LASER PULSE

**Long-term Assistance and Services for Research (LASER)
Partners for University-Led Solutions Engine (PULSE)**

SOUTH SUDAN MULTI-YEAR EMERGENCY (MYE) ACTIVITY IMPACT EVALUATION

Baseline Report

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Delivering Practical, Research-Driven Solutions to Global Development Challenges

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ABOUT LASER PULSE

LASER (Long-term Assistance and Services for Research) PULSE (Partners for University-Led Solutions Engine) is a five-year, $70M program funded through USAID's Innovation, Technology, and Research Hub, that delivers research-driven solutions to field-sourced development challenges in USAID partner countries.

A consortium led by Purdue University, with core partners Catholic Relief Services, Indiana University, Makerere University, and the University of Notre Dame, implements the LASER PULSE program through a growing network of 2,700+ researchers and development practitioners in 61 countries.

LASER PULSE collaborates with USAID missions, bureaus, and independent offices, and other local stakeholders to identify research needs for critical development challenges, and funds and strengthens the capacity of researcher-practitioner teams to co-design solutions that translate into policy and practice.

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Delivering Practical, Research-Driven Solutions to Global Development Challenges

ACRONYMS

BHA	Bureau for Humanitarian Assistance
CARB	Complementary Action for Resilience Building in South Sudan (CARB)
CMDRR	Community Managed Disaster Risk Reduction
CFW	Cash for Work
DRC	Danish Refugee Council
FAO	Food and Agriculture Organization
FCS	Food Consumption Score
FEWS NET	Famine Early Warning Systems Network
FSNMS	Food Security and Nutrition Monitoring System
GEWLP	Gender Empowerment and Women Leadership Program
HHS	Household Hunger Score
IDP	Internally Displaced Population
IRB	Institutional Review Board
KII	Key Informant Interviews
LASER PULSE	Long-term Assistance and Services for Research, Partners for University-Led Solutions Engine
MAD	Minimum Acceptable Diet
MYE	Multi-Year Emergency
NGO	Non-Governmental Organization
NRC	Norwegian Refugee Council
RAN	ResilientAfrica Network
RCT	Randomized Controlled Trials
RFSA	Resilience Food Security Activity
RRC	Relief and Rehabilitation Commission
ToC	Theory of Change
TVET	Technical and Vocational Education and Training
UN	United Nations
UND	University of Notre Dame
UNHCR	United Nations High Commissioner for Refugees
USAID	United States Agency for International Development

VSLs	Village Savings and Loans
WFP	World Food Program
WASH	Water, Sanitation and Hygiene

Executive Summary

USAID/BHA funded a Multi-Year Emergency (MYE) Activity for the period of 2021-2023 with the objectives of mitigating the impact of shocks, preventing the erosion of household assets and livelihoods, and accelerating recovery in South Sudan. The intervention will contribute to the future resilience of affected households and communities. Complementary Action for Resilience Building in South Sudan (CARB), led by the Norwegian Refugee Council (NRC), is leading the implementation of MYE Activity in Western Bahr EL Ghazal and Unity states. Some of the major activities under CARB include agriculture training, vocational training, enterprise development activities, saving and lending group support activities, essential nutrition support services, cash/food vouchers, and health and hygiene activities.

To measure the impact of MYE Activity rigorously a Randomized Control Trial (RCT)-based impact evaluation was designed in which some villages in CARB program areas were assigned to Control (not receiving interventions) and Treatment (receiving interventions). However, both the Treatment and Control villages had access to life-saving emergency relief when it was needed, and the activities that were randomized were more supplemental activities. Baseline data to construct indicators was collected in October-November 2021. This report presents the results of the baseline survey.

The evaluation team for this study, comprised of University of Notre Dame, ResilientAfrican Network, and Gender Equity Women's Leadership, identified 169 villages to be included in the RCT design; 85 assigned as Treatment villages and 84 to Control villages from three counties in Mayom, Rubkona, and Wau. To maintain the power of the study, we estimated the design needed a total of 150 villages (75 Treatment and 75 Control). However, an additional 19 villages were selected to buffer the possible loss of samples due to unforeseen circumstances (e.g. violence, floods, etc.) during the period of this evaluation.

The indicators determined for the MYE Activity evaluation were limited to a selection of standard USAID resilience and food security indicators to minimize the time burden on respondents during data collection. The households have limited time to sit for a long interview because of ongoing emergencies in CARB program areas. The evaluation team, in consultation with BHA, selected 20 key indicators to measure CARB impacts. The survey included 8 modules in addition to demographic variables.

For the baseline, we completed surveys in150 villages (Mayom: 67, Rubkona: 45, and Wau: 38). In addition, 21 key informant interviews were also completed to capture the general context in evaluation areas. Conflict and flooding precluded the ability of the survey team to survey 19 villages. As a result, we had to drop these villages from the sample. Coincidentally, we had oversampled 19 villages to provide the buffer. The enumerators surveyed a total of 3,442 households—1,672 Control and 1,770 Treatment villages. A balance test was conducted to assess the baseline situation in Control and Treatment villages. The result shows the Treatment and Control villages are similar for the selected covariates. This confirms that our Control and Treatments villages are statistically similar.

We also estimated the baseline values for indicators before implementing CARB Activity. We corrected the non-response error by creating a weights variable. The estimated indicator values serve as the benchmarks for estimating the impact of CARB Activity. Results from the t-test, comparing the indicators' values by Control and Treatment villages, confirm that both Control and Treatment villages were statistically similar for these measures. The CARB's Theory of Change outlines several activities

geared toward improving the lives of people participating in MYE Activity as measured by the indicators over the project's life. This evaluation entails baseline and endline surveys. This report comprises only the findings from a baseline survey done in 2021. A final report will be prepared when we conduct an endline survey in 2023.

Based on the baseline survey of 3,442 households conducted from 27th Oct 2021 to 30th November 2021, a few key findings are:

- The main outcome of interest for this evaluation was the Food Consumption Score (FCS), as we used this score to estimate the power of the study. Considering the FCS score, most surveyed households in Control and Treatment villages met the threshold for acceptable food consumption. In our estimation, we use a poor FCS of 55% to estimate the power. The baseline result shows the poor FCS to be at 23.7%. This means that the power calculation for the endline survey needs to be reevaluated and accordingly updated.
- Forty-three percent (43%) of households had severe Household Hunger Scores (HHS), which indicates nearly half of the population is going through hunger. Only about 12% of children that are 6 months to 24 months old met minimum acceptable diets, and about 45% of children below 6 months were exclusively breastfed. These figures indicate both 0-6 months and 6-24 months old children are not getting enough nutritious food for their growth. These values are consistent with the reports prepared by various agencies in South Sudan.
- Less than one-third of surveyed households had access to seeds, limiting their ability to grow crops during planting seasons. Only about a quarter of households that grow crops use improved agricultural practices.
- Surveyed households had minimal options for income, suggesting limited opportunities to diversify income sources for livelihood. Both bridging and linking social capital indices were at a lower level—indicating poor networks and connections within and beyond the communities. Further, very few households trusted that the local government could help them when in need.
- Most households had poor access to financial services. This was also reflected in the percentage of farmers accessing production loans. Also, the surveyed households had low civic engagement as the percentage of households with membership in any community-based organizations was shallow.
- A low level of gender empowerment was reflected for women's poor participation in household-level decision-making. This suggests that if there are no policy interventions aimed toward empowering women, the marginalization of women will continue.
- Very few households interact with people from other ethnic groups, even though such interactions are likely to be important to build trust, improve social cohesion, restore peace, and ultimately build community-level resilience and coping mechanisms.
- Less than five percent of households had a handwashing facility with water and soap.

Key information interviews provided additional information and context of how shocks and stresses (particularly flooding) exacerbated their challenges. Mass flooding was often noted as the driver of displacements, crop failures, increased diseases, and reduced access to market products and employment opportunities. In response to these shocks and stresses, interview participants referenced several coping strategies employed by people in the area. The most referenced coping strategies were migration (to flee either flooding or conflict) or selling livestock.

There was alignment between the survey results and key informants' information on food security situations in CARB Activity areas. People in the area surveyed experienced severe instances of hunger and food insecurity. The population frequently depends on food aid to survive. In most cases, food insecurity was referenced in terms of a lack of food availability. Food security was often referenced in relation to children in the community. Interview participants often referred to the nutritional status in their areas as so severe that children had no food to eat and were unable to go to school.

Recommendations

Programmatic

- The baseline value of some indicators capture dire situations in program areas, especially on ongoing hunger and the availability of nutritious foods for infants and children. Addressing these issues is of utmost importance for the concerned authorities.
- Increasing agriculture production is the most plausible and sustainable method to improve food and nutrition problems due to the surveyed household's high dependence on agriculture. Ensuring the availability of seeds and providing new technologies for crop production and livestock is key.
- Very few households trust the local government to help them when in need. Understanding the factors of why households don't trust government officials will be important before designing any program to help build partnership, buy-in and support.
- The households in the survey area have poor access to financial services. As such, farmers have poor access to production loans from financial institutions. This limits the opportunity for investing in productive enterprises if people want to get a loan. A further investigation may be helpful to understand the factors contributing to limited access and use of financial services.
- The level of women's participation in decision-making at the household level is alarmingly low. It is imperative to better understand the cultural barriers and identify appropriate ways to make MYE Activity more inclusive.
- The share of households who interacted with other ethnic groups was very small. Providing regular interaction and networking opportunities among people of different ethnic groups may help build trust and improve social cohesion and coexistence.
- Less than five percent of households had a handwashing facility with water and soap during the survey. The first step to promote handwashing practice is to increase awareness and educate the importance of health and hygiene.

Evaluation

- The baseline indicators for the overall program evaluation were estimated before the CARB Activity in program areas. To estimate the impact of CARB, it is important to implement all the planned activities in the program area from now onwards. We plan to implement an endline survey in 2023, which will be after the completion of CARB Activity in target areas. Any problems in implementing the activities in any geographic area should be documented and reported to the evaluation team.
- While implementing the activities, all planned RCT-related activities should be limited to Treatment villages. Any spillover of the input/technology to Control villages may complicate the evaluation. Any known such issues should be documented and reported to the evaluation team.

- For the end-line survey, there is a need to conduct a security evaluation before sending survey teams to implement the end-line survey, particularly in Wau county. It is not advisable to proceed with a survey while conflict occurs in the area.
- Flooding in Mayom has caused widespread displacement of locals. This also limited CARB's ability to implement the program, given the fact the local people are not in their original places. According to the CARB team, most of them live in IDP (internally displaced peoples) camps, with little chance of providing program activities. Updating the CARB plan for Mayom will allow the evaluation team to readjust our research design.
- High attrition of sampled households might have an impact on the power of the study. It is important to assess the situation before the endline to find how much attrition we can expect in the sampled villages to develop a strategy to address the issue during the survey and analysis.

Background

USAID's Bureau for Humanitarian Assistance (BHA) released a pilot multi-year emergency (MYE) opportunity in South Sudan in 2020 under the premise that longer-term emergency interventions in certain circumstances can help populations move beyond relief assistance to longer-term recovery. The objectives of MYE Activity were to mitigate the impact of shocks, prevent the erosion of household assets and livelihoods, and accelerate recovery—contributing to the future resilience of affected households and communities. Hence, MYE Activity can provide a critical link between humanitarian and development programs.

South Sudan's need for emergency humanitarian support from the international community has persisted since independence in 2011. The continued civil war and communal violence, disease outbreaks, and frequent environmental shocks (such as floods) may further increase the need for emergency assistance over the coming years. At the same time, continued financial support in humanitarian assistance may not be a sustainable method to recovery. However, recent work in resilience cited by USAID shows that "with sustained investment and the right approach, each dollar invested in resilience and early response can yield nearly three dollars in reduced humanitarian spending and avoided asset losses" (USAID/South Sudan Strategic Framework 2020-2024, p. 3). Given this evidence, BHA seeks alternative approaches in South Sudan, aiming to carefully lay the foundation for self-reliance and reducing high levels of humanitarian need that cannot be met sustainably and indefinitely. Robust evidence to support this shift in funding and programming in the humanitarian context is needed.

To measure the impact of MYE intervention rigorously, an impact evaluation based on a Randomized Controlled Trial (RCT) was designed in which some villages in MYE Activity areas are randomly assigned to Control (not receiving activities) and Treatment (receiving MYE activities). Noteworthy, no life-saving component of the emergency relief was included in the RCT as both the Treatment and Control villages had access to life-saving emergency relief when it was needed; thus, the randomized activities were more complementary activities, e.g., capacity building through training, extension services, and strengthening the agricultural market system (see **Table 1**). Baseline and endline surveys are planned for using panel data in impact estimation. Baseline data to estimate indicators were collected in October through November 2021. This report presents the results of the baseline study.

Table 1: List of Interventions in Control and Treatment villages

Interventions	Treatment villages	Control villages
Interventions in both Control and Treatment		
Food distribution by WFP in all villages of Unity and Western Bahr EL Ghazal	√	√
School feeding in Unity and Western Bahr EL Ghazal states	√	√
Nutrition centers treatment of malnutrition in all villages in Mayon	√	√

Interventions in Treatment only		
Training on resilient nutrition sensitive agriculture and fishing practices	√	
Establishment of kitchen demo gardens	√	
Establishment of community and household storage facilities	√	
Complementary inputs to build on FAO/WFP pipelines supplies	√	
Training on post-catch management of fish and post harvest management of crops	√	
Supporting in seed multiplication (input and training)	√	
Establishment and training of village loan and saving associations (VSLA)	√	
Gender based violence and risk mitigation measures training	√	
Provision of grant to support small business/enterprises	√	
Market support including farmers market associations establishment	√	
Establishment and training of community disaster management committee	√	
Community safety action plan implementation	√	
Intra- and inter- community dialogues on conflict resolution, peaceful coexistence events	√	
Short term in kind, cash and complimentary assistance provided to households	√	
Nutrition education Promoting diversification of nutrient dense crops and animal husbandry	√	

Although the full scale implementation begins after the baseline, following activities were started by the time of baseline data collection:

- Training of households and communities on resilient nutrition sensitive agricultural and fishing practices
- Supporting development of kitchen demo gardens (including training and provision of complementary input for demo gardens)
- Complementary inputs to build on FAO/WFP pipelines supplies distribution to households
- Youth mobilization to engage in livelihood opportunities through TVET
- Establishing and training of savings groups - Village Loan and Saving Association (VSLA)[1 VSLA 25 members]
- Formation of CMDRR committee
- Establishment of care support groups for optimal nutrition behaviors and diet
- Facilitatitation of cooking demonstrations to care groups

Review of Prior Studies

Research examining the impact of humanitarian programming on nutrition and food security is limited, with few systematic reviews and experimental/quasi-experiment impact evaluations conducted to date. In a scoping review of impact evaluations in the humanitarian sector, Clarke et al. find that "most areas in the humanitarian sector suffer from a paucity of evidence." The authors note studies that show a causal relationship between assistance and changes in target results are notably lacking (Clarke et al., 2014).

One area that has been well studied is health and nutrition. A scoping review of nutrition responses and outcomes for infants and young children during times of crisis found that crisis-related intervention positively affected nutrition-related knowledge and practices (Marshall et al., 2021). Another area that has been well studied is cash transfers. Van Daalen et al. conducted a mixed-methods systematic review of the impact of cash transfers on health outcomes and usage of health services in a humanitarian setting. Of the 34 articles selected, 19 reported positive impacts, 11 reported no statistically significant impact, and 4 reported potential negative impacts on health outcomes (van Daalen et al., 2022).

There is qualitative evidence of humanitarian intervention positively impacting nutrition, food security, and resilience. An evaluation of UNHCR's livelihood program in South Sudan from 2016-2018 found "that livelihood projects are favorably perceived by PoC (persons of concern)" and that qualitative survey evidence suggested these programs have increased income, access to food and non-food items, and access to markets. The report also notes that Village Saving and Loans Associations (VSLAs) have "helped participants diversify their income and build social capital with other participants" (Frankenberger et al., 2019).

A study of FAO's Cash for Work (CFW) interventions implemented after the 2011 crisis in Somalia yielded similar results. The study found that communities expressed "a positive assessment of cash-based interventions for the freedom of choice they offer" and for "short and long term gains it guarantees."

The study reported increased preferred food consumption and the reduction of negative coping strategies affecting household nutrition (FAO, 2013).

A study conducted by Tufts University's Feinstein International Center provides evidence of the impact of humanitarian interventions on household child nutritional status. The study examined a Concern Worldwide program in Chad which combined nutrition and WASH programming with food, income, and markets programming. Controlling for child, household, and settlement characteristics, the study found that both being in the intervention and moving into an intervention receiving area was significantly correlated to better household child nutritional status (Marshak et al., 2016).

There is evidence to support the positive impact of humanitarian programming on nutrition and food security outcomes on a case-by-case basis. However, the specific mechanisms of impact are less established.

Overview of the Baseline Study

The baseline study was planned to capture baseline values for various indicators, which will be used to measure the impacts of MYE Activity in South Sudan once it ends in 2023. During the preparation of the research design, the research team worked with the implementing partners, led by the Norwegian Refugee Council (NRC). Together the teams confirmed the precise geography and interventions for the evaluation and defined the Treatment and Control groups.

Complementary Action for Resilience Building in South Sudan (CARB), led by NRC, implements various program activities to improve food security and resilience in households and communities in South Sudan. The major activities include agricultural training, vocational training, enterprise development activities, saving and lending group support activities, essential nutrition support services, cash/food vouchers, and health and hygiene activities (See Theory of Change map in Annex).

The Theory of Change (ToC) of CARB Activity states that

- If households have increased food production and access to livelihood opportunities through resilience design systems then it helps to restore productive agroecosystems and improve their nutrition and well-being, and
- If they are buffered from extreme events related to climate and weather, and if humanitarian response mechanisms are strengthened, and if social cohesion is improved, and the political, security and protective environment remain conducive, then the households will be more resilient to shocks and stressors and have improved food and nutrition security.

Specifically, the project aims to address the following goal: Improved food and nutrition security in Western Bahr El Ghazal and Unity States through adding value to existing resource pipelines that are transferred from WFP, FAO, etc.

Working with NRC and its implementing partners, the research team understood the criteria to identify the target villages and determine intervention areas and random assignment to Treatment or Control status. The main objective of this baseline data collection is to construct baseline values for all 20 indicators and test for pre-Treatment balance between Treatment and Control villages.

MYE Evaluation Objectives

Given the multi-year nature of the Activity, the expected outcome of the MYE is improved food and nutrition security with improved resilience at household and community levels. Particularly, the following questions will be answered by this evaluation:

1. What are the impacts of the Activity on household food and nutrition security?

2. What are the impacts of the Activity on households' ability to mitigate and recover from conflict or climate-related shocks and stresses?

3. What are the impacts of the Activity on building community resilience?

4. What value does the multi-year emergency activity add compared to a typical approximately 12-month activity?

5. What are the added advantages of layering MYE Activity with other USAID emergency, non-emergency, and resilience activities?

6. Is MYE Activity cost-effective?

Led by the University of Notre Dame (UND), this evaluation brings experts from Makerere University's ResilientAfrica Network (RAN), and the Gender Empowerment and Women Leadership Program (GEWLP) in South Sudan to develop an impact evaluation plan and implement it. The UND/RAN/GEWLP team coordinated with the USAID South Sudan Mission and the implementing partner to collaboratively plan the data collection process. This included pre-testing and finalizing data collection instruments, and identifying the ideal time for enumerator training and data collection to precede the start of MYE Activity as quickly as possible.

Methodology and Limitations

Study Design

The evaluation will be completed through a rigorous randomized controlled trial (RCT) of the USAID/BHA-funded multi-year emergency activity. Consistent with the design of an RCT, the Treatment and Control villages were randomly assigned by the evaluation team from a list of eligible villages provided by the implementers, the CARB consortium, after a long period of consultation between both sides.

This impact evaluation will focus on establishing causality and attribution of the MYE Activity. To estimate the impact of a program on outcomes, an impact evaluation must estimate the counterfactual. That is, what the outcome would have been for program participants if they had not participated in the Activity. In practice, this requires the identification of an identical comparison group to estimate what would have happened to the participants without the Activity, versus a Treatment group that has received the Activity. Random assignment of the Treatment is considered the gold standard of impact evaluations as this helps create a counterfactual group (Control) that is statistically indistinguishable from the treatment group. It uses randomization to assign who is granted access to the Activity and who is not. Under randomized assignment, every eligible unit (i.e., an individual, household, or community) has the same probability of being selected for Treatment by an Activity.

Sample Design

Altogether, 169 villages were identified by CARB as MYE Activity eligible villages, with 85 in Treatment and 84 in Control villages from three counties. The terms of CARB's interventions in Treatment and Control villages are laid out below. While the evaluation team only anticipates evaluating 150 villages (75 Treatment and 75 Control), an additional 19 villages were selected to buffer the potential of running into issues during the data collection process.

The village selection process for the evaluation sample

1. CARB partners provided a list of CARB MYE Activity eligible villages to the evaluation team for random assignment to Control and Treatment groups. All the villages were potential areas for implementation under the CARB MYE Activity funded by USAID/BHA.

2. The villages listed by the CARB partners were from Wau County (Western Bahr EL Ghazal State, with interventions implemented by CARB consortium partner NRC), Rubkona (Unity State, with interventions implemented by CARB consortium partner DRC), and Mayom County (Unity State, with interventions implemented by CARB consortium partner NRC).

3. All the villages of Wau and Rubkona counties selected by CARB partners were randomly assigned to either Treatment or Control status.

4. A portion of Mayom (about 76 villages out of 203 villages) was randomly assigned to Control and Treatment status. Since Mayom had a large number of villages available for programming, we

selected only 76 villages for the evaluation which would provide enough samples for the evaluation design.

5. The evaluation team also assigned 19 additional villages to use as a buffer in case it is not feasible to survey households in a given village.

Power Calculation

The MYE Activity aims to improve food security at the household level. The implementation of MYE Activity is anticipated to improve the food security of the households due to the consumption of an increased quantity of more nutritious food. One of the improved food security measures in households is the Food Consumption Score (FCS). The Famine Early Warning Systems Network (FEWS NET) reported that from 2016 to 2018, the mean FCS was 25 in South Sudan, a score that would be achieved if a household consumed only cereal, wild foods, vegetables, and oil daily [1].

In the design of this study, households constitute the unit of analysis (the unit at which the main outcome is defined) and the villages constitute the unit at which the Treatment is implemented, with households nested within villages. The power analyses we have performed, taking into account this nesting of households within villages, are broadly applicable to the (household-level) binary outcomes being considered in this evaluation study. Such outcomes give place to measures such as improvement in FCS.

Based on the power calculation, a study with 150 clusters (villages), 75 in the Treatment and 75 in the Control groups, and 20 households per village will have at least 0.80 statistical power to detect a difference of 20 percentage points for the prevalence of poor FCS score between the Treatment and Control group mean percentages in each stratum (county). We estimated the total number of households for Treatment and Controls, i.e. 20 households x 75 villages=1,500 per group or 3,000 total. We oversampled the households by 15% (i.e. 23 households per village) for expected nonresponse and/or attrition. Further, as mentioned above, we oversampled the villages to buffer the possible access problems due to security or environmental hazards such as flooding. We included 19 additional villages (10 in Treatment and 9 in Control groups) in the sample [2]. With all these considerations, our estimated baseline sample was 23 households x 169 villages =3,887 households.

Questionnaire Design

Questions were adapted from the Food for Peace Indicators Handbook (supplement to Part 1). In addition to this, we included additional questions for peace and security. Questions and response options were adapted to the local context, such as those involved in providing particular activities for improved crop and livestock production. A similar adaption was made for capturing local foods in the food access and nutrition module.

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[1] FEWS NET South Sudan Special Report

[2] Although there were 169 villages in the original design, in September 2021 NRC asked the research team to drop 10 villages (five from Control and five from Treatment) from the design due to accessibility challenges and local level political disputes. Further, during the survey the survey team could not reach 9 additional villages because of ongoing conflict and in some cases flooding. All of the dropped villages were from Wau. Our final list includes 150 villages.

The UND-led research team finalized the questionnaire in consultation with the USAID/BHA team. The questionnaire contains eight modules, including demographic characteristics of sampled households (See Annex).

- Household Food Access and Nutrition: This module assesses the current food security situation of households and the nutritional status of children. This information is used to construct the indicators for food consumption scores, household hunger scale, minimum acceptable diet for children 6-24 months, and prevalence of breastfeeding children under six months of age.

- Agriculture: This module assesses households' access to crop seed and the use of various improved agricultural technologies and practices for crop and animal production.

- Resilience: This module assesses households' ability to recover from shocks and stresses absorptive, adaptive, and transformative capacities, including safety nets and livelihood diversification

- Social activities: This module considers the ways households are participating in saving and credit lending activities at the community level. This module also assesses if households are members of any community groups in their villages.

- Gender: This module considers how women are involved in the decision-making process at the household level. Particularly, women's participation in making decisions on the use of self-earned cash and a spouse's earned cash, and whether or not to seek credit (loans).

- Peace and security: This module assesses the household's perception of security and willingness to interact with others in the community.

- Water and Sanitation: This module includes questions about the presence/absence of a handwashing facility and its use by the households.

Ethical Clearance

All the survey protocols were reviewed by the University of Notre Dame's Institutional Review Board (IRB). The Notre Dame IRB approved the study protocol (Protocol ID: 21-02-6436) to move with the fieldwork. Further, to proceed for field work we received permission from concerned authorities in each county.

Field Procedures

Survey Team, Training, and Fieldwork

GEWLP was responsible for survey implementation with the help of RAN. GEWLP gathered a team of 20 enumerators and four Research Associates to implement the survey. The enumerators were drawn from the three counties: six from Wau, six from Rubkona, and eight from Mayom. The largest county in this study is Mayom country, with 76 villages. The RAN team provided the training from October 4 to 7, 2021 in Juba.

Fig 1: Enumerators Training in Juba

Piloting

The study tools were field-tested in Mangaten and Juba IDP Camp 3. Each enumerator and supervisor completed two surveys during piloting and uploaded them to the server. After the piloting, a debrief session was held to go through the issues. Following is the summary of the piloting review:

- Largely, the questions were straightforward and suited the context. Questions that appeared unclear were revised during the post-pilot debrief with the enumerators.

- Each interview took between 45-60 minutes.

- Based on the initial analysis of the pretest data, the responses to some questions were not captured well by the enumerators. The facilitators provided feedback on these questions, including additional clarifying instructions.

Fig 2: Piloting of Survey Tool

- In addition, the research team from UND also reviewed the submitted piloting data and provided feedback to improve the survey. The suggestions related to the survey questionnaires were incorporated.

Fieldwork

The baseline field survey commenced on October 25th 2021, approximately two weeks after completing enumerators' training and lasted until November 30, 2021. Surveys started first in Wau County, followed by Rubkona, and concluded with Mayom County. Before starting the survey, the team received survey approvals from local authorities in all three counties. The team visited the villages, used the random walk method to find the sampled households by skipping the households with a certain interval, interviewed the head of household if available and a spouse if the head was unavailable. The interviews lasted for approximately an hour. The enumerators recorded the survey responses on mobile tablets, and most surveys were uploaded the same day to the data server. The RAN team and UND researchers constantly monitored the quality of surveys by regularly checking the submitted surveys in the server. Any issues in surveys were reported to the data collection team to correct them.

Enumerators and supervisors reported ongoing conflict and flooding, creating difficulties in accessing selected villages. By following safety and security protocols, however, the survey team completed the work in 35 days.

CARB Activity Areas, Evaluation Counties and Locations of
Sampled Households
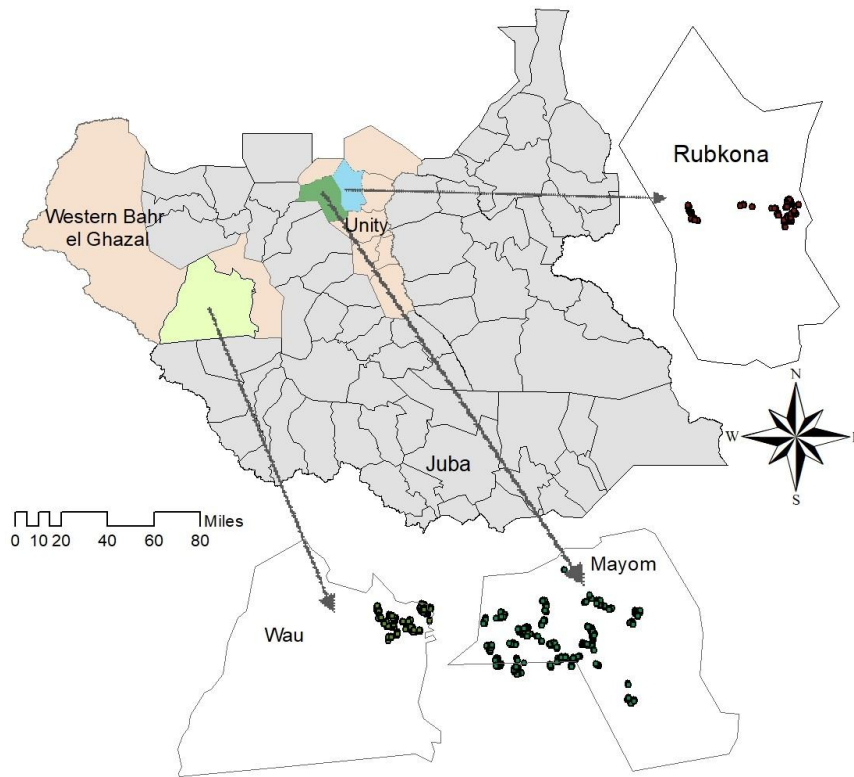
Fig 3: Evaluation Sites in South Sudan

Indicator Definitions and Tabulations

Table 2 provides detailed information about modules comprising our survey, types of indicators prepared, and level of disaggregation. To minimize the time burden on respondent households and streamline the survey questionnaire, the evaluation team worked with BHA to select the most salient indicators to measure key CARB impacts. We include the **Indicators Calculation Guide** in the Annex, which documents how each indicator is calculated [3].

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[3] We did not weight the samples based on the population of our villages (cluster level) as this data was not available.

Table 2: Indicators for measuring the impact of CARB Activity in South Sudan

Modules	Indicators	Disaggregation Level
Household Food Access and Nutrition	1. Percent of households with poor, borderline, and acceptable food consumption score (FCS)	by Control and Treatment
	2. Prevalence of households with moderate or severe Household Hunger Scale (HHS) score	by Control and Treatment
	3. Percent of children 6–24 months receiving a minimum acceptable diet (MAD)	by Control and Treatment
	4. Prevalence of exclusive breastfeeding of children under six months	by Control and Treatment
Agriculture	1. Percentage of households with access to sufficient seed to plant	by Control and Treatment
	2. Percent of producers who have applied targeted improved management practices or technologies - for crop farming - for livestock	by Control and Treatment
Resilience	1. Number of sources of income in households	by Control and Treatment
	2. Ability to recover from shocks and stresses index	by Control and Treatment
	3. Index of social capital at the household level - bridging social capital - linking social capital	by Control and Treatment
	4. Percent of households that believe the local government will respond effectively to future shocks and stresses	by Control and Treatment

Social activities	1. Percent of households participating in group-based savings, micro-finance or lending programs	by Control and Treatment
	2. Percent of farmers who used financial services (savings, agricultural credit, and/or agricultural insurance) in the past 12 months	by Control and Treatment
	3. Percent of women/men in a union who are members of a community group	by Control and Treatment Sex
Gender	1. Percent of women in a union and earning cash who report participation in decisions about the use of self-earned cash	by Control and Treatment
	2. Percent of women in a union and earning cash who report participation in decisions about the use of spouse/partner's self-earned cash	by Control and Treatment
	3. Percent of women/men in a union with access to credit	by Control and Treatment Sex
	4. Percent of women/men in a union who make decisions about credit	by Control and Treatment Sex
Peace and security	1. Percent respondents who said they interacted with people from the different ethnic groups last week	by Control and Treatment
	2. Percent respondents who said they interacted with their neighbor last week	by Control and Treatment
Water and Sanitation	1. Percent of households with soap and water at a handwashing station on premises	by Control and Treatment

Quantitative Data and Data Analysis

Collected data was quality controlled by the UND and RAN teams. The UND team developed a protocol for data cleaning and coding, and the RAN team led the data cleaning and coding process. An indicator calculation guide was prepared and used while calculating the indicators.

Stata statistical software was used in data cleaning and analysis. Mean values of the variables (i.e. indicators) are calculated and presented by Control and Treatment assignment with robust standard errors; the associated p-values are also presented to see if the differences are statistically significant.

Official demographic, social, and economic data at a disaggregated level (country or villages) is either unreliable or essentially nonexistent in South Sudan. Human mobility patterns in South Sudan, influenced by conflict, economic shocks, flooding, and other natural hazards, further complicate any realistic disaggregation of the total population. The calculation of weights matching the desired population distribution was not possible. The only statistical tool available is sample correction weighting, which adjusts for variation in the number of surveyed households by village. The survey target for each village was 23 households. Still, in some villages, it was lower than 23, and in a handful of villages the number was slightly higher. To address this, we created population weights, so that each sampled village is represented equally in the analysis. The estimated probability weights were then used to calculate and compare weighted averages of the key variables, which are recorded in this report, for both the treatment and control groups[4]. Our analysis also considers the survey design, both at the level of strata (county) and cluster (village).

Qualitative Data and Analysis

Besides the quantitative survey, qualitative interviews were also conducted involving seven key informant interviews in each county (21 KIIs in total). The key informants were selected based on their specialized knowledge and understanding of prevailing humanitarian situations in general and in selected counties in particular. Key Informants interviewed included community/village leaders, elected officials at Payam/Boma level, civil society/NGO workers, women leaders, and government officials who understand shocks, food needs, livelihood options, and different programs being implemented to address the local needs and security situations. At least 40% of the key informants in this study were women. On average, an interview lasted for about 30 minutes.

After the interviews, transcripts were prepared and reviewed for their quality. Some codes were developed and assigned in Atlas.ti based on the evaluation questions. Additional codes were added while reviewing the transcripts. This means the team used both the deductive and inductive methods in coding. Analysis of the transcripts focused on content and context, descriptions, language, and narratives that reveal respondents' respective viewpoints on the local level contexts of various aspects of food security, nutrition, shocks and resilience, gender relations, sanitation, and health and hygiene practices. Given the fact that this evaluation is participant-informed and -prioritized, we included narratives and excerpts of interviews to illustrate findings from the study. Qualitative findings are incorporated with the quantitative findings in the report.

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[4] https://stats.oarc.ucla.edu/stata/seminars/survey-data-analysis-in-stata-17/

Study Limitations and Issues Encountered

South Sudan's evolving situation poses significant challenges for conducting survey work. Millions of South Sudanese are currently affected by seasonal floods in the White Nile region area. While the ceasefire is held between the 2018 peace agreements signatories, some factions are not part of the peace process and remain active in different regions. Further, even among those who are part of the peace process, not all combatants belonging to these groups are in the camps. There are reports of splintering in political parties and the breakout of conflict with the rival factions[5] including communal violence that threatens to displace entire villages. While the return process of IDPs and refugees has slowed with the COVID-19 pandemic, it has not stopped and can pick up as the security situation improves.

Fig 4: Enumerators Navigating a Flooded Road

The research team made considerable effort to minimize non-sampling biases in the survey. The survey questionnaire was pre-tested and piloted. Also, the enumerators' training provided necessary survey skills to the enumerators. The enumerators were composed of both sexes, had command of local dialect, and were familiar with the villages they were deployed for the survey. Yet, like in other studies, some biases related to recall and self-reported data (intentionally or unintentionally) are impossible to eliminate. Further, we anticipate that the rate of non-sampling biases, including the response bias, will not vary between the Treatment and Control group.

Rubkona flood and its implication in study design

The 2021 flood in Rubkona county forced residents to find a place to resettle. The CARB consortium assessed the situation on the ground and found that over 80% of sample villages were inaccessible because of floods. Even villages that are accessible now have many households dispersed from their original places. Most families were living in the IDPs camps and it is unclear for how long these people will stay in the IDP camps as most of the villages are still underwater. It will be necessary to reassess the study design and make adjustments once the CARB reevaluates the situation and proposed activities in the affected villages[6].

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[5] https://www.crisisgroup.org/africa/horn-africa/south-sudan/b179-south-sudans-splintered-opposition-preventing-more-conflict

[6] As of May 9, 2022, the displaced people are still in the camps. Water levels have started to recede but the rainy season may start soon again. The CARB project is adapting to the flooding situation by focusing on activities that can be provided to the participants at the camp such as TVET, MSMEs, Floating gardens, Farmer field schools where participants have access to land and has requested approval to purchase motorized boat to access villages cut off by flooding (NRC's comments on baseline report, May 9, 2022).

Findings

Characteristics of the Study Population

We completed surveys from 150 villages from three counties (Mayom: 67, Rubkona: 45, and Wau: 38) during the baseline data collection. The total number of households included in the survey was 3,442 of which 45% are from Mayon, 30% are from Rubkona, and are 25% from Wau (Figure 5). Out of 3,442 surveys completed, 1,672 were from Control and 1,770 from Treatment villages. The average number of households surveyed per village was 22.8.

Total households survey by County
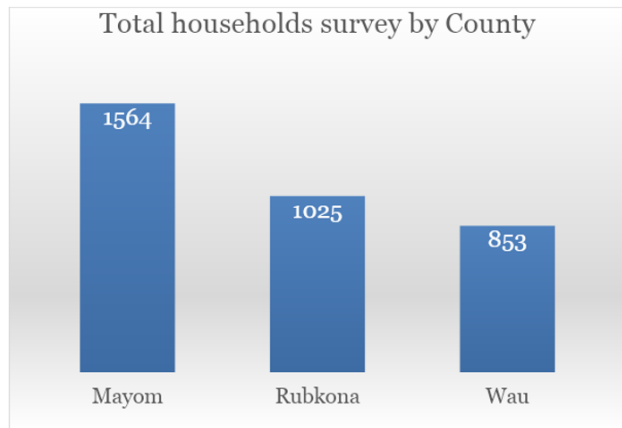
Fig 5: Household Survey by County

The sex composition of male and female household heads was 69% to 31%. The average age of the household head was 43 years. Nearly 60% of households were Catholic. Two-thirds of surveyed household heads had no schooling. The average household size was 11 members [7].

As mentioned previously, the twofold objectives of the baseline were to ensure the Control and Treatment villages are similar, and establish the values of various indicators to measure the impact of the CARB Activity. We conducted a balance test to compare the Control and Treatment villages.

Balance Tests

For an RCT, there should be a balance between the Control and Treatment groups based on relevant socio-economic characteristics. A balance test for the CARB program evaluation was conducted to ensure that the households in the randomly assigned Treatment and Control villages are statistically comparable. **Table 3** shows the balance tests for Control and Treatment villages based on the t-test. Tests of significance consider survey design, including the strata (counties) and primary sampling unit (village). Standard errors are clustered at the village level. The following variables are used for the balance tests at the baseline and endline[8].

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[7] Most households were extended households so the average household size is large.
[8] A null hypothesis of difference in value between Control and Treatment villages are tested for each variable.

Table 3: Balance Test Table

Parameters	Overall (full sample)	Control villages *Mean coefficient*	Treatment villages *Mean coefficient*	p-value
Percent female respondents	30.50%	0.29 (0.01)	0.32 (0.02)	0.44
The average age of household head, years	43.12 years	43.99* (0.57)	42.25 (0.50)	0.02
Percent currently married household heads	86.50%	0.87 (0.01)	0.86 (0.01)	0.84
Average household size	11.00 persons	11.29 (0.25)	11.12 (0.27)	0.70
Percent male respondents who married to more than one woman	65.50%	0.68 (0.02)	0.63 (0.02)	0.22
Percent household heads with no schooling	66.00%	0.66 (0.02)	0.66 (0.02)	0.90
Percent households with children below 2 years	47.00%	0.46 (0.01)	0.46 (0.02)	0.82
Percent households that grew at least one crop last season	38.00%	0.37 (0.03)	0.38 (0.02)	0.72
The average number of groups active in the village	0.45	0.46 (0.06)	0.40 (0.05)	0.49
Percent household with at least one animal (cattle/goat/sheep/pig/camel/donkey) in the household	64.00%	0.65 (0.03)	0.61 (0.03)	0.42
The average number of shocks households faced in the last 12 months	3.00 shocks	2.98 (0.07)	2.93 (0.07)	0.71
Percent HH received support; food and other support from external sources last year	36.00%	0.34 (0.02)	0.37 (0.02)	0.41

* p-value < 0.05; Standard errors displayed in brackets

The result shows that the Treatment and Control villages are statistically comparable for all of these parameters except the average age of the household head. The household heads in Control villages are slightly older than the household heads in Treatment villages (a difference of 1.74 years). This confirms the high validity of the comparison between the Control and Treatment villages in our RCT design.

Indicators by Control and Treatment

Household Food Access and Nutrition

The main objective of CARB is to improve food security and resilience in households and communities in its program areas. Results indicate that the Control and Treatment villages have no differences in all four food access and nutrition related indicators (**Table 4**). FCS is a measure to understand the food security situation in households. FCS is a composite score that captures dietary diversity, food frequency, and relative nutritional importance of different food groups consumed by the households in a given area. Based on weighted scores and using World Food Programme (WFP) thresholds, households are categorized into three groups: poor, borderline, or acceptable food consumption [9]. **Table 4** illustrates the mean FCS and percentage of households with poor, borderline, and acceptable FCS by Control and Treatment villages.

Table 4: Food Access and Nutrition Indicators for Survey Households

Indicators	Overall (full sample)	Treatment villages *Mean coefficient*	Control villages *Mean coefficient*	p-value
INDICATOR #4: Percent of households with poor, borderline, and acceptable food consumption score (FCS)				
- poor	23.74%	0.23 (0.02)	0.23 (0.02)	0.95
- borderline	22.12%	0.21 (0.01)	0.21 (0.01)	0.99
- acceptable	54.45%	0.54 (0.02)	0.54 (0.02)	0.95
INDICATOR #6: Prevalence of households with moderate or severe Household Hunger Scale (HHS) score				
- moderate	56.09%	0.54 (0.02)	0.58 (0.02)	0.24
- severe	43.68%	0.45 (0.02)	0.41 (0.02)	0.25
INDICATOR BL 12: Percent of children 6–23 months receiving a minimum acceptable diet (MAD)	12.50%	0.11 (0.01)	0.14 (0.02)	0.24

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[9] https://inddex.nutrition.tufts.edu/data4diets/indicator/food-consumption-score-fcs

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INDICATOR BL 13: Prevalence of exclusive breastfeeding of children under six months	43.50%	0.48 (0.03)	0.39 (0.03)	0.09

* p-value < 0.05; Standard errors in brackets

The results show that most households achieve an acceptable food consumption score—over 54% in both the Control and Treatment villages. Still, approximately one quarter of the households had a poor FCS score, indicating the presence of a sizable number of households with limited access to nutritious food.

Over 22% of the households are on the borderline which indicates the susceptibility of these households for further shocks. In other words, if the households experience more shocks and if there is no external support available, these households may fall into the poor FCS category.

As mentioned earlier, we found the poor FCS at 23.74% in surveyed households. We re-ran the power calculations using new data on poor FCS and found that it barely changes our statistical power.

HHS measures the percentage of households experiencing hunger in surveyed households. The three main characteristics for measuring the presence of hunger in the households include: the frequent occurrence of no food in the households, going to bed hungry, and going all day and night without eating (at least once) in the last four weeks. The results show over 43% of households experienced severe hunger in the last four weeks of the survey. Both Control and Treatment villages experienced hunger with the same intensity. About 47% of surveyed households reported having children below two years of age. We estimated the minimum acceptable diet (MAD) for 6-24 months of children, and the prevalence of exclusive breastfeeding of children below six months. The MAD indicator summarizes several infants' young children's feeding practices, including breastfeeding, dietary diversity, and feeding frequency. Only 12% of children between the ages of 6-24 months receive minimum acceptable diets, showing that infants and young children are not consuming enough nutritious food. About 45% of children below 6 months were exclusively breastfed. Conversely, over fifty percent of infants under six months old are not *exclusively* breastfed in survey areas, the globally recommended period for exclusively breastfeeding.

Consistent with the survey findings, the key informants reported people in the area experience instances of severe hunger and food insecurity. This is a part of daily life and affects households across the survey area. In most cases, food insecurity was referenced in terms of a lack of food availability. In some cases, it was also referenced in terms of a lack of access, as it was becoming too expensive for people to afford food in local markets. The population frequently depends on food aid to survive.

Food security was frequently referenced in relation to children in the community. Interview participants often referred to the nutritional status in their areas as so severe that children were not eating and were unable to go to school.

"Life is very difficult in South Sudan, now you find a person sitting and staying for two or three days without eating, and has children. This mostly affects us women. You cannot see your child starving while you have nothing..."

An official in Kosti

Agriculture

Traditionally, people living in the CARB program area depend on agriculture for their livelihood. About 38% of households grew at least one crop in the growing season that preceded the survey. However, agriculture in South Sudan is subsistence in nature, and increasing production from agriculture is increasingly difficult amid the lack of input availability and application of improved production techniques.

According to key informants, conflict and displacement were key drivers of failure of agriculture. Conflict incidents create security threats for farmers traveling to find seeds, other agricultural inputs, or support services. If conflict induces displacement, people have to leave their community *and* their lands. As many people in the survey area are pastoralists and/or rely on rainfed agriculture, they are also susceptible to climate-related shocks. Flooding was most frequently noted as the main climate shock driving food insecurity. A lack of access to seeds, as well as difficulty irrigating crops in the dry season was also noted.

Two indicators are constructed and estimated for tracking progress in agriculture and livestock in the survey. No differences between Control and Treatment villages are found for these indicators (**Table 5**).

Table 5: Agriculture Indicators for Survey Households

Indicators	Overall value	Control villages *Mean coefficient*	Treatment villages *Mean coefficient*	p value
INDICATOR #A05: Percentage of households with access to sufficient seed to plant	30.00%	0.29 (0.02)	0.30 (0.02)	0.88
INDICATOR #8: Percent of producers who have applied targeted improved management practices or technologies				
- in crop production	26.00%	0.25 (0.02)	0.27 (0.03)	0.62
- in livestock production	57.50%	0.59 (0.03)	0.55 (0.03)	0.49

* p-value < 0.05; Standard errors in brackets

People grow a variety of crops, e.g. sorghum, millet, wheat, maize, rice, groundnuts, tomato, beans, cassava during the rainy and dry seasons. One indicator to measure progress in agriculture is access to sufficient seed to plant in the households' intended planting area. A household has "access to sufficient seed to plant" when the household either: has seed in hand (i.e., own stocks), or has the ability or means to get it elsewhere (e.g., from neighbors, market, agro-dealers) on time. Only about 30% of farming households had access to sufficient seed to plant. Conversely, about 70% of households did not have access to sufficient seeds to plant when they planned to grow crops. It is therefore crucial that the program addresses the constraint of accessing seed by the locals.

To increase the resilience of households, increasing crop and livestock production is important and achieved by applying improved management practices in crop farming and the raising of livestock. This indicator is calculated and reported separately for each targeted commodity: crop and livestock. Only about one-quarter of households applied improved management practices in crop farming. Improved management practices for crops include the provision of irrigation, post-harvest management, conservation agriculture, pest control, market linkages, improved storage, fertilizer application, etc.

Nearly two-thirds of surveyed households reported they have at least one of these animals in their households: cattle, goat, sheep, pig, camel, and donkey. About 58% of these households used improved livestock management practices. Improved management practices for livestock include improved shelter, vaccination, castration, deworming, insemination, and fodder production. Understanding the main limiting factors for applying improved management practices for crop and livestock will inform a strategy to increase their application.

The CARB's ToC outlines various activities promoting improved crop and livestock management technologies in the project areas which may help to increase the production of crops and livestock. Per key informants, there are some supports coming from other agencies. The support system provided more long-term support towards food/nutritional security. Key informant interview participants often referenced the provision of tools and seeds to local populations to help them grow their own foods (generally vegetable crops). The provision of seed by the FAO through NGOs/development agencies is the largest support mechanism in this regard. Although flooding caused a significant setback in these efforts, this program and seed distribution more broadly were referenced positively by KII participants.

Resilience

Shocks and stresses such as droughts, floods, conflict, loss of jobs, and disease threaten progress toward food and nutrition security. For years, South Sudan has been suffering from shocks and stresses from various man-made and natural disasters.

Per key informants, the most frequently referenced shock was widespread, devastating flooding during the interviews in study areas. Other shocks and stresses which were referenced infrequently include dry spells, pests, and disease.

Key informant interview participants noted the ways in which shocks and stresses (particularly flooding) exacerbated other challenges in their areas. Mass flooding was often noted as the driver of displacement, crop failure, increased disease, and reduced access to the market for products and employment opportunities. The flooding was also referenced as a reason humanitarian aid could not reach certain

areas. Flooding was a key reason that drove food insecurity and hunger in the survey area. When the consequences of flooding were further exacerbated by other shocks and stresses, the most vulnerable households in their communities were significantly impacted.

In response to these shocks and stresses, interview participants referenced several coping strategies employed by people in the area. The most referenced coping strategies were migration (to flee either flooding or conflict), or selling livestock. In light of the recent Rubkona flooding, over 80% of people from sampled villages fled to a safe area outside the county. The KII participants referenced migration as a successful coping strategy in the short run. In the medium to long run, this coping strategy often resulted in increased vulnerability and dependence on humanitarian aid.

Livestock, particularly cattle, were often referenced as a key asset—and the selling of cattle as a more robust response to shocks related to food insecurity. Interview participants noted that while selling cattle was a successful coping strategy, doing so would slowly result in increased vulnerability as livestock play a central role in saving, providing food, and some aspects of social life (e.g., marriage customs, dispute resolutions).

Another coping strategy (although less frequently referenced) was eating wild foods, such as fish or waterlily. In the recent mass flooding context, fishing was noted as a key coping mechanism.

"Some people have already started eating water lilies because the situation is very bad. People are suffering, including women. If a woman gets nets and puts them in the river, she will survive with her children."

An official of Agriculture office, Rubkona

Four indicators are constructed and estimated to track the progress on resilience building at the household level. No differences between Control and Treatment villages are found for these indicators (**Table 6**).

Table 6: Resilience Indicators for Survey Households

Indicators	Overall value	Control villages *Mean coefficient*	Treatment villages *Mean coefficient*	p-value
INDICATOR: Avg. # of sources of income in HHs	1.73	1.74 (0.05)	1.72 (0.03)	0.78
INDICATOR BL 23: Ability to recover from shocks and stresses index	2.52	2.52 (0.11)	2.48 (0.10)	0.81
INDICATOR BL 38 : Index of social capital at the household level - Bridging - Linking	 1.84 0.63	 1.87 (0.09) 0.64 (0.06)	 1.81 (0.10) 0.63 (0.06)	 0.69 0.90
INDICATOR BL 24: Percent of households that believe the local government will respond effectively to future shocks and stresses	12.00%	0.13 (0.01)	0.11 (0.01)	0.34

* p-value < 0.05 Standard errors in brackets

On average, surveyed households had 1.73 (min: 0, max: 7, SD: 0.84) income sources. This indicated that the survey area population has severely restricted income opportunities. Nearly fifty percent of households reported farming and crop production as their primary source of income. A sizable portion of the surveyed population was also involved in selling wild/bush products (e.g. charcoal, firewood) as their second source of income. Therefore, to better develop strategies for diversifying income sources, a first step is to understand factors that are limiting the options for different livelihood opportunities.

In key informant interviews, the most referenced employment opportunities included: having a small business in the market, selling fish, selling cattle (both milk and meat), and piecemeal labor such as collecting firewood, cutting bamboo, or selling charcoal. The employment of local populations working for humanitarian projects in various capacities was also referenced.

Employment via a small business in the market was a focus throughout the interviews. KII participants spoke positively on the work being done by humanitarian actors to reconstruct markets, provide training

on business skills, provide startup grants, create market linkages, coach entrepreneurs through the registration process, etc. These efforts were often discussed in connection to building resilience/sustainability.

> "They are given some money but money is not enough… If you do business, that can help to sustain life and also [allow a household] to register children in school."

An official in Kosti

The ability of households to recover from shocks and stress index is calculated by inquiring about typical shocks that occur in the program areas in the last one year The average index in surveyed households is found to be 2.52 (min: 2, max: 6), which indicates households in the survey areas have less ability to recover from the shocks.

Social capital is a strong predictor of a household's ability to manage shocks and stressors in emergencies. In the form of an index, the measure of social capital captures the network of relationships that foster support and collaboration among individuals, households, and communities. The social capital indices are constructed for two sub-categories: an index of *bridging* social capital, and an index of *linking* social capital.

Bridging social capital is constructed based upon the responses of getting help from various categories of people living outside of communities, and providing help to people living outside of their communities. An additive index ranging from 0 to 6 is calculated for bridging social capital. An average score of 1.84 is found in the surveyed households. The linking social capital index is based on whether household members know a government official and/or NGO leader, how well they know them, and whether they believe the official/leader would help their family or community if help was needed. This index also ranges from 0 to 6. We found an average score of 0.63 for linking social capital. Low scores for linking social capital and bridging social capital suggest that people have limited access to outside communities, government, and other officials. As a result, the populations living in the survey areas have limited support in case of need.

Perceptions of local government capacity to respond to future shocks and stressors were included as a proxy measure of belief in the system, responding to people's needs in case of an emergency. This measure also captures the local level's underlying dimension of transformative capacity. Nearly 12% of households across the Control and Treatment villages believe local government institutions can respond effectively to future shocks and stresses. Conversely, over 88% don't believe they will be assisted by local government and other institutions in case of emergency. Part of this could be related to the bridging trust discussed above. Another reason could be related to the institutional capacity of local government as South Sudan is relatively a new country where institutions are being developed. Ideally, the community and local government would work together to build mutual trust that the people can depend on the local government's capacity to respond to shocks and stressors.

Key informants indicated that there were some external support systems in the study area. Throughout the interviews, UN agencies, NGOs, international development agencies, local government officers, and

community leaders were frequently referenced as working together to provide humanitarian aid. These partnerships were generally described in providing food aid and other non-food items such as soap, plastic sheets, mosquito nets, blankets, etc.

A lack of capacity to respond to humanitarian needs was frequently referenced by KII participants. The support system may be extensive but it does not seem to be sufficient. Local government officials and leaders often claimed to have nothing to help their people. Due to this lack of capacity, local government offices and local leaders must depend on NGOs to help meet these needs.

"Even the government cannot manage, only organizations can bring it."

A Women Leader Mayom

Social activities

Access to credit is crucial for managing risks in households (Heltberg et al., 2015). The indicator measuring participation in group-based savings, microfinance, or lending programs includes both formal and informal groups such as saving and lending groups, credit unions, and other formal and informal group-based finance or lending groups.

Three indicators are constructed and estimated to track the progress on social activities of the people at households and community levels. One difference was found for the percent of women/men in a union who are members of a community group by Control and Treatment (**Table 7**).

Table 7: Social Activity Indicators for Survey Households

Indicators	Average values	Control villages *Mean coefficient*	Treatment villages *Mean coefficient*	p-value
INDICATOR BL 31: % of households participating in group-based savings, micro-finance or lending programs	9.59%	0.08 (0.01)	0.10 (0.01)	0.51
INDICATOR #29: Percent of farmers who used financial services (savings, agricultural credit, and/or agricultural insurance) in the past 12 months	7.57%	0.07 (0.01)	0.07 (0.01)	0.72

INDICATOR BL 41: Percent of women/men in a union who are members of a community group				
- men	8.00%	0.10* (0.01)	0.06 (0.00)	0.04
- women	5.00%	0.05 (0.00)	0.05 (0.00)	0.99

* p-value < 0.05; Standard errors in brackets

The survey results show less than 10% of households have access to group-based saving and micro-finance services which indicates most of the people lack access to financial services. Further, only 7.5% of farmers used financial services in the 12 months before the time of this survey. This indicates that very few farmers accessed loans and other financial services to invest in farming activities. Understanding the barriers to accessing various financial services would help implementing partners develop strategies to overcome this issue.

Saving groups and/or cooperatives were infrequently referenced by KII participants. There were two references to humanitarian projects promoting village savings and loans (VSL). One example of a women's group operating a rotating shared fund was also given. But they are not widespread.

Civic participation is another indicator of trust in government, or perhaps an indication of ability to advocate for change or support when needed. One measure to capture people's active civic life is membership in various local-level institutions. We included questions around people's participation in the forest, water, agriculture, civic groups, trade groups, religious groups, and saving groups. Surprisingly, very few respondents reported that they are a member of one of these groups. Only 5% women and 8% men were the members of community groups.

In addition, more men in Control villages were members of community groups than in the Treatment villages (a difference of 0.03). Building institutions at the local level, such as saving and credit groups, or farmers groups, is crucial to increase the participation of people who get help during the shocks (Aldrich et al., 2021; Roque et al., 2020).

Gender

Significant gender gaps exist in South Sudan, regarding: access and control of resources, the traditional labor divisions, the exclusion of women in the decision-making process, and cultural norms and practices De Silva et al., 2020). These gaps suggest there are institutional and cultural barriers for women's empowerment. The CARB intervention aims to provide humanitarian support for some time to build resilience for absorbing shocks from natural disasters and violence. There are many positive externalities associated with this support. The program is also likely to promote women's agency with women entrepreneurs who can create wealth, reduce household level poverty, and help South Sudan transition toward economic recovery.

Women in the study area experience unique challenges based on their gender. KII participants noted the disproportionate labor burden placed on women, especially regarding household labor and child-rearing. KII participants also noted gender-based violence toward women, such as domestic abuse or rape. Women also face a higher chance of death because of a lack of maternal health facilities and services. In one case, it was noted that according to traditional customs following a husband's death, the wife often loses the family's property to the deceased husband's brothers—leaving her and her children vulnerable.

However, the KII participant noted a gradual change in cultural norms around gender. In some areas, due to cultural norms as well as the women's preferences, women are strictly limited to household chores and other household activities. In other areas, however, women are taking up economic activity outside of the home, including the market.

These changes in cultural norms, and the change in the distribution of labor, are accompanied by both positive and negative consequences. On the one hand, interview participants noted that women taking part in more economic activity has resulted in empowerment, a new source of income, increased stability, the ability to send their kids to school, etc. However, participants also noted that in some cases as women gain more intrahousehold bargaining power, it causes conflict with their husband —resulting in domestic abuse, conflict within the family, divorce, etc.

Our survey collected information on women's and men's participation in cash-earning activities, group membership, and access to credit. Cash can be used toward making investments in productivity-enhancing inputs, investing in children's education, or purchase of diverse and more nutritious food. For women, engagement in cash-earning activities can be transformative for their empowerment and equality at the household level. This could translate into their active role in making important decisions about themselves or their children.

Four indicators are constructed and estimated to track the progress on gender, which will be helpful to understand women's empowerment in program areas. No differences are detected between Control and Treatment villages for these indicators (**Table 8**).

Table 8: Gender Indicators for Survey Households

Indicators	Overall values	Control villages *Mean coefficient*	Treatment villages *Mean coefficient*	p-value
INDICATOR BL 33: Percent of women in a union and earning cash who report participation in decisions about the use of self-earned cash	4.77%	0.05 (0.01)	0.04 (0.01)	0.39
INDICATOR BL 34: Percent of women in a union and earning cash who report participation	2.12%	0.02 (0.00)	0.01 (0.00)	0.64

in decisions about the use of spouse/partner's self-earned cash				
INDICATOR BL 42: Percent of women/men in a union with access to credit				
- men	10.74%	0.10 (0.01)	0.10 (0.01)	0.74
- women	14.22%	0.14 (0.02)	0.14 (0.03)	0.95
INDICATOR BL 43: Percent of women/men in a union who make decisions about credit				
-men	10.74%	0.10 (0.01)	0.10 (0.01)	0.74
-women	14.22%	0.14 (0.02)	0.14 (0.03)	0.95

* p-value < 0.05 Standard errors in brackets

Participation in credit decisions is defined as making the decision on whether to borrow or how to invest the money from one of the sources available in their areas. Sometimes men and women decide alone or jointly. Surprisingly, less than five percent of women who earn cash reported participating in making a decision about their self-earned cash. This indicates that most of the women are not actively involved in making decisions about where or how to spend their own earnings. Furthermore, only about two percent of women are involved in deciding their husbands' earnings.

Approximately 10% of men and 14% of women have access to credit. A similar percentage of men and women decide about credit (whether to get it or not, how to spend it, etc). There are barriers to women's participation in decision-making at the household level in rural areas, and understanding those barriers is important for developing program activities to address such issues.

Peace and Security

How people regard their neighbors and people from another ethnic group is necessary for understanding peace and security. It helps identify latent conflict and the likely potential of local conflicts flaring up.

Peace and security continue to be an issue within the areas surveyed. Key informant interview participants frequently noted the use of violence to address conflict within their communities. Common examples include cattle raids, revenge killings, and ethnic/clan-based violence. These examples were noted both within communities and between them. Local leaders, particularly chiefs, are key actors in helping address these issues. Chiefs were frequently referenced as key players in helping communities

resolve conflict through dialogue. Chiefs also play an important role in validating local customs and using these mechanisms to resolve disputes.

Our survey questions captured if the respondents interacted with people from another ethnic group and their neighbors within the last week. Two indicators are constructed and estimated to track the progress on peace and security in the communities. More people in Control villages interacted with their neighbors compared to Treatment villages (**Table 9**).

Table 9: Peace and Security Indicators for Survey Households

Indicators	Overall value	Control villages Mean coefficient	Treatment villages Mean coefficient	p-value
Percent respondents who said they interacted with people from different ethnic groups last week	33.50%	0.35 (0.03)	0.32 (0.02)	0.58
Percent respondents who interacted with their neighbor last week	72.00%	0.76* (0.01)	0.68 (0.02)	0.01

* p-value < 0.05 Standard errors in brackets

Over 72% of the surveyed population interacted with their neighbor. This indicates that, at the local level, people have dense interactions with their neighbors—primarily within the same ethnic group. Only 34% of the surveyed population interacted with people from another ethnic group in the seven days prior to the survey. This measure indicates that the surveyed population has less interaction with people from another ethnic group, but a foundation exists for promoting inter-ethnic interactions. To further build trust and increase societal cohesion, various inter-ethnic, socio-economic activities can be designed to encourage more interaction between different ethnic groups.

Water and Sanitation

Only one indicator is constructed to track the progress on water and sanitation at the household level. No difference between Control and Treatment villages is found for this indicator (**Table 10**).

Table 10: Resilience Indicators for Survey Households

Indicators	Overall value	Control villages Mean coefficient	Treatment villages Mean coefficient	p-value
INDICATOR BL 17: Percent of households with soap and water at a handwashing station on premises	3.80%	0.03 (0.00)	0.04 (0.00)	0.68

* p-value < 0.05 Standard errors in brackets

The measurement of this indicator is based on observation by a member of the research team at the time of the survey. During the survey, the enumerators were asked to observe the station where household members commonly wash their hands and the availability of water and soap in the washing station. Surprisingly, a tiny percent (less than five percent) of the surveyed household had soap and water at a handwashing premise, indicating there is much room for improvement with WASH activities.

Conclusions and Recommendations

Conclusion

We assessed the baseline situation in the Control and Treatment villages. The results show the Control and Treatment villages are statistically similar for the main socio-demographic variables. This confirms that estimating intervention impacts by comparing the results in Control and Treatment villages will not introduce a bias. We also estimated the baseline values of various indicators before the implementation of the CARB Activity.

The main outcome of interest for this evaluation was FCS. FCS were used to estimate the power of study design. The proportion of households with poor and borderline FCS was above 45%, which shows these households are vulnerable. Further, FCS is overly sensitive to seasonality or other localized factors that affect food availability and accessibility at the time of the survey. Additionally, any shocks and stress may risk the households falling back to the poor FCS category if the existing support systems are not adequate. The HHS results show that over 43% of surveyed households experienced severe hunger during the four weeks before this survey was conducted. Both Control and Treatment villages experienced hunger with the same intensity. This emphasizes the need to support these households; otherwise, they will continuously suffer. Our qualitative results also align with these findings as most of the key informants agree that households in the survey area have been struggling to get enough food to eat.

Children have been deprived of minimum acceptable diets which may impact their physical and mental health in the long run. Approximately 12% of children between 6-24 months met minimum acceptable diets. This means nearly 9 out of 10 children are not eating enough acceptable diets for their age. This will have long-term consequences for their growth. This is also an access issue as the households can not afford to buy nutritious food. Furthermore, less than 50% of children below six months old are exclusively breastfed, falling below the UNICEF recommended threshold for this important practice.

Indicator values for FCS, HHS, MAD, and exclusively breastfed children below six months, are consistent with these measures' national figures in South Sudan. For example, the average borderline and poor FCS was about 42% during the month of October (the month of our survey) from 2011-2016 per FEWS NET report[10], which is similar to what we found in our analysis. The MAD value is consistent with the UNICEF report as the UNICEF reported 13% of children between 6-24 months old got minimum acceptable diets nationally in 2019 in South Sudan.[11] The percent of children below six months who

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[10] https://fews.net/east-africa/south-sudan/special-report/december-2018
[11] https://www.unicef.org/southsudan/media/2981/file/Nutrition-Briefing-Note-December-2019.pdf

exclusively breastfed was about 45% which is consistent with this World Bank report[12]. The household hunger scale was consistent with the Reliefweb report as the report mentions two-thirds of households were in a moderate to severe hunger[13].

Less than one-third of surveyed households had access to seed, limiting their ability to grow crops for consumption. Also, only about a quarter of households that grow crops use improved agricultural practices. Diversifying income sources is common practice to minimize the impact of various shocks and stresses. Surveyed households have had minimal options for income. This is also reflected in the low index value for recovering from shocks and stresses. Both bridging and linking social capital indices are low, indicating there much work to be done to increase the network within and beyond the communities.

Recommendations

Programmatic

- Our baseline values for all the indicators show that both Control and Treatment villages are similar before starting the CARB Activity. Some of these indicators capture dire situations in program areas, especially on ongoing hunger and the availability of nutritious foods for infants and children. Addressing these issues is of utmost importance for the concerned authorities.

- Increasing agriculture production is the most plausible way to solve food and nutrition problems sustainably due to the high dependence of the households in agriculture in the survey area. Ensuring availability of seeds and providing new technologies for crop production and livestock is important.

- Very few households trust the local government to help them when in need. Understanding the factors why they don't trust government officials is important before designing any program that addresses distrust. Organizing activities that promote interactions between government officials and the general population can help build trust and promote peace and security in the study area.

- The households in the survey area have poor access to financial services. As such, farmers have poor access to production loans from financial institutions. This limits the opportunity for investing in productive enterprises if somebody wants to get a loan. A further investigation may be helpful to understand the factors contributing to limited access and use of financial services. Promoting village-level saving and lending groups, however, might help increase access and use of financial services.

- The level of women's participation in decision-making at the household level is alarmingly low. There is a clear need to understand the cultural barriers and identify appropriate ways to make MYE Activity more inclusive.

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[12] https://data.worldbank.org/indicator/SH.STA.BFED.ZS?locations=SS

[13] https://reliefweb.int/sites/reliefweb.int/files/resources/south_sudan_food_security_and_nutrition_monitoring_bulletin_-_round_19.pdf

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- The share of households who interacted with their neighbor was high, but these interactions were mostly within the same ethnic group and very limited across ethnic groups. Providing regular interaction and networking opportunities among people of different ethnic groups can help build trust and improve social cohesion and coexistence..

- The importance of washing hands regularly is key for a healthy life. The ongoing COVID-19 pandemic further evidences its importance. However, less than five percent of households had a handwashing facility with water and soap during the survey. The first step to promote handwashing practice is to increase awareness about health and hygiene.

Evaluation

- Our baseline indicators are estimated before the CARB Activity in program areas. To estimate the impact of CARB, it is important to implement all the planned activities in the program area from now onwards. We plan to implement an endline survey in 2023, which will be after the completion of CARB Activity in target areas. Any problems in implementing the activities in any geographic area should be documented and reported to the evaluation team.

- While implementing the activities, the planned RCT-related activities should be limited to Treatment villages. Any spillover of the input/technology to Control villages may complicate the evaluation. Any known such issues should be documented and reported to the evaluation team.

- For the end-line survey, there is a need for prior security evaluation before sending survey teams to the ground for the end-line survey, particularly in Wau county. It is not advisable to survey while conflict occurs in the area.

- Flooding in Mayom has created widespread displacement of locals, which has also limited CARB's ability to implement the program, given the fact the local people are not in their original places. According to the CARB team, most of them live in IDP camps, with little chance of receiving program activities. Updating the CARB plan for Mayom will help the evaluation team readjust our research design.

- We plan to come back to the same households that were included in the baseline for the endline survey. If there is a high movement of sampled households from their original places, it results in a high attrition rate. High attrition of sampled households might have an impact on the power of the study. It is important to assess the situation before the endline to find how much attrition we can expect in the sampled villages to develop a strategy to address the issue during the survey and analysis. If there is a high attrition, we may need to resample the households in each village for the endline survey.

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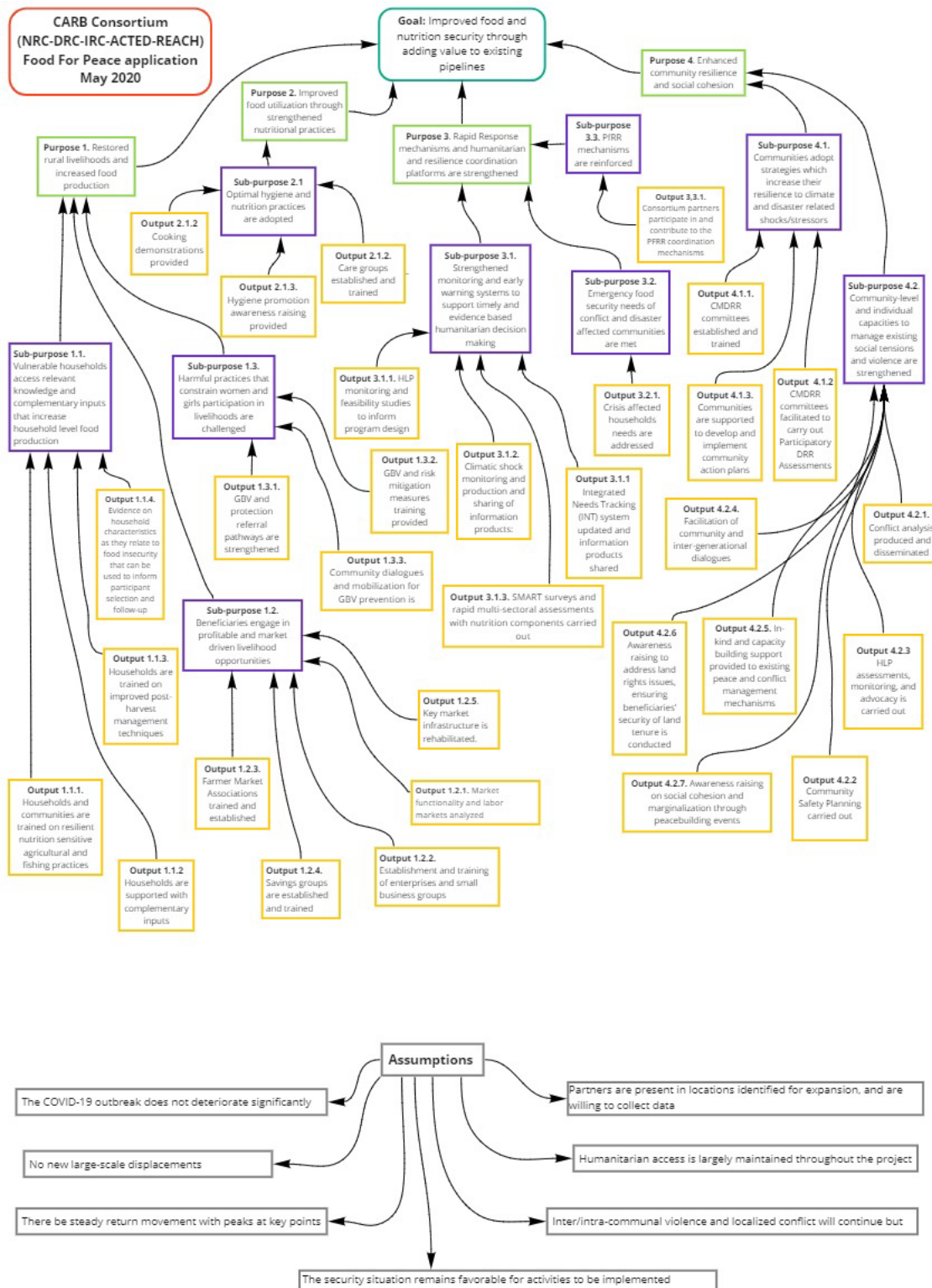
ANNEX

Survey questions

Research Design

Indicators calculation guide

CARB Theory of Change

CARB Consortium (NRC-DRC-IRC-ACTED-REACH) Food For Peace application May 2020

Goal: Improved food and nutrition security through adding value to existing pipelines

Purpose 1. Restored rural livelihoods and increased food production

Purpose 2. Improved food utilization through strengthened nutritional practices

Purpose 3. Rapid Response mechanisms and humanitarian and resilience coordination platforms are strengthened

Purpose 4. Enhanced community resilience and social cohesion

Sub-purpose 2.1 Optimal hygiene and nutrition practices are adopted

Sub-purpose 3.3. PIRR mechanisms are reinforced

Sub-purpose 4.1. Communities adopt strategies which increase their resilience to climate and disaster related shocks/stressors

Output 2.1.2 Cooking demonstrations provided

Output 2.1.2. Care groups established and trained

Output 2.1.3. Hygiene promotion awareness raising provided

Sub-purpose 3.1. Strengthened monitoring and early warning systems to support timely and evidence based humanitarian decision making

Output 3.3.1. Consortium partners participate in and contribute to the PFRR coordination mechanisms

Sub-purpose 1.1. Vulnerable households access relevant knowledge and complementary inputs that increase household level food production

Sub-purpose 1.3. Harmful practices that constrain women and girls participation in livelihoods are challenged

Output 3.1.1. HLP monitoring and feasibility studies to inform program design

Sub-purpose 3.2. Emergency food security needs of conflict and disaster affected communities are met

Output 4.1.1. CMDRR committees established and trained

Sub-purpose 4.2. Community-level and individual capacities to manage existing social tensions and violence are strengthened

Output 1.1.4. Evidence on household characteristics as they relate to food insecurity that can be used to inform participant selection and follow-up

Output 1.3.2. GBV and risk mitigation measures training provided

Output 1.3.1. GBV and protection referral pathways are strengthened

Output 3.1.2. Climatic shock monitoring and production and sharing of information products:

Output 3.2.1. Crisis affected households needs are addressed

Output 3.1.1 Integrated Needs Tracking (INT) system updated and information products shared

Output 4.1.3. Communities are supported to develop and implement community action plans

Output 4.1.2 CMDRR committees facilitated to carry out Participatory DRR Assessments

Output 4.2.1. Conflict analysis produced and disseminated

Output 1.3.3. Community dialogues and mobilization for GBV prevention is

Sub-purpose 1.2. Beneficiaries engage in profitable and market driven livelihood opportunities

Output 3.1.3. SMART surveys and rapid multi-sectoral assessments with nutrition components carried out

Output 4.2.4. Facilitation of community and inter-generational dialogues

Output 1.1.3. Households are trained on improved post-harvest management techniques

Output 1.2.5. Key market infrastructure is rehabilitated.

Output 4.2.6 Awareness raising to address land rights issues, ensuring beneficiaries' security of land tenure is conducted

Output 4.2.5. In-kind and capacity building support provided to existing peace and conflict management mechanisms

Output 4.2.3 HLP assessments, monitoring, and advocacy is carried out

Output 1.1.1. Households and communities are trained on resilient nutrition sensitive agricultural and fishing practices

Output 1.2.3. Farmer Market Associations trained and established

Output 1.2.1. Market functionality and labor markets analyzed

Output 4.2.7. Awareness raising on social cohesion and marginalization through peacebuilding events

Output 4.2.2 Community Safety Planning carried out

Output 1.1.2 Households are supported with complementary inputs

Output 1.2.4. Savings groups are established and trained

Output 1.2.2. Establishment and training of enterprises and small business groups

Assumptions

The COVID-19 outbreak does not deteriorate significantly

Partners are present in locations identified for expansion, and are willing to collect data

No new large-scale displacements

Humanitarian access is largely maintained throughout the project

There be steady return movement with peaks at key points

Inter/intra-communal violence and localized conflict will continue but

The security situation remains favorable for activities to be implemented

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