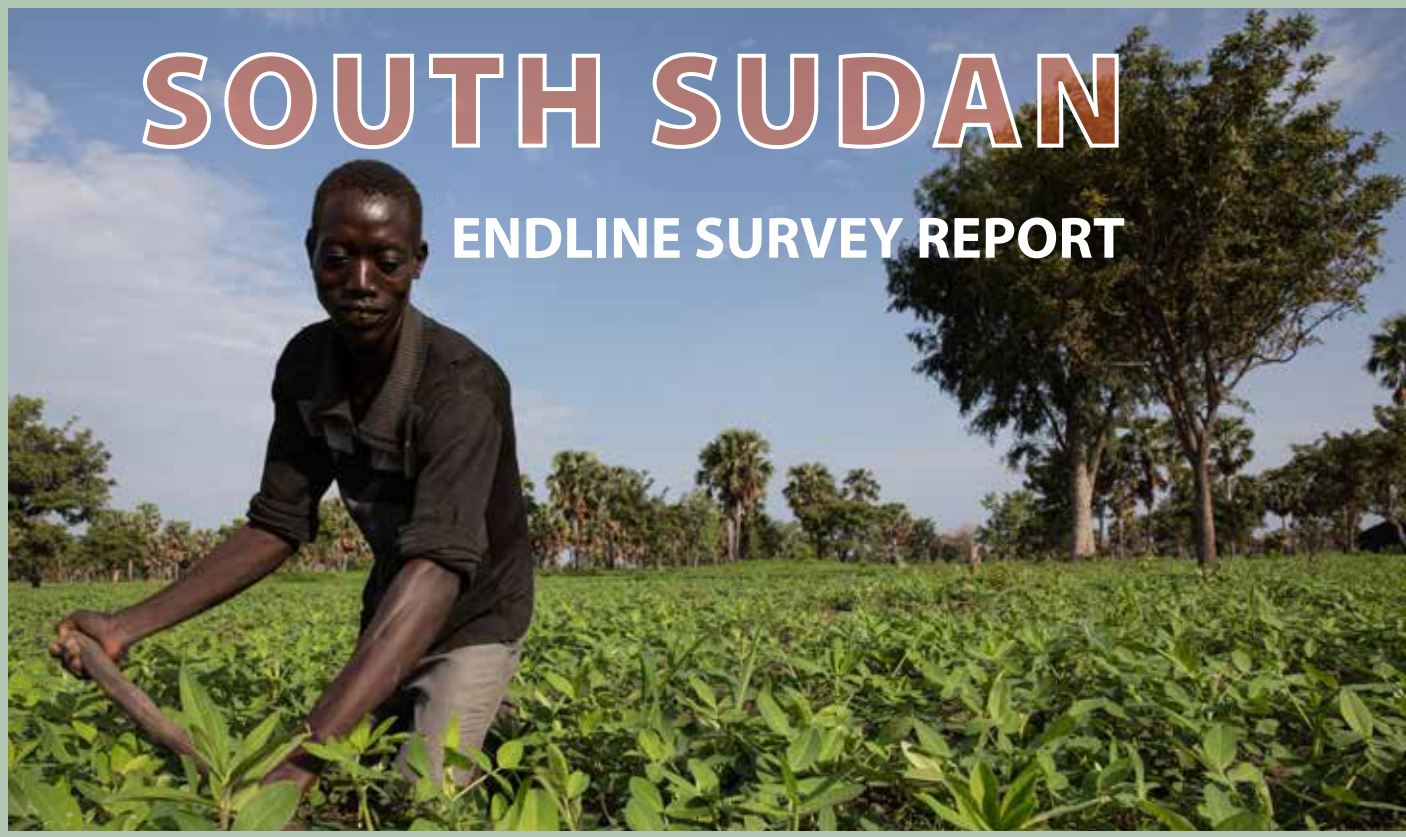
Food and Agriculture Organization of the United Nations

FOOD AND NUTRITION SECURITY RESILIENCE PROGRAMME IN SOUTH SUDAN



ENDLINE SURVEY REPORT

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Abbreviations

ABS	Access to Basic Services
AC	Adaptive capacity
AST	Assets
CSI	coping strategy index
DiD	difference-in-difference
EGS	early-generation seed
FAO	Food and Agriculture Organization of the United Nations
FCS	food consumption score
FIES	Food Insecurity Experience Scale
FNS-REPRO	Food and Nutrition Security Resilience Programme
GAP	good agricultural practices
HDDS	household dietary diversity score
HDP (nexus)	humanitarian-development-peace (nexus)
IPC	Integrated Food Security Phase Classification
NRM	Natural Resource Management
PSM	propensity score matching
PSU	primary sampling unit
RCI	resilience capacity index
rCSI	reduced coping strategy index
RIMA	resilience index measurement and analysis
SSN	social safety net
SSP	South Sudanese pound
SSU	secondary sampling unit
TLU	tropical livestock units

Executive summary

The Food and Nutrition Security Resilience Programme (FNS-REPRO), funded by the Government of the Netherlands through FAO, was a four-year programme of USD 28 million aimed at contributing directly to the operationalization of the United Nations Security Council Resolution 2417 by addressing the "cause-effect" relationship between conflict and food insecurity in Somaliland, South Sudan and Sudan (Darfur). The programme became operational in October 2019. Its design allowed FAO and partners to set examples of building food system resilience in protracted crises. The programme adopted an innovative area- and livelihood-based approach that looked at the multidimensional threats and risks that communities were exposed to, while identifying and utilizing opportunities for improved livelihood resilience. It focused on value chains that could contribute to more resilient food systems, resulting in improved food and nutrition security and localized peace dividend. These value chains included fodder (Somaliland), seeds (South Sudan) and gum Arabic (Sudan – Darfur). Intervention activities for FNS-REPRO were built around these value chains.

This document serves as an endline report for the FNS-REPRO project for South Sudan. The report utilizes data collected from households through a panel, two rounds of surveys (baseline in 2020 and endline in 2023), collected from both intervention and non-intervention areas in the project areas of South Sudan. This method of panel data collection provides the strongest evidence for attribution of a causal relationship between the implemented interventions and the effect on beneficiaries. Estimation of the household resilience capacity is done using the FAO RIMA-II tool (FAO, 2016a).

Main findings in brief

The rescaled resilience capacity index (RCI) among the beneficiary households increased from 50 in baseline to 55 in endline. The overall RCI reported a significant positive impact, with a change of 3.95 points. The adaptive capacity (AC) and social safety net (SSN) pillars reported the highest significant and positive impact, with a change of 4.7 and 4.9 points respectively. The project contributed to resilience in these pillars through diversification and an increase in the number of income sources, increase in productivity in the crop sector, participation in seed groups and improved capacity and training in natural resource management and production.

The project had a significant positive impact (11 percent) on the percentage of households reported to have used quality seeds and planting materials during the cropping season preceding the survey. The percentage of households using quality seeds improved remarkably for those planting maize and sorghum, but it was still low for those planting other crops such as vegetables, green gram, cowpeas, groundnut, cassava cuttings and sweet potato vines. The self-reported germination rates for the different crops varied by location, with Nzara reporting the lowest germination rates of <50 percent and the other counties showing germination rates of >50 percent. While uptake and use of quality seeds has improved, more advocacy and support are required to increase the uptake across the different crop varieties and locations.

The three main sources of income in the project area were income from agriculture and sale of cereals, vegetables and other crops; income from livestock and sale of livestock or livestock products and poultry; and casual labour related to agriculture. The project had a positive impact on overall income, income from crop production and income from livestock production. There was an increase of SSP (South Sudanese pound) 7 898 and SSP 3 030 in overall income and income from crop production respectively. A positive but insignificant impact was reported on income from livestock production.

The food security situation in the area as measured by the food consumption score (FCS) showed a slight improvement in the proportion of households. Both the treatment and control groups exhibited improvement in FCS, with the treatment group experiencing a more substantial positive shift, particularly in the "borderline" and "poor" categories, that registered a six percent and three percent reduction respectively. On average, a household in the survey area consumed six different kinds of food out of the 12 food groups for both treatment and control and in baseline and endline. There was a high consumption of cereals, vegetables, oils and sugar in the survey area during baseline and endline.

The four main shocks in the study area in the two rounds of surveys were poor harvest/crop failure, drought, loss of livestock and serious illness or accident of household member(s).

Based on the current Integrated Phase Classification (IPC) analysis period of September to November 2020, approximately 5.83 million people – almost half of South Sudan's population (46 percent) – are experiencing high levels of acute food insecurity classified as IPC Phase 3 or above (Crisis or worse). An estimated 35 000 people are in IPC Phase 5 (Catastrophe) in the Duk (3 000) and Nyirol (3 000) counties of Jonglei State, and the Rubkona County (15 000) of Unity State, while 14 000 South Sudanese returnees who fled the ongoing conflict in Sudan are also classified in IPC Phase 5 (Catastrophe). A further 1.64 million people are in IPC Phase 4 (Emergency).

In the harvest/post-harvest projection period of December 2023 to March 2024, the situation is projected to improve marginally because of reduced intensity of climatic shocks. An estimated 5.78 million people (46 percent of the population) are projected to face IPC Phase 3 or above (Crisis or worse), including 25 000 people likely to be in IPC Phase 5 (Catastrophe) and 1.71 million people likely to be in Phase 4.

In the lean season projection period of April to July 2024, the food security situation will deteriorate, and an estimated 7.10 million people (56 percent of the population) will be highly food insecure (IPC Phase 3 or above). An estimated 79 000 people are likely to be in IPC Phase 5 (Catastrophe), while an estimated 2.34 million people are likely to be in Phase 4.

The most food insecure populations are in locations that have been significantly affected by frequent climate-related shocks (flooding and dry spells), the economic crisis (currency depreciation and high food prices), conflict and insecurity, including the spillover effects of the conflict in Sudan, causing forced displacement, low agricultural production and a reduction in humanitarian assistance.

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1. INTRODUCTION

The Food and Nutrition Security Resilience Programme (FNS-REPRO), funded by the Government of the Netherlands through FAO, was a four-year programme of USD 28 million that contributed directly to the operationalization of the United Nations Security Council Resolution 2417 by addressing the "cause-effect" relationship between conflict and food insecurity in Somaliland, South Sudan and Sudan (Darfur). The programme became operational in October 2019. FNS-REPRO was the first programme in Eastern Africa specifically designed to foster peace and food security at scale, through a multi-year livelihood- and resilience-based approach, in some of the least stable regions where interventions are normally of a humanitarian programming nature exclusively. Its design allowed FAO and partners to set examples of building food system resilience in protracted crises.

South Sudan is a disaster-prone country that has been in a range of protracted crises over the last several decades, which have resulted in population displacement and disruption of livelihoods. South Sudan continues to grapple with persistent challenges that significantly impact food security, as highlighted by the latest IPC data. Acute food insecurity in South Sudan remains concerning, with the latest 2023 data showing that 5.83 million people (46.3 percent of the population) are experiencing high levels of acute food insecurity, classified as IPC Phase 3 or above (Crisis or worse). Contributing factors to this food insecurity encompass recurrent conflict, climatic variability and economic instability.

The FNS-REPRO project is aimed at providing solutions that lessen the impact of the aforementioned shocks through the seed sector. While farmers in South Sudan have continued to produce in challenging contexts, the production has been sub-optimal with one of the main hindrances being the shortage of quality seeds and planting materials. This has resulted in low yields and a reduction in capacity to produce enough food for their family consumption and market sales. The FNS-REPRO project focused on closing the cereal production gap, while eventually providing more diversified products for local, national and export markets. In particular, the FNS-REPRO will increase the resilience of communities and their food security status by:

- addressing the constraints to accessibility, availability, affordability and quality of seeds of adapted varieties through an integrated seed system approach; which will increase participation in crop livelihood and improved yields and income.
- improving seed quality assurance to build on farmer trust and stimulate demand for quality seed; which will increase participation in the seed value chain and make quality seeds more accessible for use.
- strengthening formal and informal outlets and local markets for agricultural inputs through support to farmers organizations and small entrepreneurs to effectively bridge the last mile delivery of improved agricultural inputs to smallholder farmers; similarly, this will increase participation in the seed value chain and make quality seeds more accessible for use.
- developing institutional and organizational capacity to support the establishment of an integrated, sustainable, resilient and robust seed system;
- providing opportunities for conservation of crop-biodiversity in order to enhance the resilience of the seed and crop system.

In a nutshell, to improve access, availability, suitability and quality of seeds as key elements to seed security and a major contributor to food, income and nutrition security, FNS-REPRO and partners supported the development of integrated seed systems whose interventions were informed by evidence-based studies such as the seed systems security assessment (2019). Thus, the programme supported formal and informal seed systems by identifying their gaps, and jointly with other key partners, recommend appropriate interventions to improve their functioning. In this regard, progressive farmers were organized into seed producer groups (SPGs), trained on quality seed production and marketing and supported with seed production inputs. Seed producer groups were further supported with seed quality control measures through the seed quality control boards (SQCBs) and linked with seed aggregation points and off-takers including private seed companies, agrodealers and seed fairs and voucher systems. This allowed for increased production of quality seeds for diverse crops, enhancing market opportunities for locally produced seed and improving livelihoods of the local communities.

The programme adopted an innovative area- and livelihood-based approach that looked at the multidimensional threats and risks that communities are exposed to, while identifying and utilizing opportunities for improved livelihood resilience. FNS-REPRO was to promote coordination with relevant stakeholders involved in targeted areas to reach collective outcomes between multisectoral humanitarian and development interventions. The FNS-REPRO project targeted Torit, Magwi, Wau, Jur River, Bor, Yambio and Nzara counties.

1.1 Objectives of the FNS-REPRO endline survey

The overall objective of the endline assessment is to determine the extent to which the project has been able to achieve its intended results (outcome and outputs) of improving food and nutrition security and the capacity of households, within their livelihoods, to withstand and adapt to shocks, achieved through improved inclusive access to and management of local natural resources; improved livelihood and income opportunities along selected value chains; enhanced knowledge, skills and capacity of local communities around nutrition-sensitive livelihood support; and established and implemented learning mechanisms that reinforce field activities and facilitate improved policy and practice on food system resilience. The survey targeted both the treatment group (actual beneficiaries targeted by the intervention) and control group (households that will not benefit directly from the intervention). The results for both groups are disaggregated, and comparisons are made at the inception and conclusion of the intervention to assess the change.

Specific objectives include:

- To be used for monitoring the extent to which the project has achieved its intended results (outcome and outputs) among the target beneficiaries.
- It will contribute to an increased understanding of the impact of the project on the livelihoods of communities within and beyond project areas.
- To feed into the overall monitoring, evaluation, accountability and learning agenda of the FNS-REPRO project.

1.2 Expected impact and outcomes

As the conclusion of FNS-REPRO approaches in March 2024, a critical examination of the impact, outcomes and overall effectiveness of the implemented interventions becomes essential. The primary objective of the endline survey was to methodically gauge the programme's success in attaining its predetermined goals and objectives. A comparative analysis of the data collected between baseline and endline was aimed at offering a nuanced comprehension of the transformations observed throughout the project's duration. Employing a consistent approach with the baseline survey, the endline survey targeted both

the treatment group (direct beneficiaries of the intervention) and the control group (households not directly benefiting from the intervention). This report presents disaggregated results for both groups, facilitating comparisons between baseline and endline to assess the degree of change.

South Sudan continues to grapple with persistent challenges that significantly impact food security, as highlighted by the latest IPC data. Acute food insecurity in South Sudan remains concerning, with the latest 2023 data showing that 5.83 million people (46.3 percent of the population) are experiencing high levels of acute food insecurity, classified as IPC Phase 3 or above (Crisis or worse). Contributing factors to this food insecurity encompass recurrent conflict, climatic variability, and economic instability.

FNS-REPRO was the first programme in Eastern Africa to work across the humanitarian-development-peace (HDP) nexus, building the resilience capacity of households, communities and institutions in some of the least stable regions where interventions are normally exclusively of a humanitarian programming nature. Its design allows FAO and its partners to set examples of building food system resilience in protracted crises. FNS-REPRO implemented an integrated and adaptive approach to food systems development informed by continuous context monitoring and evidence-based learning that influenced programme changes to encourage efficiency and relevance of interventions to the affected communities. The programme encouraged layering and complementarity along the triple nexus, setting best examples of contributing to food systems resilience and localized peace in protracted crises. For example, the development of the seed value chain contributed to improved livelihoods, linking with humanitarian requirements for quality seeds, developing community-based approaches to conflict resolution, encouraging social cohesion among farming communities and promoting lasting peace.

The anticipated impact of the project was to enhance food and nutrition security as well as the resilience capacity of households. The project's overarching goal was the development of resilient livelihoods and food systems, contributing to sustainable localized peace. This comprehensive goal was pursued through several key strategies – firstly, by fostering improved and inclusive access to local natural resources; secondly, by enhancing livelihood and income opportunities, particularly within selected value chains (such as the seed value chain in South Sudan); thirdly, by elevating the knowledge, skills and capacity of local communities in nutrition-sensitive livelihood support; and finally, by establishing and implementing learning mechanisms that reinforce field activities, thereby facilitating improved policy and practice in food system resilience. This holistic approach aimed to create a lasting impact, intertwining the strength of communities with the sustainability of their food systems.

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2. METHODOLOGY

The study employed an impact evaluation strategy where a quasi-experimental approach was implemented to assess the effectiveness of the FNS-REPRO project. The impact evaluation comprised baseline (conducted in 2020) and endline (conducted in 2023) surveys. Table 1 presents the households visited in the baseline and endline surveys, disaggregated by county and by treatment status.

Geographic coverage of the assessment consisted of seven counties (Bor South, Jur River, Magwi, Nzara, Torit, Wau and Yambio) from Jonglei, Western Bahr El Ghazal, Eastern Equatoria and Western Equatoria states of South Sudan where the project was implemented. A total of 977 household interviews were conducted with 640 beneficiary households and 337 non-beneficiary households during the endline assessment, while 1 016 household interviews were conducted with 663 beneficiary households and 353 non-beneficiary households during the baseline assessment.

The counties where the interventions were to be implemented were selected based on predefined characteristics as agreed by the project implementation team. Once the payams had been identified, the remaining payams were assessed based on similarity to the selected payams where the project was being implemented. A two-stage cluster sampling approach was applied on these intervention and non-intervention payams. The first stage sampling units (PSU) were the villages and the second stage sampling snits (SSU) were the households.

Once the intervention villages had been selected, the sampling frame was derived from the beneficiary list provided by the FNS-REPRO implementing officers for identification of the households to be interviewed. For the non-intervention villages where a list of households did not exist, the enumerators were trained to perform k-step systematic sampling based on spinning a pen to choose direction and then choosing every third to fifth household along the line depending on how densely populated the village was.

Table 1. Sample size

County	Baseline			Endline		
	Non-beneficiary	Beneficiary	Overall	Non-beneficiary	Beneficiary	Overall
Bor South	45	97	142	80	64	144
Jur River	53	97	150	45	96	141
Magwi	68	117	185	54	75	129
Nzara	52	104	156	40	100	140
Torit	49	41	90	38	101	139
Wau	62	96	158	40	100	140
Yambio	24	111	135	40	104	144
Total	**353**	**663**	**1 016**	**337**	**640**	**977**

During the endline survey, for households that could not be reached, replacements were sought within the same villages. The decision to select a replacement was controlled in the sense that the decision was not made by the enumerator, it required authorization from both the field supervisor and overall supervisor based in Juba.

The summary statistics for indicators that were not expected to change because of project interventions were analysed by baseline and endline only and by county, while the rest were analysed by treatment and control. The impact evaluation approach considered both a difference-in-difference (DiD) estimator and propensity score matching (PSM) depending on the imbalance observed. The data were analysed using STATA 14 software.

3. ENDLINE RESULTS

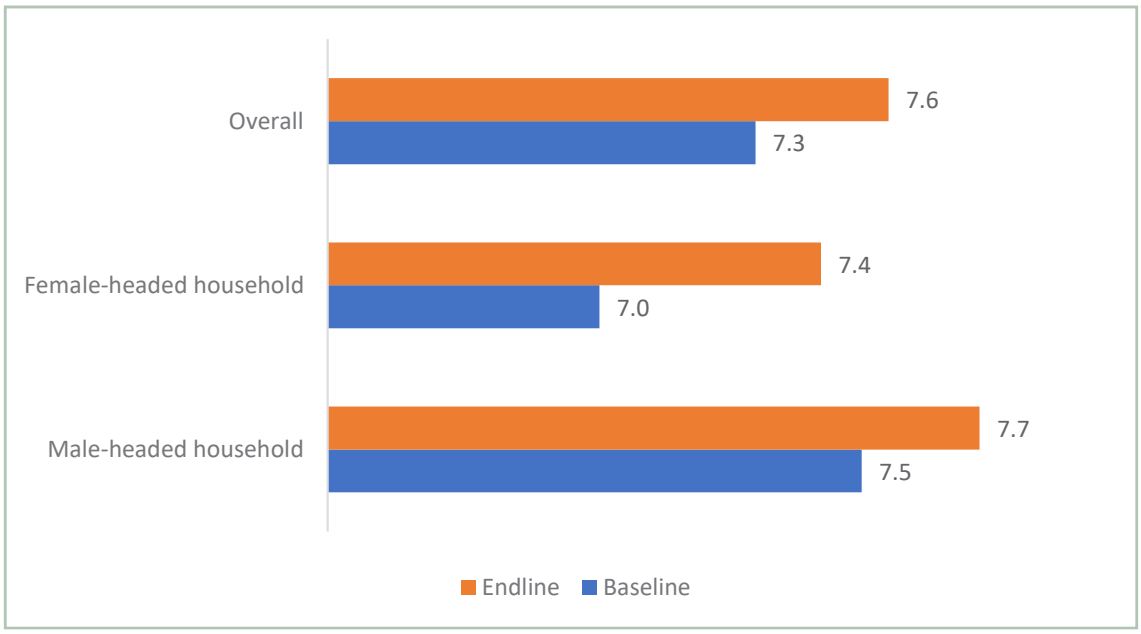
Basic descriptive statistics

3.1. Demographic

3.1.1. Household size

The average number of members residing in the household is seven members in the baseline and eight members in the endline, hence there is a slight increase in the household size. Male-headed households are slightly more than female-headed households, both in the baseline and endline surveys.

Figure 1. Household size



3.1.2. Dependency ratio

The dependency ratio is a demographic measure of the ratio of the number of dependants to the total working-age population in a country. Dependants are defined as those aged zero to 14 and those aged 65 and older; working age is defined as from 15 to 64 years.

In terms of dependency ratio, the median dependency ratio is estimated at 167 in the baseline and 180 in the endline, suggesting that for every 100 productive/working community members there are 166 dependants in the baseline and 180 dependants in the endline. There is a significant decrease in the dependency ratio of the beneficiary households when comparing baseline (180) and endline (167). This implies a decrease in the burden carried by the working-age group for the beneficiary households.

Table 2. Dependency ratio

Beneficiary type/Dependency ratio	Baseline	Endline
Non-beneficiary	157	180
Beneficiary	180	167
Overall	167	180

3.1.3. Household education level

In terms of the education status of household heads, 46 percent and 48 percent had never been to school in the baseline and endline assessments respectively, 25 percent had started but did not complete primary school in the endline assessment, while 24 percent had started but did not complete primary school in the baseline assessment.

The percentage of beneficiary household heads classified as between completed primary school and completed higher than secondary school was 29 percent in the baseline assessment and 27 percent in the endline assessment. Overall, consistently, over 70 percent of the respondents in both beneficiary and non-beneficiary groups had no formal education or had not completed primary educational level in both rounds of surveys.

Table 3. Household education level

	Baseline			Endline		
	Non-beneficiary (%)	Beneficiary (%)	Overall (%)	Non-beneficiary (%)	Beneficiary (%)	Overall (%)
None/Never been to school	47	45	46	53	46	48
Primary school incomplete	21	26	24	25	26	25
Primary school complete	7	8	7	6	7	7
Secondary school incomplete	10	10	10	9	10	10
Secondary school complete	11	8	9	8	9	9
Higher than secondary school	5	3	4	0	1	1

3.1.4. Household livelihood sources

The major sources of income for the households were agriculture and sale of cereals, vegetables and other crops (77 percent in baseline and 94 percent in endline), livestock and sale of livestock or livestock products and poultry (17 percent in baseline and 27 percent in endline) and casual labour related to agriculture (29 percent in baseline and 22 percent in endline). From the endline assessment findings, there is an increase in the percentage of households engaged in agriculture and sale of cereals, vegetables and other crops and livestock and sale of livestock or livestock products and poultry as their major sources of income compared with the baseline assessment findings. This could be attributed to the support the project provided to the beneficiaries, such as provision of inputs (assorted seeds and tools) through direct distribution and seed fairs, trainings on seed production and quality assurance, technical support to private seed companies in early generation seed (EGS) production and management, production of landraces and establishment of demonstration units across project sites.

Table 4. Household livelihood sources

Livelihood sources	Baseline			Endline		
	Non-beneficiary (%)	Beneficiary (%)	Overall (%)	Non-beneficiary (%)	Beneficiary (%)	Overall (%)
Agriculture and sale of cereals, vegetables and other crops	74	79	77	94	94	94
Livestock and sale of livestock or livestock products and poultry	14	18	17	21	30	27
Casual labour related to agriculture	23	32	29	19	24	22
Casual labour related to non-agricultural activities	19	22	21	9	8	8
Skilled labour	10	14	13	5	3	4
Trader/shop owner/ commerce/petty trading/ handicraft, etc.	13	13	13	8	9	9
Salaried work (public/ private)	9	8	9	4	4	4
Sale of firewood/poles, charcoal, grass, stones	15	18	17	6	11	9
Fishing or sale of fish	5	4	4	3	2	2
Kinship/support from family friends/remittances	1	1	1	0	1	0
Formal transfers, cash transfers (CfW, UCT, IDP/ returnee assistance)	0	1	1	0	0	0
Informal transfers from kinship/ support from family friends/remittances	8	7	7	0	0	0
Food assistance/sale of food assistance	2	4	3	3	2	2
Gathering of wild food and hunting	0	0	0	2	3	2

3.1.5 Training

The study examined the participation in various types of training of both beneficiaries and non-beneficiaries at the baseline and endline stages. Notably, there was a consistent increase in training percentages across most categories from baseline to endline, with a more pronounced increase observed among the beneficiaries.

In the category of good agricultural practices (GAP), more beneficiaries (72 percent) received training than non-beneficiaries (46 percent) in the endline stage, with an overall average increase from 42 percent at baseline to 63 percent at endline.

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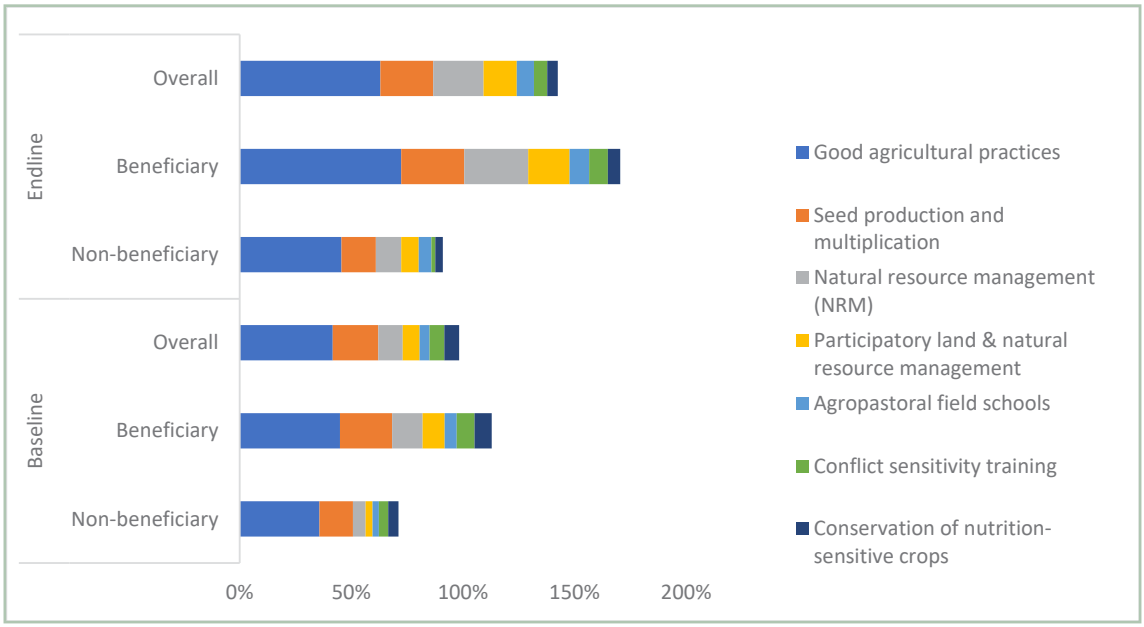
Similarly, for seed production and multiplication, there was a notable overall increase in training participation from 20 percent at baseline to 24 percent at endline, with beneficiaries contributing to this upward trend.

Training in natural resource management (NRM) reflected a substantial increase, with the overall average rising from 11 percent at baseline to 23 percent at endline. This positive trend is mirrored in the participatory land and natural resource management category, where overall participation in training increased from 7 percent to 15 percent.

Agropastoral field school training reflected moderate increases, highlighting a positive shift in training engagement over time. However, the conservation of nutrition-sensitive crops and conflict sensitivity training categories showed a decrease in overall training participation – from 7 percent at baseline to 5 percent at endline and 7 percent at baseline to 6 percent at endline respectively as shown in Figure 2.

Figure 2. Trainings received



3.1.6 Social capital

The study explored the various social networks that households can rely on in times of difficulty to prevent them from depleting their assets through the adoption of damaging coping strategies. The social networks contribute to social cohesion, information dissemination, support systems and civic engagement within the wider community.

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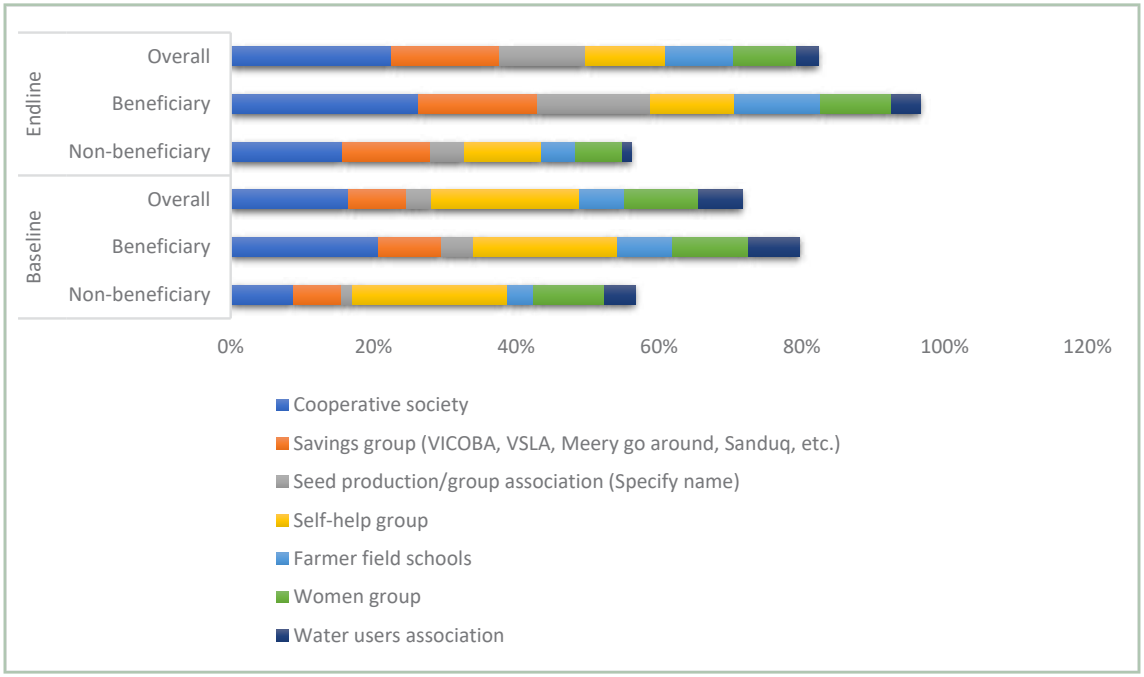
Figure 3. Membership to various groups



During the baseline, the three main social networks that the households participated in were cooperative societies, saving groups (VICOBA, VSLA, merry go round and sanduq) and self-help groups. For the beneficiary group, during the endline, the three main social networks were cooperative societies, saving groups (VICOBA, VSLA, merry go round and sanduq) and seed production groups. At the baseline, non-beneficiaries had an average of 0.42 social networks, whereas beneficiaries had a higher average of 0.68, resulting in an overall average of 0.59. By the endline, both non-beneficiaries and beneficiaries had witnessed an increase in their average number of networks, reaching 0.47 and 0.87 respectively. This increase contributed to an overall average of 0.73. A higher number of networks can contribute to overall financial resilience. Social networks provide a safety net during periods of economic uncertainty, enabling individuals to access both formal and informal cash transfers when needed.

In terms of access to transfers, at baseline, non-beneficiaries had a slightly higher access to informal transfers (22 percent) compared with beneficiaries (20 percent), resulting in an overall access rate of 21 percent. However, at the endline, both groups showed a significant decline, with 11 percent access for both non-beneficiaries and beneficiaries, leading to an overall access rate of 11 percent for informal transfers.

Regarding access to formal transfers, non-beneficiaries had a 70 percent access rate at the baseline, while beneficiaries had a higher rate of 79 percent, resulting in an overall access rate of 76 percent. Notably, at the endline, access rates for formal transfers had equalized, reaching 100 percent for both non-beneficiaries and beneficiaries, and resulting in an overall access rate of 100 percent. These findings suggest a substantial improvement in access to formal transfers for both groups by the endline. Such changes could be related to interventions from other projects in the respective areas.

3.1.7 Natural capital

At the baseline, non-beneficiaries had 2.81 feddans of accessible land, slightly less than beneficiaries who had 2.86 feddans, resulting in an overall average of 2.84 feddans. At the endline, non-beneficiaries experienced an increase to 4.22 feddans, while beneficiaries saw a substantial rise to 5.45 feddans, contributing to an overall average of 5.02 feddans.

Regarding cultivated land, non-beneficiaries had 1.15 feddans at the baseline, and beneficiaries had a similar amount at 1.16 feddans, leading to an overall average of 1.16 feddans. By the endline, non-beneficiaries experienced an increase to 1.20 feddans, and beneficiaries saw a rise to 1.36 feddans, resulting in an overall average of 1.30 feddans.

Table 5. Main crops cultivated

Main crops cultivated	Baseline			Endline		
	Non-beneficiary (%)	Beneficiary (%)	Overall (%)	Non-beneficiary (%)	Beneficiary (%)	Overall (%)
Maize	67	68	67	53	66	61
Groundnut	52	69	63	43	60	54
Sorghum	40	34	36	48	52	50
Vegetables	0	0	0	18	13	15
Cassava	25	37	33	9	12	11
Sesame	3	8	6	9	10	10
Rice	16	12	13	9	9	9
Beans	8	4	5	6	7	7
Cowpeas	7	6	6	4	3	3
Millet	1	2	1	3	2	2
Pigeon peas	6	5	6	3	1	2
Sweet potatoes	2	1	1	3	1	2
Green grams	11	6	8	0	0	0
Yams	0	0	0	0	0	0
Fruits	0	0	0	1	0	0
Irish potatoes	0	0	0	0	0	0

Major crops like maize, groundnut and sorghum were predominantly cultivated during both the baseline and endline periods. However, a change in crop preferences became evident by the endline as there was an increase in the cultivation of vegetables (from 0 percent to 15 percent) and sesame (from 6 percent to 10 percent overall). Baseline and endline figures are compared in Table 5. During the last two years of the project, there were efforts to enhance the knowledge, skills and capacity of local communities around nutrition-sensitivity. This encouraged an increased number of beneficiaries, especially women and youth, to engage in vegetable production for household consumption and the market.

3.1.8 Physical capital

Physical capital, including assets, is a key element of livelihoods, enabling households to produce consumable or tradable goods as well as guarantee comfort in life. Moreover, access to assets increases the household's ability to manage and mitigate against assorted shocks (including drought and conflict) as well as smoothing consumption during such periods. Furthermore, access to assets can help households to handle income uncertainties and escape poverty.

In this section, two kinds of assets are discussed that are important in the survey area – livestock and productive tools. Chickens and goats remained the main livestock, both at the baseline and at endline. However, a decrease in overall livestock ownership is evident when considering the tropical livestock units

(TLU) measure. Initially, at the baseline, both non-beneficiaries and beneficiaries held an average TLU of 0.8. By the endline, there was a notable reduction for both groups, with the TLU average decreasing to 0.3.

Regarding household assets, the commonly owned items include beds, chairs, tables, sponge mattresses and mosquito nets, in that order, as depicted in Figure 4.

Figure 4. Ownership of household items

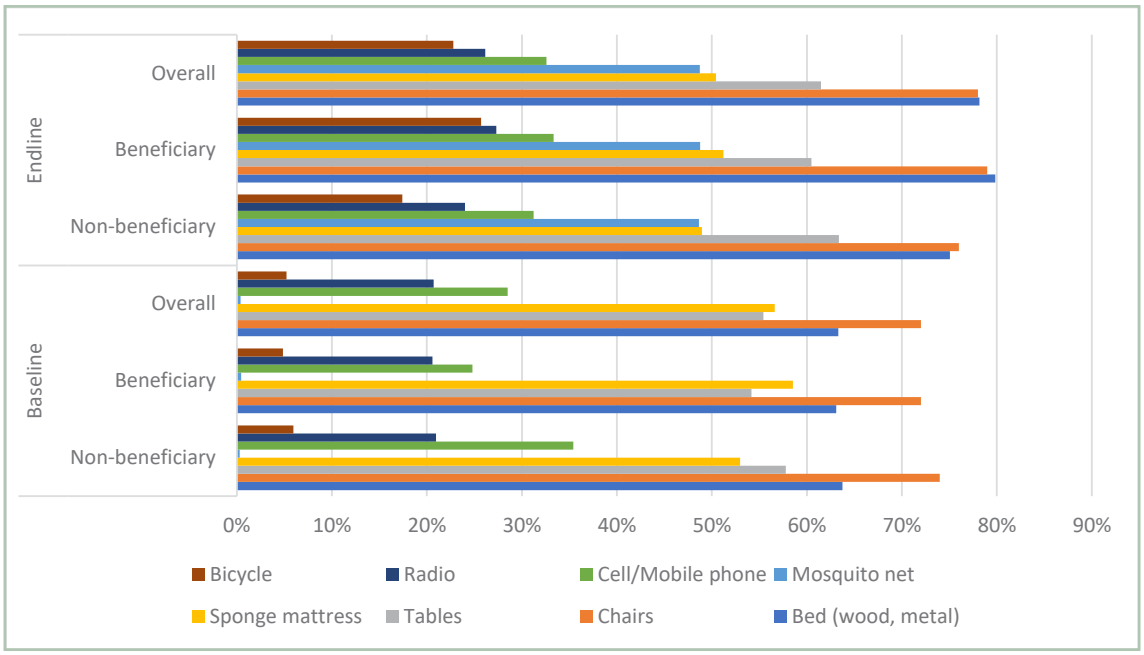
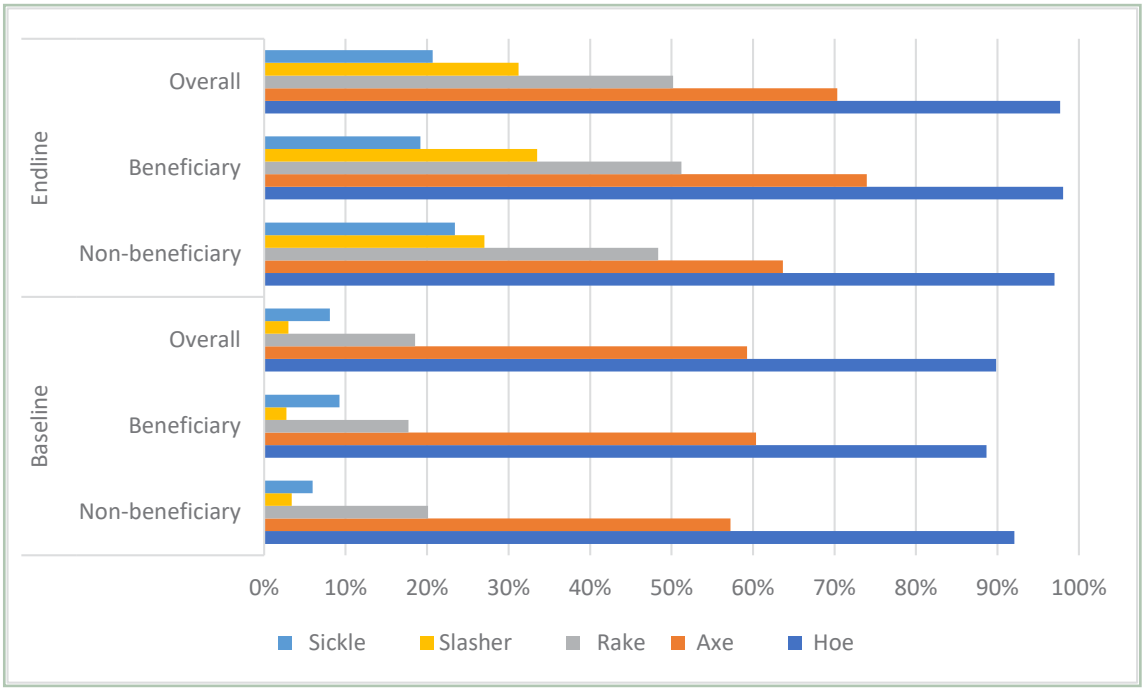


Figure 5. Ownership of agricultural tools



The ownership of agricultural tools saw significant improvements from baseline to endline among both non-beneficiaries and beneficiaries as shown in Figure 5. Hoes, the most frequently owned tool, showed an increase in overall ownership from 90 percent to 98 percent, with substantial increases in both groups. Axes, rakes, slashers and sickles also reflected varying degrees of increased ownership, contributing to more widespread access to these essential farming implements. Various farming tools were provided by the project at the start as a one-off support, while the project continued to provide trainings and other critical inputs including foundation seed and packaging materials in a phased approach to enhance community resilience and project sustainability

3.1.9 Distance to services (minutes) and access to basic services

The study investigated access to essential services by asking the respondents about the distance in terms of the minutes required for individuals in the survey area to reach specific service locations. Table 6 details the average walking distance (one way) in minutes to the designated facility.

Table 6. Average distance to services in minutes

	Baseline			Endline		
	Non-beneficiary	Beneficiary	Overall	Non-beneficiary	Beneficiary	Overall
Primary school	47	56	53	27	42	37
Petty market	73	88	82	53	72	65
Public/Private health facility [smaller and less equipped than a hospital]	61	74	69	48	103	84
Crop market	135	114	121	102	109	107
Nearest local government office	136	112	120	104	118	113
Hospital	161	153	156	127	138	134
Public means of transport	140	153	148	129	147	141
Secondary school	151	154	153	137	155	149
Livestock market	201	177	185	153	172	165
Farmer field school training or demonstration plot/ ground	185	145	159	184	158	167
Agric/Extension services office	193	171	179	188	211	203
Veterinary clinic	213	192	200	199	237	224

Access to improved cooking energy showed a slight increase, with the overall access rate growing from 9 percent at the baseline to 15 percent at the endline. There was a slight decrease in overall access to safe water, dropping from 57 percent during the baseline to 55 percent at the endline. Similarly, access to safe toilets decreased slightly, from 47 percent to 42 percent.

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3.2 Shocks

The most severe shocks experienced by the majority of households during the endline assessment were poor harvest/crop failure (41 percent), drought (28 percent), loss/death of livestock (27 percent), serious illness or accident of household member(s) (21 percent) and floods (19 percent). During the baseline, the most severe shocks were unemployment/shortage of money (35 percent), loss/death of livestock and poor harvest (34 percent respectively) and unusually high food prices (27 percent).

Table 7. Most severe shocks experienced by the household

Shocks	Baseline			Endline		
	Non-beneficiary (%)	Beneficiary (%)	Overall (%)	Non-beneficiary (%)	Beneficiary (%)	Overall (%)
Poor harvest/crop failure	35	34	34	40	41	41
Drought	18	24	22	25	29	28
Loss/death of livestock	30	36	34	23	28	27
Serious illness or accident of household member(s)	24	25	24	20	21	21
Floods	24	22	23	24	16	19
Unemployment/shortage of money	37	34	35	17	19	18
Unusually high food prices (for consumers)	28	26	27	18	18	18
Unusually high level of crop pests and diseases	14	13	13	8	10	9
Death of working household member/head of household/spouse	12	17	15	7	9	8
Conflicts/intercommunal conflict	16	24	21	9	7	8
Unusually high prices of fuel/transport and other non-food items	7	10	9	4	7	6
Cyclones	1	2	1	6	4	5
Lack of/inadequate water	7	8	7	3	6	5
Unusual animal disease and death	11	10	11	2	3	3
Unusually low food prices (for producers)	8	9	9	3	2	2
Desert locust invasion	3	3	3	0	0	0

3.3 Reduced coping strategy index

The average reduced coping strategy index (rCSI) in the baseline was 11.6 and 9.4 in the endline, measured on a scale of 0 to 56. This indicates that the households can still afford essential food without engaging in severe coping strategies. Coping strategy index (CSI) is often used as a proxy indicator of household food insecurity. CSI is based on a list of behaviours (coping strategies). There is a decrease in the rCSI when comparing baseline with endline.

Households were asked how often they used a set of five short-term food-based coping strategies in situations in which they did not have enough food, or money to buy food, during the one-week period prior to the interview. The results indicate that for an average of 1.9 days in baseline and 1.6 days in endline the household relied on less preferred and less expensive foods. The average number of days households had to limit the portion size at mealtimes was 1.8 during baseline and 1.3 during endline, and the average number of days households had to reduce the number of meals in a day was 1.9 during baseline and 1.4 during endline.

Table 8. Reduced coping strategies

Variables	Baseline			Endline		
	Non-beneficiary	Beneficiary	Overall	Non-beneficiary	Beneficiary	Overall
rCSI	11.9	11.4	11.6	10.2	9.0	9.4
Days households relied on less preferred and less expensive foods	2.1	1.8	1.9	1.7	1.5	1.6
Days households limited portion size at mealtimes	2.0	1.8	1.8	1.4	1.2	1.3
Days consumption was restricted by adults for children to eat	1.5	1.5	1.5	1.3	1.1	1.2
Days where the number of meals in a day was reduced	1.9	1.8	1.9	1.4	1.4	1.4
Days where food was borrowed or help was relied on from friends or relatives	0.8	0.8	0.8	0.9	0.8	0.8

3.4 Food security/nutrition

Household food security exists when all the people living in the household have physical, social and economic access to sufficient, safe and nutritious food at all times that meets their dietary needs and food preferences for an active and healthy life (World Food Summit Declaration, 1996). The assessment used the Integrated Phase Classification (IPC), food consumption score (FCS), household dietary diversity score (HDDS) and the Food Insecurity Experience Scale (FIES) as some of the indicators to measure the food security status across the project areas.

3.4.1 Food consumption score

FCS is a composite score based on dietary diversity, food frequency and the relative nutritional importance of different food groups. It is calculated using the frequency of consumption of different food groups consumed by a household during the seven days before the survey. Table 9 shows the food consumption scores and FCS categories for beneficiary and non-beneficiary households for both baseline and endline. Overall, the food security status as measured by the FCS during the endline showed that 14 percent of the households had acceptable food consumption, 40 percent had borderline consumption, while the rest were in the poor food consumption category, showing slight differences from the baseline as highlighted in Table 9.

Table 9. Food consumption score

Sample type	Baseline			Endline		
	Non-beneficiary (%)	Beneficiary (%)	Overall (%)	Non-beneficiary (%)	Beneficiary (%)	Overall (%)
FCS	**32**	**30**	**31**	**29**	**30**	**30**
FCS: Poor	45	48	47	48	45	46
FCS: Borderline	35	34	35	39	40	40
FCS: Acceptable	20	17	18	13	15	14

The food consumption score (FCS) remained stable for the beneficiary groups over the two time periods. It decreased slightly for the non-beneficiary group. With respect to the three categorizations of FCS, the acceptable FCS dropped significantly for the non-beneficiary group (from 20 percent to 13 percent), but dropped marginally for the beneficiary group (17 percent to 15 percent). Both the treatment and control groups exhibited improvement in FCS, with the treatment group experiencing a more substantial positive shift, particularly in the "borderline" and "poor" categories that registered a six percent and three percent reduction respectively. It is worth noting that the food security situation in South Sudan has been gravely affected by the economic decline as evidenced by the macroeconomic crisis caused by the depreciation of the local currency and high food prices, conflict and insecurity. The situation is further exacerbated by the spillover effects of the conflict in Sudan as well as subnational and localized conflict which are disrupting livelihoods and forcing the displacement of people, recurrent climatic shocks as well as low agricultural production, resulting in the households largely consuming cereals as compared with the other food groups, which in turn affects the FCS.

3.4.2 Household dietary diversity score

HDDS is a qualitative measure of food consumption that reflects household access to various foods. It consists of a simple count of food groups that a household has consumed over the 24 hours before the survey and is meant to reflect, in a snapshot format, the economic ability of a household to access a variety of foods. Studies have shown that an increase in dietary diversity is associated with socioeconomic status and household food security (household energy availability) (Hoddinott and Yohannes, 2002; Hatløy *et al.*, 2000).

The respondents were asked to indicate the different food groups consumed by the household members during the 24 hours prior to the survey. The average HDDS across the project areas for both the project beneficiaries and non-beneficiaries was 6. This means that over the 24 hours, the households ate about six different kinds of foods (out of the 12 food groups). Over time, the HDDS remained stable.

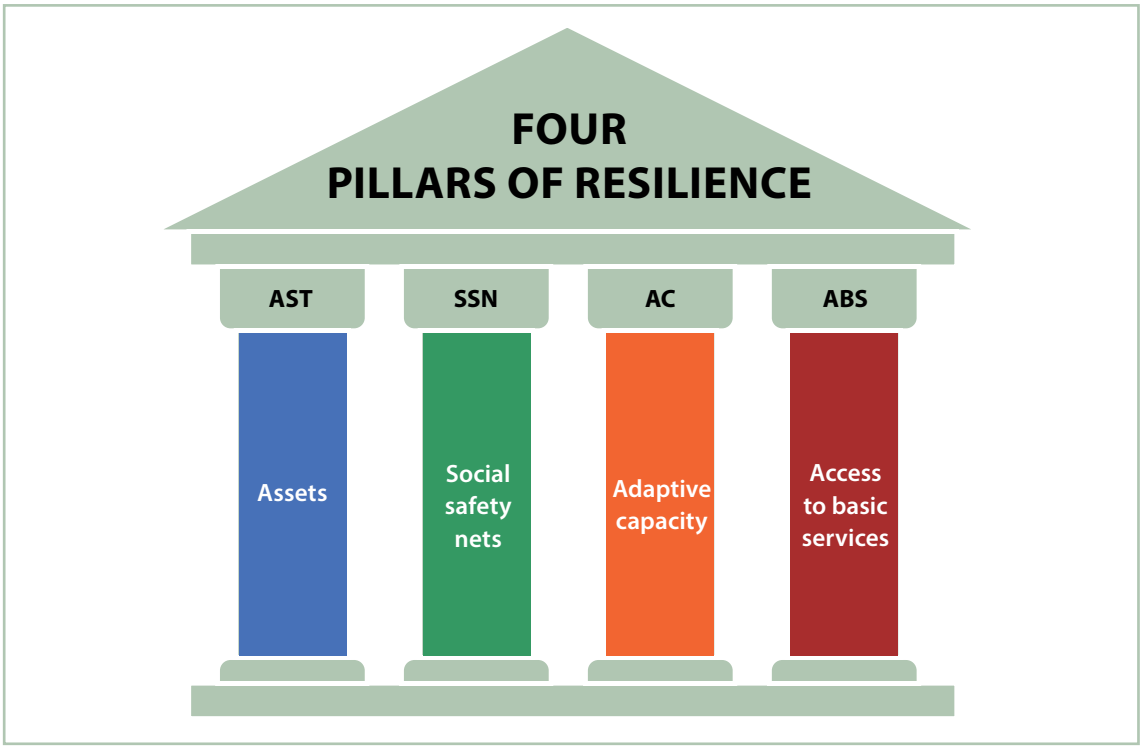
Table 10. Household dietary diversity score

Sample type	Baseline			Endline		
	Non-beneficiary (%)	Beneficiary (%)	Overall (%)	Non-beneficiary (%)	Beneficiary (%)	Overall (%)
HDDS	**5.70**	**6.17**	**6.01**	**5.85**	**5.95**	**5.91**
HDDS: Poor	37.96	29.07	32.15	33.53	26.59	28.98
HDDS: Medium	28.33	27.41	27.73	25.82	31.42	29.49
HDDS: High	33.71	43.52	40.12	40.65	41.99	41.53

3.5 Impact evaluation for selected outcomes

This section analyses the resilience capacity and structure of the households surveyed. In this section the average treatment effect of the FNS-REPRO programme on the treated households is presented. The RCI and its associated pillars are analysed, as are food security, income and use of quality seed indicators.

Each analysis consists of three steps: (i) a balance test, (ii) the statistical attribution analysis (if it is possible to statistically attribute the impact to the programme); and (iii) the evaluation of the effect size on the indicator. Two samples can be considered balanced when they do not significantly differ from each other, in other words, if there are no observable and unobservable differences that may influence the experiment's outcomes. When this is the case, a simple DiD estimator can be adopted; otherwise a matching technique (typically the propensity score matching [PSM]) needs to be employed as regressor. In this study, some imbalances were identified, hence PSM was preferred. The balance test is provided in Annex 1. The matching was obtained using a set of covariates (household size, gender of household head, education level of the household head and the county), which were selected through a Probit regression. The idea is to find enough variables that could create a propensity score which is able to pair the observations in the two subsamples of the population (for example between non-beneficiaries and beneficiaries).



The statistical attribution analysis looks at how, and if, the evaluated project/treatment has had an impact on the treated population of interest. Two aspects are considered: the statistical significance and the direction of the effect. The former assesses the statistical evidence of the impact; the latter whether the effect has been positive or negative.

Finally, the statistical meaning of the analysis needs to be completed by the economic meaning and linkage with the theory of change for the FNS-REPRO programme.

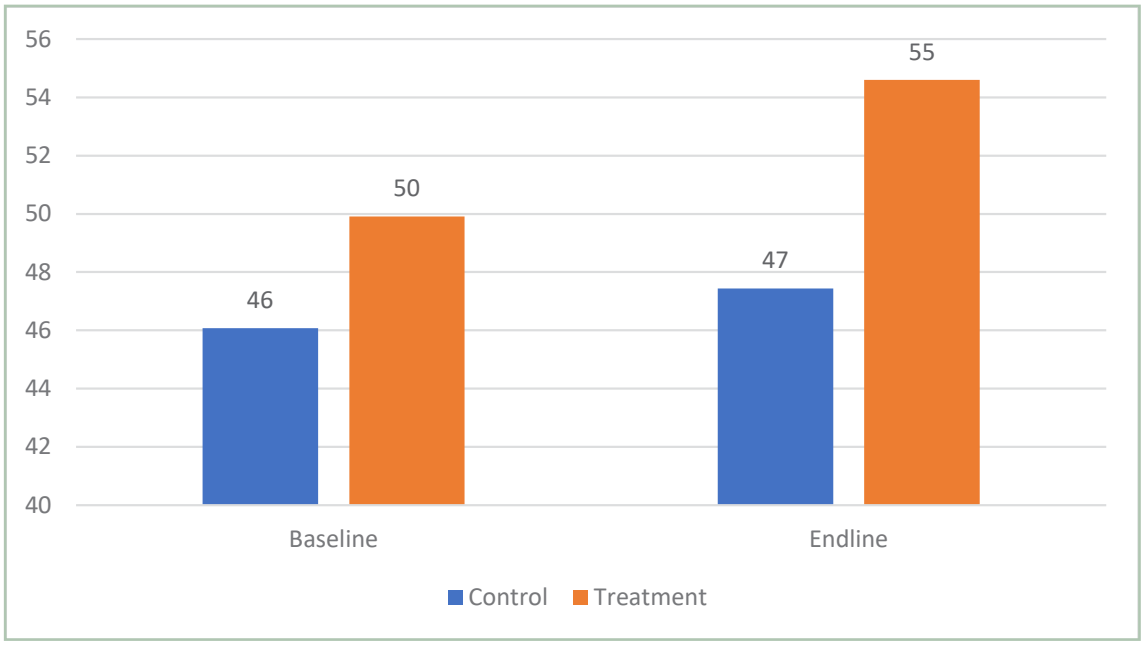
(a) Resilience capacity

This section presents the analysis of both the resilience capacity and resilience structure of the households surveyed. It uses resilience index measurement and analysis (RIMA) methodology developed by FAO, which systematically explores the relationship between a core set of context-specific variables of resilience to construct the RCI based on the four pillars of resilience – assets (AST), social safety nets (SSN), adaptive capacity (AC) and access to basic services (ABS). The RCI measures a household's capacity to withstand stresses and shocks that have long-lasting effects.

The RCI provides a useful baseline to (a) inform/support targeting decisions, as it can be used as a ranking tool to identify households that are most at risk; (b) identify the specific weaknesses (or negative coping mechanisms) that increase vulnerability; (c) explain how much each pillar contributes to resilience capacity and how each observed variable contributes to its pillar; and (d) assess the impact of the project on household resilience. It is with this information that the theory of change, targeting and implementation strategy can be examined to contribute to adaptive management and the indicators of the project can be assessed.

The RCI was estimated for the pooled data. Figure 6 presents the estimated RCI values for both beneficiaries (treatment) and non-beneficiaries (control) at baseline and endline. Among the non-beneficiary households, the RCI increased by 1 point, while for the beneficiary group the RCI increased by 5 points.

Figure 6. Estimated RCI values for control and treatment at baseline and endline



The RCI is a composite index that captures the four diverse pillars and a single programme/project might not impact fully on all four pillars. This analysis set out to evaluate the impact of the FNS-REPRO project on the RCI as well as the individual pillars. A PSM estimator was employed for the RCI and each of the pillars. The output is shown in Table 11.

The overall RCI reported a significant positive impact with a change of 3.95 points. Looking at the individual pillars, the AC and SSN pillars reported a significant and positive impact with a change of 4.7 and 4.9 points respectively. The AST and ABS pillars did not show any significant change. The AC pillar is made up of several income sources in which the household is participating, crop diversification, inverted dependency ratio, capacity building and training accessed, household head education level and ability to write. For the AC pillar, the observed variables driving the change are access to training, the number of crops the households are producing and income diversification. The SSN pillar is made up of access to formal and informal transfers, and the number of associations/groups that the household is participating in. For the SSN pillar, the main driving variable is participation in groups and associations.

Table 11. PSM estimator for the resilience capacity index

ATE	Coef.	Std. Err.	z	P-value
RCI	3.949	.658	6.00	0.000
ABS	-0.592	.579	-1.02	0.307
AST	0.191	.387	0.49	0.621
SSN	4.919	.963	5.11	0.000
AC	4.701	.792	5.93	0.000

The economic meaning of this finding is that the effect of the interventions of the FNS-REPRO programme led to an increase in resilience capacity as shown through the positive impact on RCI. This confirms the theory of change of the programme, which is aimed at increasing the resilience capacity through improved inclusive access and management of local natural resources and improved livelihood and income opportunities along the seed value chain. From these perspectives, a strong change was expected in the adaptive capacity pillar and assets pillar.

(b) Food security

Table 12 presents PSM estimator results for the FCS and HDDS. The project was reported to have a positive impact on both FCS and HDDS. However, only the impact on HDDS was significant. FNS-REPRO in South Sudan was aimed at increasing food security in two ways. First, by increasing crop production and natural resource management through improved access to quality seeds and sustainable production and utilization of natural resources, which in turn leads to more income which can be used to purchase more diversified foods. Secondly, by enhancing the knowledge, skills and capacity of local communities around nutrition-sensitive livelihood support.

Table 12. PSM estimator results for the food consumption score and household dietary diversity score

ATE	Coef.	Std. Err.	z	P>z
Food consumption score (FCS)	0.031	0.688	0.040	0.964
Household dietary diversity score (HDDS)	0.271	0.149	1.820	0.069

(c) Quality seeds

Figure 7 presents the percentage of households that used quality seeds for crop production for both beneficiary (treatment) and non-beneficiary (control) households at baseline and endline. There was an overall improvement in the use of quality seeds from baseline to endline.

Figure 7. Percentage of households that used quality seeds

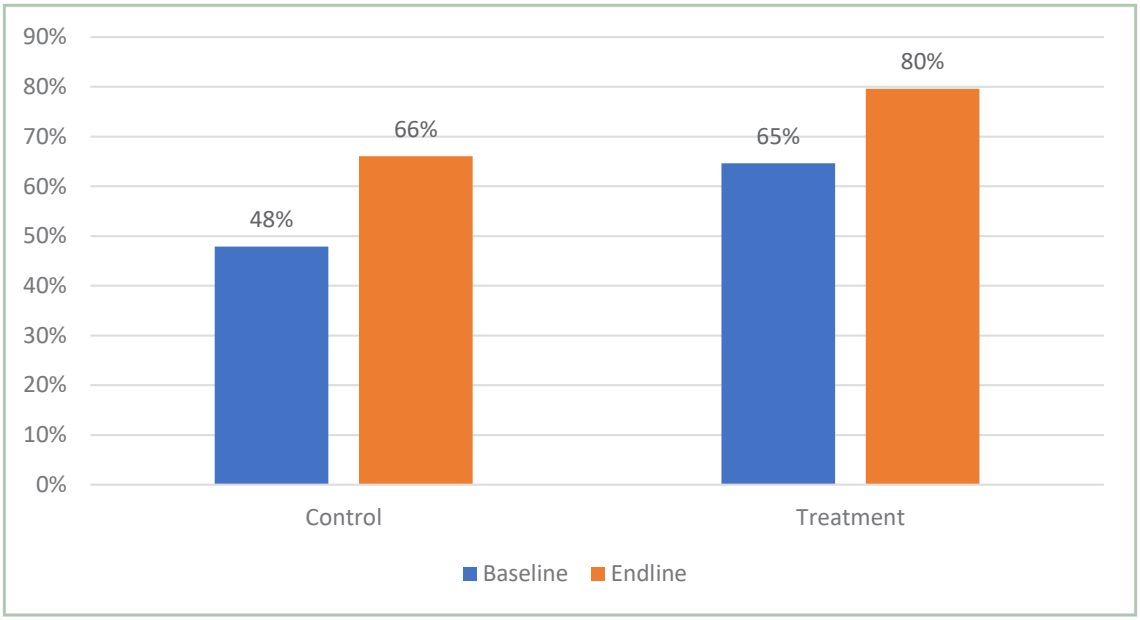


Table 13. PSM estimator results for percentage of households using quality seeds

ATE	Coef.	Std. Err.	z	P>z
Percentage of households using quality seeds	0.106	0.025	4.20	0.000

Table 13 presents PSM estimator results for the percentage of households reported to have used quality seeds during the cropping season preceding the survey. The project's significant and positive impact (11 percent) was reported on the percentage of people using quality seeds. The increases in the use of quality seeds by the non-beneficiary group can be attributed to spillover effects as well as cross-learning and social market activities such as seed fairs, which usually cover a wide area and are open for attendance by any interested farmer in a region.

FNS-REPRO in South Sudan aimed to address the constraints to accessibility, availability, affordability and quality of seeds of adapted varieties through an integrated seed system approach. This was intended to provide quality seeds throughout the year and increase crop production.

Access to quality seeds varies according to crop type. Table 14 presents access to quality seeds by type disaggregated by beneficiary type. Only sorghum and maize crops have access to quality seeds among over 50 percent of the households. Farmers do not have access to quality green gram seeds. It is important to note that the FNS-REPRO project supported seed producer groups with foundation seed of major and widely grown crops such as maize and sorghum. Other crops such as cowpea, groundnuts, green gram, vegetable seeds, cassava cuttings and sweet potato vines were provided only to specific locations where the crop is preferred by the community and adapted to the prevailing environment.

Table 14. Access to quality seeds

Access to quality seeds	Non-beneficiaries (%)	Beneficiaries (%)	Overall (%)
Access to any quality seed	56	83	73
Access to quality sorghum seeds	41	67	58
Access to quality maize seeds	33	57	50
Access to quality green gram seeds	3	6	5
Access to quality cowpea seeds	8	21	17
Access to quality groundnut seeds	27	40	35
Access to quality cassava cuttings	7	16	13
Access to quality sweet potato vines	6	13	11
Access to quality vegetable seeds	17	27	24

Table 15 presents self-reported germination rates for the crops planted during the survey period covered in the endline study.

Table 15. Germination rates

	Germination rate			
	0%–25%	25%–50%	50%–75%	75%–100%
Bor South	1%	3%	59%	37%
Jur River	7%	15%	28%	50%
Magwi	2%	2%	35%	60%
Nzara	26%	23%	30%	21%
Torit	3%	24%	36%	37%
Wau	8%	17%	21%	54%
Yambio	5%	18%	37%	40%
Total	**7%**	**15%**	**35%**	**43%**

(d) Income

Table 16 presents PSM estimator results for the various income sources – overall income, income from crop production and income from livestock production. Positive and significant impacts of the project on both overall income and income from crop production were reported. There was an increase of SSP 7 898 and SSP 3 030 in overall income and income from crop production respectively. A positive but insignificant impact on income from livestock production was reported. FNS-REPRO in South Sudan aimed to boost income by increasing crop production and natural resource management through quality seeds and diversification of income within different crop value chains. However, most farming communities in South Sudan are agropastoralists who make use of their animals for ploughing and to provide manure for their crops, while the animal feeds on the leftover straw on the farm after harvesting. Although the FNS-REPRO project in South Sudan was not contributing directly to livestock production, livestock is an important asset contributing to the improved nutrition, income and livelihoods of the communities.

Table 16. PSM estimator results for the various income sources

ATE	Coef.	Std. Err.	z	P>z
Overall income	7 898	3 185.5	2.480	0.013
Income from crop production	3 030	1 895.9	1.680	0.090
Income from livestock production	1 181	2 145.7	0.550	0.582

Table 17 presents changes in income (in SSP) from different sources between baseline and endline disaggregated by beneficiary type.

Table 17. Changes in income from various sources

	Baseline*		Endline*	
	Non-beneficiaries	Beneficiaries	Non-beneficiaries	Beneficiaries
Overall income	56 675	60 500	76 938	89 136
Employment	23 296	21 493	18 212	21 537
Skilled labour	11 292	11 305	20 600	23 430
Agriculture-related casual labour	17 006	17 824	26 292	28 876
Petty trade	32 773	27 624	26 311	28 375
Sale of charcoal and firewood	22 487	18 648	27 056	31 969
Sale of wild fruits	12 619	10 077	11 960	16 695
Sale of agricultural produce	26 062	26 127	48 593	54 752
Sale of livestock and related products	15 443	12 815	40 495	36 413
Sale of fish	10 548	10 850	24 900	17 239

* IN SSP

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4. CONCLUSION

This chapter presents the implications for future programming as elucidated from the findings of this report. It is important to note that the Horn of Africa has continued to be affected by the number and intensity of shocks, both natural and human-induced. Some of the shocks cover the entire Horn of Africa while others are country specific. Topping the list are conflict, climate extremes and economic shocks. These shocks were recurrent during the period when the FNS-REPRO project was being implemented. COVID-19 and its after-effects also weighed in on many households during the FNS-REPRO implementation period. In South Sudan, multiple shocks continue to undermine the efforts being made to attain food security. Such shocks include persistent sporadic conflict, inflation, persistent flooding, high food and basic commodity prices and increased pressure on already stretched basic services caused by people arriving in South Sudan after fleeing militarized conflict in neighbouring Sudan.

The FNS-REPRO project is aimed at providing solutions that lessen the impact of these shocks through the seed sector. While farmers in South Sudan have continued to produce crops in challenging contexts, the production has been sub-optimal, with one of the main obstacles being the shortage of quality seeds and planting materials. This has resulted in low yields and a reduction in capacity to produce enough food for their family consumption and market sales. The FNS-REPRO project focused on closing the cereal production gap, while ultimately providing more diversified products for local, national and export markets.

In this study, a rigorous impact evaluation of the FNS-REPRO project was undertaken. The design of the study compared similar beneficiary and non-beneficiary households before and after the start of the programme to extract the causal impact of receiving support in increasing crop production, use of quality seeds, enhanced food security and income diversification.

Against this backdrop, the project was successful in reaching the target households, providing timely support and realizing both short-term and long-term positive impact on resilience, food security and improved livelihoods. Specifically, the project increased the overall resilience capacity index of the households, which, in the absence of the intervention, would have been worse off given the various shocks affecting the Horn of Africa.

The overall RCI reported a significant positive impact with a change of 3.95 points. Looking at the individual pillars, the Adaptive capacity and Social safety nets pillars reported significant and positive impacts, with a change of 4.7 and 4.9 points respectively. The Adaptive capacity and Social safety nets pillars of resilience received the highest positive impact from the project. This result responds to learning question 1 (LQ1): *To what extent are households better able to withstand and recover from shocks and stressors as a result of FNS-REPRO?* This showed that the beneficiaries of the FNS-REPRO project coped better with the shocks and stressors, and hence their resilience capacity was strengthened, compared to the non-beneficiaries.

FNS-REPRO aimed to address the persistent constraints related to the accessibility, availability, affordability and quality of seeds of adapted varieties using an integrated seed system approach. The percentage of households that reported using quality seeds and planting materials during the cropping season preceding the survey experienced a significant and positive impact (11 percent). The percentage of farmers using

quality seeds improved remarkably for those planting maize and sorghum, while it was still low for other crops such as vegetables, green gram, cowpeas, groundnut, cassava cuttings and sweet potato vines. The self-reported germination rates for the different crops varied according to location, with Nzara reporting the lowest germination rates of <50 percent and the other counties reporting germination rates of >50 percent. While the uptake and use of quality seeds have improved, more advocacy and support are required to increase the uptake across the different crop varieties and locations.

The contribution of the FNS-REPRO project in improving food security of households in the target community is notable. The project's positive impact was reported on both the food consumption score and the household dietary diversity score. However, only the HDDS impact was significant. The FNS-REPRO project increased the food security of households in the target areas in two ways. First, by increasing crop production through quality seeds and more income from the diversified sources of income which can be used to purchase food. Secondly, by enhancing the knowledge, skills and capacity of local communities around nutrition-sensitive livelihood support. This finding provides evidence for learning question (LQ I4): *To what extent is there improved food and income security as a result of FNS-REPRO?*

The FNS-REPRO programme has played a key role in increasing the accessibility, availability, affordability and quality of seeds and planting materials of adapted varieties, boosting farm yields and increasing food production for smallholder farmers in South Sudan. However, there is still more to be done as highlighted in the recommendations.

Recommendations

An improvement was observed in the resilience capacity of the households in the FNS-REPRO target areas. The observed improvement in resilience was more evident in the Adaptive capacity and Social safety net pillars, with minimal impact on the Access to basic services pillar and Assets pillar. This shows that there is a need to design bigger and more encompassing packages of interventions that can cover at least three of the pillars at once to provide more effective change in the resilience capacity of target households.

Investment in quality seeds is important in enhancing crop productivity, crop diversification and the food and nutrition security of households. From the results it was evident that through the support of FNS-REPRO, households that were involved in the project had higher access to quality seeds with improved germination rates. There is still more to be done:

a Firstly, there are differentials in access to quality seeds and planting materials by crop type. Greater achievements have been made in sorghum and maize but other crops such as vegetables, green gram, cowpeas, groundnut, cassava cuttings and sweet potato vines are still lagging.

b Secondly, some quality seeds and planting materials might be available, but their supply might not be to scale to meet the ever-growing demand of smallholder farmers. To this end there is a need to continue supporting seed production capacity through community-led groups and certified private sector agencies.

c Thirdly, the distribution of such quality seeds is severely affected by poor infrastructure, including transport and storage.

d Finally, there is a need to support the government to develop strong policies and regulations for the production, storage, distribution and use of seed and planting materials.

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Annexure

Annexure 1: Balance test at baseline

var	mean1	N1	mean2	N2	mean diff	pvalue
Household size	7.56	353	7.42	661	0.14	0.49
Household head can read & write	0.50	353	0.50	661	-0.01	0.87
Average education for household head	4.47	353	4.15	661	0.32	0.32
Household head age	40.53	352	39.30	661	1.23	0.10
Cultivated land	1.15	353	1.16	661	-0.01	0.89
Experienced drought	0.18	353	0.24	661	-0.06	0.02
Experienced flood	0.24	353	0.22	661	0.01	0.64
Experienced conflict	0.16	353	0.24	661	-0.07	0.01
Safe water	0.58	353	0.56	661	0.02	0.49
Safe toilet	0.52	353	0.45	661	0.07	0.03
Improved cooking energy	0.10	353	0.09	661	0.01	0.46
Agric. assets index	0.14	353	0.14	661	-0.01	0.23
Tropical livestock units	0.88	353	0.82	661	0.06	0.68
Access to credit	0.19	353	0.25	661	-0.06	0.03
Access to informal transfers	0.22	353	0.20	661	0.02	0.53
Access to formal transfers	0.70	353	0.79	661	-0.09	0.00

This document forms part of a series of FNS-REPRO resilience baseline and endline analyses prepared by the Food and Agriculture Organization of the United Nations (FAO) in South Sudan and the FAO Resilience Team for Eastern Africa.

The series provides programming and policy guidance to FNS-REPRO actors, policymakers, practitioners, United Nations agencies, non-governmental organizations and other stakeholders by identifying the key factors that contribute to the resilience of households in food insecure countries and regions.

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