops

Activity	%				
	Male HH head	Female HH head	Other male HH member	Other female HH member	Others
Land preparation	64.6	31	1.5	0.7	2.2
Seed selection	61.9	34.4	1.7	1	1
Seed acquisition	59.7	36.4	1.4	1.4	1.2
Sowing	57.3	37.6	1.2	2.1	1.8
Staking (for climbers)	60.4	30.2	9.4	0	0
Applying fertilizer	65.7	29	1.3	2.1	2
Weeding	54.7	38.8	2.2	1.8	2.4
Pest Control	73	18.9	5	2.5	0.6
Harvesting	58.8	35.7	1.5	1.8	2.2
Transport (field to home)	60.9	31.2	3.6	2	2.3
Sorting	53	42.1	1.7	1.3	2
Storing	56.8	37.9	1.6	1.5	2.2
Selling	59.7	35.8	1.1	1.4	2
Cooking	28.6	65.5	0.8	5	0.1

Notes: HH=household

Male household heads are the main decision makers for most of the activities, making more than 50% of all decisions for all activities apart from cooking, where they were the main decision makers only 29% of the times. On the other hand, female heads lead as the main decision makers in cooking (66%). They also make substantial contribution in decision making in sorting (42%), weeding (39%), storing (38%), among others. Female heads participation as the main decision makers is lowest for pest control (19%). For all other decision apart from pest control, they are the main decision makers at least 30% of the times.

Male heads were also the main decision makers in use of agricultural assets (74%), sale of assets (74%), and use of livestock income (66%) (Table 3.27). The highest contribution by female heads was in the use of livestock income, where they were main decision makers 27% of the times.

Table 3. 27 Main decision maker in use of agricultural assets and livestock income

Decision maker	%		
	Use of assets	Sale of assets	Use of livestock income
Male household head	74.1	73.5	65.9
Female household head	17.6	18.3	27
Other male household member	3.1	3	4
Other female household member	0.2	0.3	1.5
Other decision makers	4.9	4.9	1.7

3.10. Household Nutrition

Household nutrition was assessed using Household Dietary Diversity Scores (HDDS) as well activities such as production of nutritious crops. HDDS is a proxy measure of household food access. To calculate dietary diversity scores, all foods consumed by household in the preceding 24 hours were categorized into 12 groups (Table 3.28; Appendix 2) as discussed by Swindale and Bilinsky (2006). HDDS were calculated by summation of all the food groups a household consumed, and then grouped into low (0-3), medium (4-6), and high (7-12) categories (Swindale & Bilinsky, 2006).

Table 3. 28 HDD food groups consumed by households in the last 24 hours

Category	Food group	% households consuming
A	Cereals	99.1
B	Roots and tubers	10.5
C	Vegetables	86.7
D	Fruits	23.3
E	Meat, poultry, offal	22.7
F	Eggs	24.8
G	Fish and seafood	20.6
H	Pulses, legumes, nuts	27.1
I	Milk and milk products	20.6
J	Oil/fats	65.2
K	Sweets (Sugar/honey)	26
L	Miscellaneous (spices/condiments/ beverages)	7

Cereals were consumed by almost all the households (99%) in the preceding 24 hours when the survey was conducted. Vegetables and oils/fats were also consumed by majority of the households (87% and 65% respectively). All other food groups were consumed by less than 30% of the households, including meat, pulses, fruits and roots and tubers.

Different HHDS levels for the sampled households are presented in Table 3.29. The average HDDS is 4.33, which is below the mid-point (6), already indicating low food access for the surveyed households. Indeed the highest proportion of households have either low or medium HDDS (41% and 45% respectively), with only 14% of the households having high HDDS. The mean for the low dietary diversity category is 2.46, indicating that 41% of the households consumed less than three food groups on average.

Table 3. 29 HDDS categories and levels

HHDS category	Range	%	Mean
Low dietary diversity	0 – 3	41.1	2.46 (0.65)
Medium dietary diversity	4 – 6	44.8	4.76 (0.78)
High dietary diversity	7 – 12	14	8.47 (1.84)
Total	0 – 12	100	4.33 (2.20)

Respondents were also asked if their households produced or farmed orange fleshed sweet potato (OFSP) and high Iron/Zinc beans in the Oct 21-May 22 season as well as the main sources of nutrition information. The findings are summarized in Table 3.40.

Table 3. 30 Production of nutritious crops and nutrition information

Variable	%
Produced orange fleshed sweet potato (OFSP)	16.6
Produced high Iron/Zinc beans	7.1
Main source of nutrition information	
Health clinic	54.2
Radio	20.6
Agricultural extension officer/farmer promoter	11.2
Neighbors, Friend, Relatives	7.8
Others sources of nutrition information	2.1
NGO	1.8
Television	1.4
Other sources	0.8

Only 17% and 7% of the sampled households farmed OFSP and high Iron/Zinc beans respectively, in the season Oct 2021-May 2022. Additionally, health clinics were the major (54.2%) sources of nutrition information, mentioned as the main source by 54% of the households. This is followed by radio (21%) and extension officers (11%).

CONCLUSIONS

Agriculture is acknowledged as main source of livelihood among a majority of farming households in Zambia. Ownership of land with a title deed is not common among farmers and most of the land is owned customarily, which may affect access to credit. Farmers allocate the highest proportion of their plots in maize production, indicating that maize remains an important cash and food crops in the country. Yields are low however, and farmers are yet to achieve the national average of 2 t/ha.

The three main SIPs implemented include maize-groundnut rotation, direct seeding, and maize-soya bean rotation. There are more than 10 other practices that could offer households a range of diversification options, but have not been adopted. Similarly, conservation agriculture dominates NRM TIMPs and thus there may be a need to help households diversify to other TIMPs. In addition, CSAs practices are mainly dominated by leaving crop residues in the field and incorporating it into the soil, application of animal manure, minimum tillage, and ripping. There is an opportunity to support farmers to diversify to the other CSAs practices.

There is room for improvement in access to extension services as the majority of households did not receive extension/advisory service. Those who accessed extension mainly sought/accessed information on crop production practices, weather/rainfall forecast, and pest/disease monitoring. Other services such as value addition are not being served by extension services. There is also an opportunity to improve agricultural productivity through use of digital platforms, which have very low usage, possibly due to low access to smartphones and lack of digital training. Additionally, the few farmers who belonged to social groups are members of cooperatives societies. Main female household members used groups mainly for savings and credit, while main male members used the groups mainly for inputs access. Groups usage to offer knowledge on SIPs and CSAs is low. There is also room to improve access to agricultural credit which is only being accessed by a small proportion of farmers.

Male household heads were the main decision makers on almost all farming activities except for cooking. There is thus gender imbalance in decision making on agricultural activities, that need to be addressed.

There is a high imbalance in food access with low intake of proteins such as pulses, meat, eggs, milk/milk products, and fish, as well as low intake of fruits. Average HDDS is low and thus there is need for interventions to improve food access. One of the interventions could indeed be promotion of nutritious crops such as OFSP and high Iron/Zinc beans, whose adoption is currently very low.

REFERENCES

Chapoto, A., & Subakanya, M. (2019). Rural Agricultural Livelihoods Survey 2019 Report. A report by Indaba Agricultural Policy Research Institute (IAPRI).

Mwila, N. M., Kalaluka, M., Mick, M., Kelvin, K., Tamala, K., Aaron, S., … Rubaihayo, P. (2022). Situational analyses on cowpea value chain in Zambia: the case of an untapped legume. Cogent Food and Agriculture, 8(2094060), 1–18. https://doi.org/10.1080/23311932.2022.2094060

Sitko, N. J., Chamberlin, J., & Hichaambwa, M. (2014). Does Smallholder Land Titling Facilitate Agricultural Growth?: An Analysis of the Determinants and Effects of Smallholder Land Titling in Zambia. World Development, 64, 791–802. https://doi.org/10.1016/j.worlddev.2014.07.014

Swindale, A., & Bilinsky, P. (2006). Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide. Retrieved from www.fantaproject.org/sites/default/files/resources/HDDS_v2_Sep06_0.pdf

APPENDICES

Appendix 1: Baseline Questionnaire

Appendix 2: The 12 food groups for the calculation of Household Dietary Diversity

1. **Cereals:** nshima, porridge, bread, rice, biscuits, noodles or any foods made from maize, rice, wheat, millet, sorghum or any other grains.
2. **Roots and tubers:** any white or yellow sweet potatoes, Irish potatoes, yam, white cassava, or other foods from roots.
3. **Vegetables:**
    a. Vitamin A rich vegetables and tubers including pumpkins, carrots, squash, or sweet potatoes that are orange inside and other available vitamin A rich vegetables.
    b. Dark green leafy vegetables including wild forms and locally available vitamin A rich leaves such as Amaranths, cassava leaves, pumpkin leaves, sweet potato leaves, kale, spinach, okra and many more.
    c. Other vegetables such as tomatoes and onions.
4. **Fruits:**
    a. Vitamin A rich fruits included ripe mango and pawpaw.
    b. Other fruits included guavas, oranges, avocado, or any wild fruits.
5. **Meat:**
    a. Offals included liver, kidney, heart, or other organ meats or blood-based foods.
    b. Flesh meat included beef, pork, lamb, goat, game meat, crocodile, chicken, duck, guinea fowl, pigeon, quail, or other birds and insects.
6. **Eggs** included those from chicken, duck, guinea fowl, and crocodile.
7. **Fish** included fresh or dried fish (e.g., kapenta, bream, chisense etc.).
8. **Legumes, nuts and seeds**: dried beans, groundnuts, or other foods made from these (e.g., peanut butter).
9. **Milk and milk products:** fresh milk, cheese, yoghurt, sour milk, or other milk products.
10. **Oils and fats:** oils, fats or butter added to food or made for cooking.
11. **Sweets:** sugar and honey.
12. **Spices, condiments, beverages:** any spices, coffee, tea, or alcoholic beverages.

Authors

Simon Kimenju, Philip Kamau and Rahma Adam

Acknowledgments

This work was carried out under the CGIAR Initiative on Diversification in East and Southern Africa, which is grateful for the support of CGIAR Trust Fund contributors (www.cgiar.org/funders). The CGIAR Initiative on Diversification in East and Southern Africa aims to help smallholders transition to sustainably intensified, diversified, and derisked agri-food systems based on maize in 12 ESA countries. Specifically, it seeks to enable 50,000 value chain actors, including farmers (at least 40% women, 40% youth), to adopt climate-smart maize-based intensification and diversification practices and one million to access digital agro-advisory services. Emphasizing the role of the private sector in driving such transformation, UU targets to support at least 30 start-ups and SMEs.

This is a contribution to the following:

Citation

This publication should be cited as: Kimenju, S., Kamau, P., and Adam, R. 2023. 2022 Baseline Survey Report for Zambia. Nairobi, Kenya:Ukama Ustawi: Diversification for resilient agribusiness ecosystems in East and Southern Africa (ESA) initiative. Initiative Report: ESA-2023-1.

Creative Commons License