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# **Agriculture in Complex Emergencies: Exploring the Association between Agricultural Programs and Dietary Diversity among Women and Children in South Sudan**

Study Findings



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# Contents

Acknowledgments .....	v
Acronyms.....	vi
Executive Summary .....	vii
Research Methods and Findings .....	vii
Discussion and Conclusions.....	ix
Recommendations .....	x
Further Research .....	xii
Chapter 1. Introduction.....	1
Chapter 2. Background .....	3
Agriculture for Nutrition in Complex Emergencies .....	3
South Sudan Context.....	4
Chapter 3. Methodology.....	9
Rationale for Report.....	9
Conceptual Framework .....	10
Research Questions .....	12
Chapter 4. Project Background and Implementation.....	17
Overview .....	17
Seed Kits.....	18
Fishing Kits .....	19
Agricultural Tools.....	19
Agricultural Training .....	19
Other Agricultural Support.....	20
Project Outputs and Outcomes.....	20
Factors Influencing Implementation (Research Question 1) .....	21
Chapter 5. Dietary Diversity Findings .....	24
Participant Characteristics.....	24
Participation in Agricultural Activities .....	27
Prevalence of MDD (Research Question 2) .....	29
Association between Project Participation and Dietary Diversity (Research Question 3) .....	32
Household Factors Associated with Dietary Diversity (Research Question 4) .....	39
Association between Maternal Social Support and Dietary Diversity (Research Question 5).....	45

Chapter 6. Discussion and Conclusions.....	47
Chapter 7. Recommendations.....	50
Donors.....	50
Bureau for Humanitarian Assistance.....	51
Further Research.....	52
References.....	54
Annex 1. Livelihood Zones in South Sudan.....	59
Annex 2. Online Survey for ELRP Implementing Partners.....	61
Annex 3. Questions and Corresponding Responses to Assess Agricultural Activity Participation.....	69
Annex 4. Acute Malnutrition in Africa’s Drylands Conceptual Framework.....	71
Annex 5. Definitions of Household Characteristics.....	72
Annex 6. Social Support Scale.....	75
Annex 7. Percent (n) of Households Participating in Agricultural Activities by State.....	77
Annex 8. Household Characteristics by Participant Status.....	78
Annex 9. Percent of Households Participating in Agricultural Activities by Household Head.....	81
Annex 10. Difference in Dietary Diversity Scores by Program Participation.....	82
Annex 11. Full Results of Factors Associated with MDD-W and MDD.....	84
Annex 12. Full Results of Association of Social Support with MDD-W and MDD.....	92

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# Acronyms

BHA	Bureau for Humanitarian Assistance
CI	confidence interval
ELRP	Emergency Livelihood Response Program
FAO	Food and Agriculture Organization of the United Nations
FEWS NET	Famine Early Warning Systems Network
FCS	Food Consumption Score
FFS	Farmer Field School
FSNMS	Food Security and Nutrition Monitoring System
FY	Fiscal Year
HDDS	Household Dietary Diversity Score
HHS	Household Hunger Scale
IDP	internally displaced person
IPC	Integrated Food Security Phase Classification
IRB	Institutional Review Board
JSI	JSI Research & Training Institute, Inc.
MDD	minimum dietary diversity
MDD-W	minimum dietary diversity for women
NGO	nongovernmental organization
SBC	social and behavior change
SD	standard deviation
UN	United Nations
UNICEF	United Nations Children’s Fund
USAID	U.S. Agency for International Development
WFP	World Food Programme

# Executive Summary

Complex emergencies place populations at risk for food insecurity, malnutrition, and other poor health outcomes. Agriculture interventions have been implemented in many complex emergency contexts to mitigate the impact of the crisis on food insecurity, but little research has been done to evaluate the effectiveness of these interventions on nutrition outcomes. Dietary diversity is an indicator reflective of nutritional adequacy of the diet. Many studies in development contexts have found that agricultural interventions are effective at improving this measure, but little is known about the effectiveness of such interventions in complex emergencies. To address this gap, the U.S. Agency for International Development's (USAID's) Bureau for Humanitarian Assistance (BHA) engaged USAID Advancing Nutrition to investigate how agriculture activities can be designed to improve nutrition outcomes in these contexts. This report presents the findings from a study of the Emergency Livelihood Assistance Program (ELRP) in South Sudan.

South Sudan has been experiencing a complex emergency almost since its independence in 2011. Poverty rates are high, and most households rely primarily on agriculture and/or pastoralist-based livelihoods. Food insecurity rates have risen strikingly since independence, and national-level production is generally not enough to meet needs. In 2021, it was estimated that more than half of the population was facing severe acute food insecurity (Integrated Food Security Classification Phase 3 and above) (IPC 2020). The ELRP has been implemented in rural areas in South Sudan since 2014. The program aims to enhance food production and strengthen resilience in rural food-insecure households. The program provided seed kits, fishing kits, agricultural tools, agricultural training, and veterinary assistance.



## Key Messages

- Less than one-third of women (aged 18–49 years) or children (aged 6–23 months) were consuming a minimally diverse diet.
- Participation in agricultural program activities, such as training receipt of seeds or other agricultural inputs; or receipt of fishing equipment was associated with a higher dietary diversity among women, but not children.
- Other household factors, such as participation in social groups, source of income and food, were also associated with greater dietary diversity, suggesting opportunities to strengthen future programs.

## Research Methods and Findings

This study explored five research questions (listed below). The first question focused on factors influencing the implementation of the program. To assess this question, we shared an online survey with 89 implementing partner representatives, and received 27 completed responses. To examine research questions 2 through 5, we used data from the 27th round of the Food Security and Nutrition Monitoring System (FSNMS) survey, conducted between October 2021 and January 2022 in South Sudan. This survey yielded a representative sample of 14,215 households.

**Table 1. Key Findings by Research Question**

<b>1. Which factors influenced implementation of the nutrition-sensitive agriculture interventions within emergency activities?</b>
<ul style="list-style-type: none"><li>• Program implementing partners predominantly had positive perceptions about the quality of implementation and considered the high to very high quality of agriculture and nutrition related training important factors positively influencing program outcomes related to food security, crop yield, and household dietary diversity.</li><li>• The main challenges affecting implementation were largely external to the program and included insecurity and safety issues, poor infrastructure, and the program’s short implementation cycle.</li></ul>
<b>2. What is the prevalence of meeting minimum dietary diversity (MDD) among women of reproductive age (15–49 years) and among children (aged 6–23 months)?</b>
<ul style="list-style-type: none"><li>• The percentage of women and children who met MDD in the overall sample was low, with only 30 percent of women and 22 percent of children having consumed five or more food groups in the previous 24 hours.</li><li>• Seventy percent of women reported consuming grains, roots, and tubers and 56 percent consumed dark green leafy vegetables. Among children, 74 percent consumed breastmilk and 55 percent consumed grains, root, and tubers. All other food groups were consumed by less than 50 percent of women and children.</li></ul>
<b>3. What is the association between participation in agricultural activities and meeting MDD among women of reproductive age (15–49 years) and among children (aged 6–23 months)?</b>
<ul style="list-style-type: none"><li>• Participation in agricultural activities was associated with a higher prevalence of MDD for women (MDD-W), suggesting that agricultural activities are potentially important investments in complex emergencies. We were not able to disaggregate the contributions of specific agricultural activity components.</li></ul>
<b>4. Which household-level factors are associated with meeting MDD among women of reproductive age (15–49 years) and among children (aged 6–23 months)?</b>
<ul style="list-style-type: none"><li>• A few household factors were shown to be associated with dietary diversity of both women and children, including having a household member who was part of a social group, such as community organizations, farmers’ associations, savings groups, youth groups, mothers support groups, or health committees, and the proportion of food that comes from own production.</li><li>• Facilitating participation in social groups, such as farmer’s groups, women’s groups, or youth groups, may be a mechanism for agricultural programs to increase their impact on dietary diversity.</li><li>• Total number of assets owned was associated with dietary diversity, which suggests that increasing production and income of the most vulnerable households could improve dietary diversity.</li></ul>
<b>5. What is the association between maternal social support and meeting MDD among women of reproductive age (15–49 years) and among children (aged 6–23 months)?</b>
<ul style="list-style-type: none"><li>• Overall, in this study sample, which included a high proportion of female-headed households in an emergency context, women’s perceived social support was low.</li><li>• Social support was not associated with dietary diversity in this sample, but this finding is likely affected by the low levels of social support overall.</li></ul>



Implementing partners reported that internal factors of their organization, such as program leadership, technical capacity, relationship with the community, and efficient distribution, facilitated implementation. Challenges implementers faced included insecurity and safety, poor infrastructure, and a short implementation period. Implementers reported improved agronomic knowledge, improved sustainability of agricultural practices, and increased crop yields for participants.

For research questions 2 through 5, the primary outcomes of interest were MDD-W and MDD of children aged 6 to 23 month. Individuals were considered to have participated in the ELRP if they had reported receiving agricultural training; agricultural inputs, such as tools or seeds; or fishing equipment from the Food and Agriculture Organization of the United Nations (FAO) or one of the implementing partner nongovernmental organizations (NGOs).

A high proportion of households in the FSNMS survey were headed by women (63.5 percent). Most households were residents or internally displaced people; the average household size was seven members; and the mean household dietary diversity score (HDDS) was 4.3 out of 12 food groups. More than 50 percent of households produced more than half their own food. More than one in three respondents participated in agricultural program activities.

Among women, the prevalence of MDD-W was 30 percent; among children, the prevalence of MDD was 22 percent. Participation in agricultural activities was associated with a higher prevalence of MDD for women but not for children. Women in households that participated in agricultural activities had a 9 percent higher prevalence of MDD-W than women in households who did not participate. Among children, there were fewer differences between participants versus nonparticipants in terms of consumption of individual food groups compared with women. For instance, a higher proportion of children in households that participated in agricultural activities reported consumption of legumes and nuts, meat or fish, and eggs. A slightly lower proportion of participants consumed dairy, however, compared with nonparticipants.

Many household factors were found to be associated with MDD. Factors associated with MDD-W were woman's age, total number of assets the household owned, household size, proportion of household expenditures spent on food, most important source of food and income, proportion of food that comes from own production, a household member being part of a social group, distance to market, and HDDS. Factors associated with MDD among children included child's age, total number of assets the household owned, proportion of food that comes from own production, a household member being part of a social group, and HDDS. Social support, assessed by using a 10-question scale, was not found to be associated with dietary diversity among women or children. Average social support scores among women were low.

## Discussion and Conclusions

These findings highlight the importance of agricultural interventions in complex emergencies and suggest that such programs are important investments in improving dietary diversity among women. Direct food assistance programs in emergency contexts are typically only able to provide a staple grain or fortified blended flour, legumes, and oil rather than fruits, vegetables, or animal source foods. This study suggests that agricultural interventions have the potential to improve overall diet quality and can complement direct food assistance programs. Despite this finding, agricultural programs are often not designed with an explicit goal of improving dietary diversity. Without this intentionality in the design, agricultural investments may not directly translate into improved nutrition outcomes. Nevertheless, this study found that overall dietary diversity among women and children was low and the program reached only one-third of households. More progress is needed, and there is a continued need to reach nonagricultural households through other types of programming.

In conclusion, **we found that participation in agricultural program activities was associated with greater dietary diversity among women** but not children. The difference in outcomes may be the result of inadequate consideration of barriers to improving dietary diversity among young children. Some barriers, such as concerns about food consistency and food safety, may differ for children compared with women. In sum, despite the challenging context in which this program was implemented, this study suggests that investments in agricultural activities can have an impact on nutrition outcomes.

## Recommendations

Although this study offers some promising results with respect to MDD-W, many opportunities for improvement exist. This study suggests a few avenues for further refinement of program design and for research to enable stronger evidence-based decision-making. Below we offer recommendations based on the findings from this study in addition to knowledge and best practices from USAID Advancing Nutrition’s work researching and developing guidance for nutrition-sensitive agriculture and SBC.

### Donors

Our findings have implications for donors that fund nutrition and agriculture programs in complex emergencies:

- **Consider promoting and funding nutrition-sensitive agriculture in South Sudan and other complex emergencies to improve women’s diets.** As these findings show, agriculture projects can be appropriate to improve women’s dietary diversity within South Sudan’s highly food-insecure, complex emergency context and may in other similar contexts as well. However, more research is needed to understand why similar associations were not apparent among children. These projects can be implemented within short time frames provided that they align with the seasonal calendar and production cycles. We found that among households that planted diverse, nutrient-rich crops, women’s dietary diversity improved. Importantly, the nutrition outcomes from these interventions will likely be stronger if nutrition is an explicit component of the project design and implementation. Emphasis should be placed on the production of nutrient-rich foods coupled with social and behavior change (SBC) approaches that promote the consumption of such foods. For more guidance on nutrition-sensitive agriculture programming design, please see USAID Advancing Nutrition’s *Designing Effective Nutrition-Sensitive Agriculture Activities Workshop: Facilitator’s Guide and Slides*. This design guide was developed for programs in development settings, but many elements will be useful and applicable for emergency settings, as well.
- **Consider strengthening social networks as a means to improve dietary diversity.** Our findings on social support warrant further consideration as factors that may influence women’s diets. Importantly, agriculture interventions that are implemented by creating and implementing group activities can serve a dual purpose—one for improving agricultural practices and the other to serve as a social network that provides women with social support. This may particularly be important in South Sudan given the low social support experienced by women and the high portion of female-headed households in the country.
- **Explore other nutrition activities to improve children’s diets in complex emergencies.** Children’s diets are affected by care and feeding practices that are not necessarily related to household food access. For more guidance, see USAID Advancing Nutrition’s guidance on prioritizing multi-sectoral nutrition behaviors and designing complementary feeding activities.

## Bureau for Humanitarian Assistance

The following recommendation is for consideration by BHA and applicable when an implementing partner identifies nutrition as an objective for agricultural activities in an application for BHA emergency funding:

- **Evaluate the appropriateness of agricultural activities to improve diets.** When evaluating emergency applications with nutrition objectives, BHA should consider whether the agricultural activities proposed are indeed nutrition sensitive and likely to improve diets in the specific context (e.g., given agroecology, production systems, markets). The theory-of-change statement in the application should provide a logic for how the agricultural activities are nutrition sensitive and will improve diets; it should include both crop-based interventions and animal-source food production efforts. This approach requires developing objectives and hypotheses that go beyond improving food security. The response analysis implementing partners conduct should also provide justification for the design of the nutrition-sensitive agriculture programming, including timeline considerations based on production cycles and seasonality.

## FAO, World Food Programme, and Emergency Implementing Partners

Through thoughtful program design, implementing organizations can increase the likelihood that their programs will have an impact on improving dietary quality:

- **Bring nutrition goals to the forefront of agricultural program design.** Nutrition-sensitive agriculture interventions are most likely to have impacts on dietary diversity when there is explicitly stated intent to achieve nutrition-related objectives (Margolies et al. 2022). Laying the foundation through clearly established nutrition goals and targets can help refine the implementation strategy for agricultural interventions that aim to improve nutrition. For more guidance, see USAID Advancing Nutrition’s [Designing Effective Nutrition-Sensitive Agriculture Activities Workshop: Facilitator’s Guide and Slides](#).
- **Standardize and integrate women’s dietary diversity measures into FSNMS survey modules.** Women’s dietary diversity was integrated in the FSNMS for purposes of this secondary analysis, and the results suggest that the use of this indicator should be standardized and integrated into future rounds of the FSNMS survey and the survey tool. MDD-W is now a well-established and meaningful indicator that is also important to include in monitoring food security and nutrition in complex emergency contexts.
- **Place greater emphasis on diverse crop varieties and timely delivery.** The most common types of seeds received from FAO or an NGO were sorghum and maize. Only a small fraction of households reported receiving seeds for legumes, nuts, seeds, fruits, or vegetables. Among the small proportion of households that did receive these types of seeds, there appeared to be higher dietary diversity scores. Evidence suggests that crop diversity can translate into increased dietary diversity in some contexts (Khandoker, Singh, and Srivastava 2022), particularly when market access is limited (Habtemariam et al. 2021; Khandoker, Singh, and Srivastava 2022; Khonje et al. 2022). As shown in annex I, there are many communities with poor access to markets in South Sudan. It is also critical that the seeds are provided in a timely manner, in line with the growing seasons in the region.
- **Strengthen delivery and monitoring of nutrition SBC components to improve women’s and children’s diets.** Evidence suggests that agriculture interventions that include SBC components are more likely to have an impact on improving dietary diversity (Margolies et al. 2022; Ruel, Quisumbing, and Balagamwala 2018). Although the ELP program did contain some nutrition education elements, this study was not able to assess the effectiveness of this aspect of the program. Key messages of the SBC strategy should focus on the primary goals of

the program and the likely barriers to adoption. Relevant nutrition messages can be incorporated into agricultural training, including encouraging consumption of the promoted nutrient-rich foods among nutritionally-vulnerable household members, feeding the promoted nutrient-rich foods to young children as part of improved IYCF practices, considering dietary diversity throughout the year when making crop choices, task sharing among household members, and how spouses can collaboratively make decisions about how to use yields and agricultural income. Agricultural interventions may also be paired with nutrition counseling provided by health workers or community health volunteers. For more information, see USAID Advancing Nutrition's guidance on [prioritizing multi-sectoral nutrition behaviors](#), [designing complementary feeding activities](#), and [engaging family members in nutrition](#).

- **Strengthen social group activities to share knowledge and resources and to build social networks.** This study suggests that participation in social groups, such as community organizations, farmers' associations, savings groups, youth groups, mothers support groups, and health committees, is associated with greater dietary diversity. By purposefully including these types of group activities in the program design, the program may enable households to have greater access to knowledge, resources, and social support. These external support systems may be particularly important in emergency contexts, where typical household or extended family social support systems may be weakened.

## Further Research

Although there is a growing body of evidence on the effectiveness of agricultural interventions on improving dietary diversity in development contexts, there is limited research on such programs in emergency contexts. This imbalance hinders the ability to develop evidence-based operational guidance for program implementation. Recognizing the challenges of conducting research in these difficult settings, opportunities nevertheless exist to use large-scale surveys or tailor studies to assess the reach and effectiveness of agricultural programs:

- **Develop survey modules that specifically assess program activities to strengthen monitoring.** The questionnaire was not well aligned with the design of the program and made interpretation of program participation challenging. In protracted crises, opportunities may arise to develop brief, standardized survey modules that can be incorporated into national surveys. Particularly in contexts where surveys are repeated over time, such standardized data-collection tools can be used to evaluate the reach of large-scale programs over time and in response to situational changes. Although this work might not be feasible in shorter-term, acute crises, the longer time horizon of protracted, complex emergencies may warrant greater investment in survey tools designed to evaluate program activities.
- **Consider conducting a study specifically designed to evaluate the effectiveness of emergency agricultural programs.** The study presented in this report used secondary data from a survey that was not explicitly designed to evaluate the program. A well-designed study with tailored data-collection tools and a well-designed analysis strategy, however, could provide substantial insight and target key implementation questions that could not be addressed through this analysis.

# Chapter I. Introduction

Agriculture interventions in complex emergency contexts have typically been implemented to protect and rebuild livelihoods and food security. These interventions typically include seed and tool distribution, livestock support, and training (Maxwell and Caldwell 2008). Evidence supports the effectiveness of nutrition-sensitive agriculture activities in improving dietary outcomes in development contexts (Ruel and Alderman 2013; Ruel, Quisumbing, and Balagamwala 2018). Little research has been done, however, to determine the effectiveness of these investments to improve nutrition outcomes in complex emergency contexts (FAO 2010; Hall, Blankson, and Shoham 2011; Levine and Chastre 2011).

Although no single definition can fully describe all complex emergencies, they have been described as “those environments in which a significant proportion of the population is acutely vulnerable to death, disease and disruption over a prolonged period of time” (FAO 2010). In such circumstances, emergencies may become the normal situation; thus, the types of assistance needed may differ from those implemented for people experiencing an acute crisis. For example, emergency food assistance programs may be necessary to save lives and meet basic needs, but they may be insufficient to provide adequate dietary quality to enable people to thrive over many years.

Agricultural interventions have the potential to fill this need, but such programs in emergency contexts may not have the same effect on nutrition as they do in development contexts for several reasons. Even in the context of complex emergencies, emergency programs are often funded for short periods and implemented for only 6 to 12 months. Implementing partners may design short-term programs in a different way than they would for those projects that have an extended implementation timeline. In addition, emergency programs themselves face more challenging implementation circumstances, and the enabling environment is often weak (Hall, Blankson, and Shoham 2011; Hendrix and Anderson 2021; Quak 2018). Indeed, a systematic review of factors influencing implementation of nutrition-sensitive agriculture interventions found that project implementation can be constrained by implementer and farmer capacity, a weak enabling environment, poor infrastructure, and shocks (Di Prima et al. 2022). Further, farmers receiving agricultural interventions in such contexts face different, complex challenges than those in stable, non-conflict contexts. Household membership or dynamics may shift as a result of conflict or displacement, which could influence the household’s ability to carry out farming activities. Similarly, changes in the household head may affect the extent to which households can access resources for farming or other livelihoods. Finally, household access to land may be particularly challenging for internally displaced populations, refugees, and refugee returnees. The challenging contexts in which emergency programs are implemented warrant exploring whether agricultural interventions positively influence dietary intake in these contexts.

Given the lack of evidence about the effectiveness of agriculture interventions for nutrition in complex emergencies, the U.S. Agency for International Development’s (USAID’s) Bureau for Humanitarian Assistance (BHA) engaged USAID Advancing Nutrition to explore when nutrition-sensitive agriculture activities are appropriate in emergency contexts and how they can be designed to improve nutrition outcomes. After reviewing BHA agriculture investments and consulting with BHA, we decided to focus on the following parameters:

- **Complex emergency contexts.** Many of BHA’s agriculture investments focus on complex emergency contexts. Complex emergencies are associated with protracted political instability and internal or external conflict that may occur over years or decades (LEGS 2014).

- **Agriculture interventions that aimed to improve food security rather than nutrition explicitly.** We focused on agriculture interventions because we were not able to not identify BHA-funded emergency agriculture investments that had nutrition goals and were interested in partnering with us during the design phase of this activity. We did not conduct a systematic review of BHA-funded agriculture activities, so this does not reflect on BHA’s portfolio.
- **Opportunities to assess dietary diversity.** We focused on opportunities to assess dietary diversity as the primary outcome of interest and an appropriate indicator of diet quality that can change quickly, such as within the 6- to 12-month funding cycles typical of emergency programming. Indicators of nutrition status, such as chronic malnutrition (stunting, or low height-for-age), are long-term indicators that are not appropriate for assessment in activities implemented for five years or less or for single-intervention activities (USAID Advancing Nutrition 2020).

We identified two BHA-funded agriculture activities that met the above criteria and were implemented in fiscal year (FY) 2021, were interested in collaborating, and had existing data-collection plans on which we could build. The following two activities met the criteria:

- Emergency Response to Food Insecurity for Lake Chad Basin Crisis-Affected Populations in the Far North Region of Cameroon, implemented by Première Urgence Internationale
- Emergency Livelihood Response Programme, South Sudan, implemented by the Food and Agriculture Organization of the United Nations (FAO)

This report presents the methodology and findings for the FAO Emergency Livelihood Assistance Program (ELRP), implemented in South Sudan. [A companion report](#) presents the methodology and findings for Cameroon. [A third report](#) provides a synthesis of the two studies. Chapter 2 presents background for the study, the context in South Sudan, and the project background. Chapter 3 provides the methodology, and chapter 4 presents the study findings. Finally, chapters 5 and 6 present the discussion and conclusions and our recommendations, respectively.

# Chapter 2. Background

## Agriculture for Nutrition in Complex Emergencies

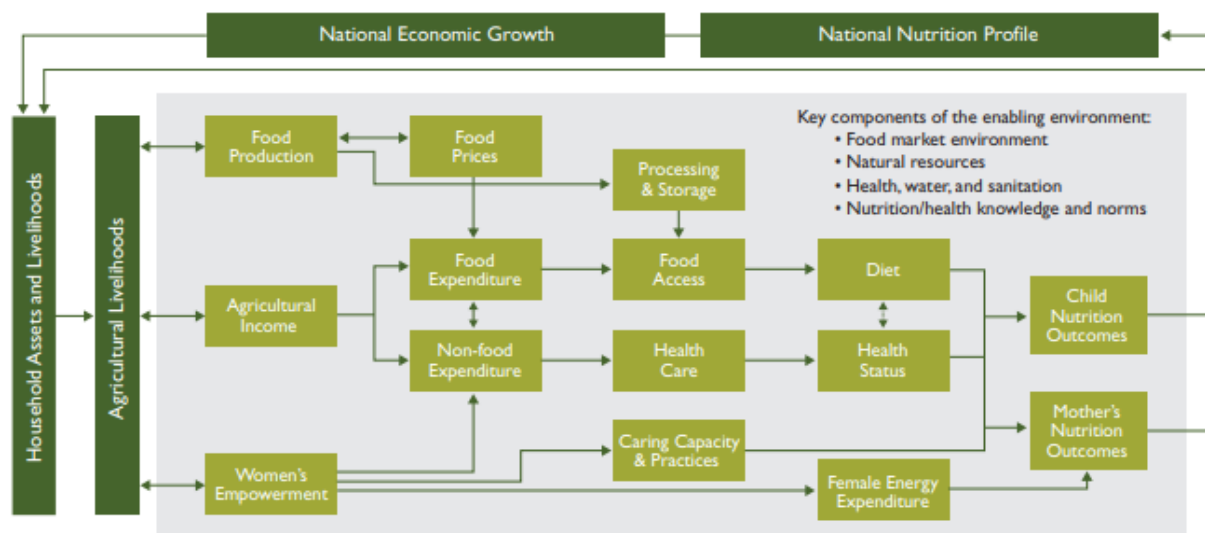
Agriculture activities are typically implemented in complex emergency contexts to protect or strengthen livelihoods, food security, and nutrition. BHA funds agriculture activities, including nutrition-sensitive agriculture, in emergencies to “address immediate emergency needs, enhance recovery, and contribute to the goal of preventing widespread food insecurity among vulnerable populations” (USAID BHA 2022).

Food insecurity and malnutrition are significantly more common in complex emergency contexts for a variety of reasons (Delgado and Smith 2021; IFPRI 2015; Khara and Mates 2013; Quak 2018; USAID 2016). Food insecurity is both a cause and a consequence of conflict (Delgado and Smith 2021; Global Panel 2020; Hendrix and Anderson 2021; IFPRI 2015; Quak 2018). Food system disruptions and food insecurity “lead to poor diets with low diversity, which in turn can contribute to all forms of malnutrition” (WFP 2020). Crises, whether violent conflict, climate shocks, population displacement, or others, typically fuel food insecurity as a result of decreases in agricultural production, weakened livelihoods and poverty, food price volatility, and market and supply chain disruptions (Global Panel 2020; Hendrix and Anderson 2021; USAID 2016; WFP 2020). Thus, food crises are occurring increasingly in conflict-affected and fragile contexts. The situation has deteriorated in recent years, with a near doubling of the number of people experiencing food crisis situations or worse since 2016 (Integrated Food Security Classification [IPC] phase 3 or higher) (Global Network Against Food Crises 2022).

Agricultural activities are an approach that can be used to help address food insecurity in complex emergencies (USAID 2016). These activities can include distribution of agricultural inputs, promotion of improved crop and livestock production practices to increase yields, promotion of climate-smart agricultural practices, diversification of crops, improved postharvest management, and improved marketing (USAID BHA 2022). As has been articulated in development contexts (figure 1), agriculture may support nutrition in complex emergencies through at least two potential food security-related pathways:

- **Increased food production.** Agricultural production can help increase households’ access to nutritious foods through their own production. Improved postharvest management can ensure that household production is safely stored for consumption (Herforth and Harris 2014; Quak 2018).
- **Increased agricultural income.** Households may sell products from increased agricultural production to earn income. Such sales can enable households to increase the quantity of food purchases or diversify food purchases, including purchase of more expensive, nutritious foods, such as animal-source foods. Households can also use this income to invest in other, non-food necessities that can support nutrition, including health care and improved water and sanitation (Herforth and Harris 2014).

**Figure I. Conceptual Pathways between Agriculture and Nutrition**



*Adapted for Feed the Future by Anna Herforth, Jody Harris, and SPRING, from Gillespie, Harris, and Kadiyala (2012) and Headey, Chiu, and Kadiyala (2011).*

As illustrated in the conceptual framework, there are many complex steps between agricultural production and nutrition outcomes, and therefore they may be barriers to fully achieving them. Importantly also, the framework lists key components of the enabling environment that can support or impede the ability of an agricultural program to achieve nutrition goals. Farmers in complex crisis contexts often face adversities that negatively affect production, including crop damage, restricted access to land, labor shortages, poor access to finance and banking services, limited access to high-quality inputs, and poor access to extension services. Further, they face challenges from weakened markets and trade systems, including poor infrastructure, price volatility, and high transaction costs. Weak consumer demand further constrain farmers' economic opportunities (Global Panel 2020; Quak 2018). Thus, substantial barriers exist to agricultural programs achieving beneficial nutrition outcomes. Adding to this challenge, it has been increasingly recognized that dietary diversity is an important precondition for micronutrient adequacy of the diet (Arimond et al. 2010). Yet, agricultural programs are often not designed with an explicit goal to improve dietary diversity. Without this design intentionality, agricultural investments may not directly translate into improved nutrition outcomes.

## South Sudan Context

South Sudan became an independent state from Sudan in 2011 and has been in a complex emergency for much of its independence. In 2013, a conflict began between the Government of South Sudan and organized, armed groups. The conflict was initially concentrated in the north, then spread to the south in 2016. In 2018, a power-sharing agreement was signed to end the civil war. In addition to organized, armed conflict, low-level resource and ethnic conflict has persisted since independence (FEWS NET 2018). Violence has continued, however, with a 300 percent increase in violent incidents in January to June 2020 compared with 2019. During this period in 2020, there were 1,080 documented human rights incidents, and at least 2,100 civilians were killed (OCHA 2022). South Sudan ranked third out of 178 countries in the Fragile States Index, ranking just above Yemen and Somalia (UNICEF South Sudan 2021). In the first half of 2021, violence increased in 6 of 10 states and displaced more than 80,000 people (FAO 2021b).

The ongoing conflict has exacerbated vulnerabilities in the country, as discussed further below. The conflict has also contributed to the internal displacement of an estimated 1.7 million people, and in 2021, an estimated 8.3 million people needed humanitarian assistance out of a total estimated population of 12.1 million (USAID BHA 2021). Several United Nations (UN) agencies and international donors,



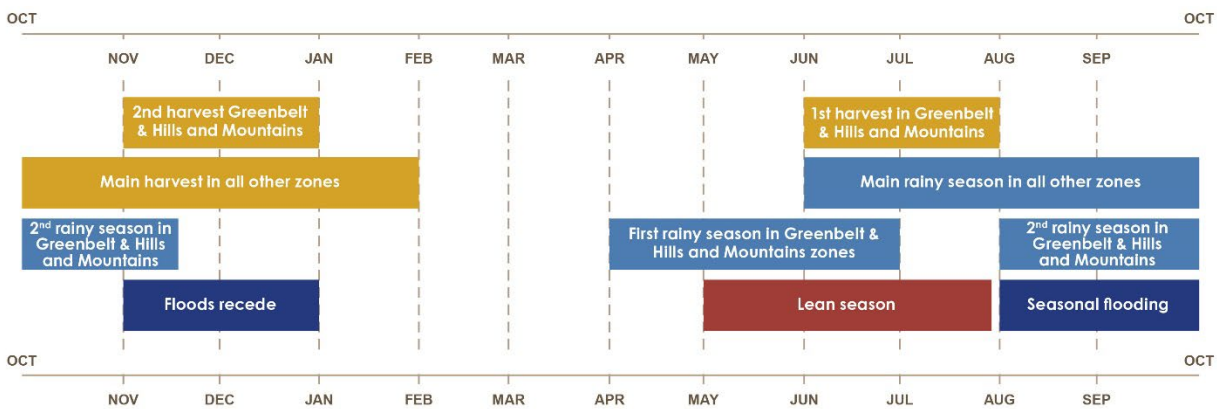
including USAID, provide funding to address this humanitarian need. In FY 2021–22, BHA provided \$812 million in humanitarian funding to help address food security; agriculture; health; nutrition; protection; logistics; and water, sanitation, and hygiene issues. In addition to FAO, BHA funded 10 implementing partners for agriculture activities in FY 2021–22 (FAO 2021a).

### Livelihoods and Agricultural Production

Poverty rates are high, with four out of five people living under the poverty line in 2016, a problem that is concentrated in the eastern portion of the country (OCHA 2022). Much of the population lives in rural areas and relies on small-scale, rainfed crop and livestock production (FEWS NET 2018; UNICEF South Sudan 2021). About 80 percent of the population relied on subsistence agriculture in 2020, and 49 percent of households owned livestock in 2018 (UNICEF South Sudan 2021). Livestock ownership is important in both pastoral and agrarian areas as households largely keep their financial capital in the form of livestock and livestock ownership is central to social capital, social networks, and social support. Livestock ownership has decreased because of conflict, poverty, livestock diseases, cattle raiding, and other issues that have decimated livestock holdings (Catley 2018; Cullis 2021). Fishing is a main source of food and income for more than 1.7 million people living in riverine communities (FAO 2021b).

South Sudan has seven general agroecological zones. The climate is tropical, with wet and dry seasons (figure 2), but the amount of rainfall and the timing of the wet and dry seasons varies, with some regions experiencing bimodal rainfall and others not. The south and west receive slightly more rain than the north and southeast. The main harvest takes place between October and February, depending on the region, and the lean season generally occurs from May to August (FEWS NET 2018).

Figure 2. Seasonal Calendar in a Typical Year



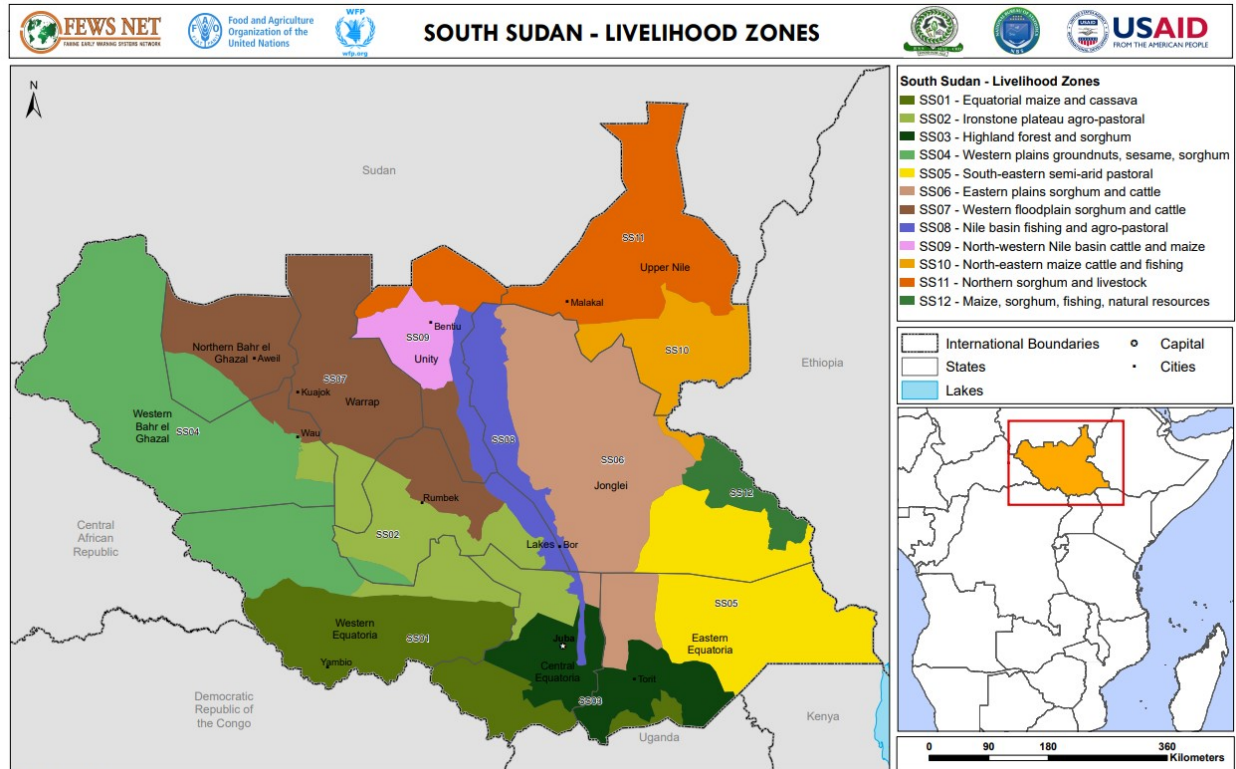
Source: FEWS NET 2013

Inflation, price volatility, and market failures are serious problems in the economy (FAO 2021b). Conflict and climate shocks negatively affect livelihoods and agricultural production in the country. Conflict over resources, including cattle, is localized but ongoing and can damage livelihoods (FEWS NET 2018). The country is vulnerable to natural disasters and climate change, which exacerbate existing humanitarian crises. In 2021, severe flooding occurred that negatively affected an estimated 780,000 people, particularly in the Jonglei, Unity, and Upper Nile states (FAO 2021a).

As shown in figure 3 and summarized in annex 1, South Sudan has 12 livelihood zones in which people share similar livelihood patterns and market access. The livelihood zones vary by agroecology, main economic activities, market access, and exposure to hazards. There is also variation in ethnic groups and languages spoken across regions. Most livelihood zones are agropastoral, with reliance on rainfed crop production and livestock production. Only one livelihood zone—the southeastern semiarid pastoral

zone—is primarily pastoral. Fishing, use of forest products, and wild food gathering is common in some zones. Market access and the primary hazards vary across livelihood zones, depending on location (e.g., if near a border), agroecology, infrastructure quality, and conflict severity (FEWS NET 2018).

**Figure 3. Livelihood Zones in South Sudan**



Updated: August 2018  
 Source: FEWS NET 2018

## Food Security

Conflict, agroecology, economic risks, access to markets, price volatility, climate change, natural shocks, gender inequality, animal diseases, crop pests, and poverty all create an environment of chronic vulnerability and susceptibility to shocks that worsens food security (FEWS NET 2018; IPC 2022; UNICEF South Sudan 2021). South Sudan does not produce enough cereals to meet national needs, even in years with good production, and thus relies on imports and humanitarian assistance to fill those gaps (UNICEF South Sudan 2021). Conflict, a significant contributor to food insecurity in South Sudan, has worsened the food security situation because it restricts livelihood activities, causes displacement, and disrupts markets. The effect of conflict on food security can be sudden and localized. Market access is generally weak, and some rural communities do not have consistent access to markets. Climate change has contributed to rainfall variability, including droughts and flooding, as well as pest infestations, including desert locusts, which negatively affect food production and livelihoods and increase vulnerability (FEWS NET 2018; UNICEF South Sudan 2021; WFP 2018). Food prices have risen because of high inflation. The cost of the food basket increased by 42 percent in 2020 (OCHA 2022). In 2021, COVID-19 restrictions disrupted access to markets, impeded access to livestock grazing and watering points, caused supply issues, and increased food prices (FAO 2021b). In the ELRP’s post-distribution monitoring survey, conducted in April to August 2021, 89 percent of households reported experiencing negative effects from COVID-19, including increases in nonfood prices and a restriction in movement for daily activities (FAO 2021b).

Rural households are largely dependent on their own production and wild foods for food. Livestock production is an important source of animal-source foods, including meat, milk, and blood. Wild foods, such as fish, fruits, wild greens, and game meat, are important food sources both in times of scarcity and not (FEWS NET 2018). The lean season is typically from May to August (although timing varies by region and year), during which households may run out of their own stocks and are more reliant on market purchases for food (FEWS NET 2018). Food insecurity has increased since 2015 because of the compounding negative effects of conflict on the economy and food production systems (WFP 2018).

Food insecurity (IPC phase 3 or worse) rose between 2014 and 2018, with an increase in the proportion of the population facing acute food insecurity from 19 percent in 2014 to 58 percent in 2018 (WFP 2018). In October through November 2020, the situation remained fragile, with 52.6 percent of the population (6.35 million people) facing severe acute food insecurity (IPC phase 3 or worse) and 24,000 people suffering from catastrophic conditions (IPC phase 5). Acute food insecurity was projected to rise to 60 percent of the population, or 7.24 million people, during the lean season of April to July 2021 (IPC 2020). This situation is most severe in areas where chronic vulnerabilities were exacerbated by a range of shocks, including severe flooding; droughts; subnational and localized violence; and the effects of the ongoing macroeconomic crisis, such as in Jonglei, Unity, Upper Nile, Lakes, Warrap, and Northern Bahr el Ghazal (IPC 2020).

## Health and Nutrition

Access to quality health services is limited, which contributes to poor health and nutrition outcomes. There is only 1 physician for every 65,574 individuals (OCHA 2022). The health sector is underfunded, with only 1 percent of the national budget allocated to health in FY 2019/20 and FY 2020/21 (UNICEF South Sudan 2021). Life expectancy at birth is 57 years (UNICEF South Sudan 2021), and only 35 percent of the population has access to safe water (UNICEF South Sudan 2021). The maternal mortality rate is the highest in the world, at 1,150 maternal deaths per 100,000 live births (UNICEF South Sudan 2021). The under-five mortality rate is 90.7 deaths per 1,000 live births, which is also one of the highest rates in the world (UNICEF South Sudan 2021).

Acute malnutrition is a serious problem in South Sudan. Nearly 500,000 pregnant and lactating women were estimated to be acutely malnourished in 2021 and in need of treatment (UNICEF South Sudan 2021). In 2020, 31.3 percent of children under five years of age were stunted (have low height-for-age) (UNICEF South Sudan 2021). In 2017, global acute malnutrition rates exceeded 15 percent, which the World Health Organization considers critical, in 8 of 10 states (WFP 2018). In November 2020 to March 2021, 68 percent of counties were classified as IPC phase 3<sup>1</sup> or above (IPC 2022). Under-five malnutrition rates in South Sudan are related to a complex set of factors, including inadequate care practices; insufficient access to health and nutrition services; high prevalence of disease; inadequate hygiene and sanitation behaviors; food insecurity; sociocultural norms; conflict; natural shocks; and, more recently, COVID-19 disruptions (IPC 2022; WFP 2018). There are two seasonal malnutrition peaks—one at the end of the dry season and the other at the end of the rainy season—that likely have different causes. The analysis also found these two peaks in Chad and Sudan but found that acute malnutrition varied less by season in South Sudan than in the other two countries, likely because of the influence of conflict (FAO and Tufts University 2019). The normalized difference vegetation index and temperature have a stronger relationship with nutrition outcomes than precipitation. In addition, seasonal fluctuations in livelihoods and access to natural resources likely contribute to seasonal changes in food security, care, and health (Young 2020).

Data about dietary practices in South Sudan are relatively limited. Diets are poor for children aged 6 to 23 months, with only 7 percent having a minimum acceptable diet and 15 percent having minimum dietary diversity (MDD) (IPC 2020). A study in Warrap and Northern Bahr el Ghazal states found that

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<sup>1</sup> The IPC phase 3 means that 10 percent to 14.9 percent of children are acutely malnourished (IPC 2021).

cereals are predominately given in addition to breastmilk for children aged 6 to 23 months. The study was done during a time of scarcity, and households on average consumed just 1.6 meals per day. When they did not have enough food, women reduced their own portion sizes first; then reduced the men's portion; and, as a final resort, reduced the amount of food given to children. Women would make these changes when allocating food at mealtimes, during which they first allocated food to young children, then older children, then adult men, and finally adult women. Family meals typically consisted of sorghum porridge and soup made with okra, ground peanuts (when available), dried fish (when available), and *kombo* (liquid made from straining water over ash) (Paul et al. 2014). Another study in Western Bahr el Ghazal State found the dark leafy greens grown in small kitchen gardens or collected from the wild are typically eaten with cereals. Consumption of meat, organ meat, fish, and legumes was uncommon and households were dependent on the market for purchasing these iron and protein-rich foods (Sassi 2022).

## Gender

Gender inequalities are significant in South Sudan, which makes women and girls more vulnerable in humanitarian crises and when displaced (Buchanan 2019; UNICEF South Sudan 2021). The country ranks near the bottom globally on the Gender Development Index. South Sudan has a patriarchal system in which men predominately have control over productive assets, decision-making, and authority. Patriarchal gender norms constrain women's and girls' access to education, mobility, decision-making power, and control over and access to resources (UNICEF South Sudan 2021). Women can own small livestock and engage in the sale of milk and livestock products, but they do not own cattle, which are central to financial and social capital (Cullis 2021; Wilson 2018). Child marriage is grounded in sociocultural and patriarchal norms (UNICEF South Sudan 2021). About half of women aged 20 to 24 years are married or in a union before they are 18 years old. Nearly a third of adolescent girls experience pregnancy (UNICEF South Sudan 2021). Gender-based violence is likely high, with some studies indicating that 65 percent of women and girls experience gender-based violence during their lifetimes (UNICEF South Sudan 2021). A high portion of households are female headed because husbands and sons leave their communities to join the conflict or to avoid being forced to fight (FEWS NET 2018). This number is even higher among those who are displaced, with 80 percent of displaced households headed by women (Buchanan 2019).

# Chapter 3. Methodology

## Rationale for Report

In an effort to improve the impact of emergency-funded agricultural activities on nutritional status, especially that of women and young children, BHA has asked USAID Advancing Nutrition to explore how agriculture activities can be designed to improve nutrition outcomes. The FAO agreed to collaborate with USAID Advancing Nutrition to explore the relationship between dietary diversity for women and children and the agriculture interventions delivered through the BHA-funded 2020 ELRP in South Sudan.

Populations of women and children in countries experiencing complex humanitarian crises consistently perform poorly on indicators related to well-being, health status, and infant mortality (Women's Refugee Commission 2010). Food insecurity is associated with poorer maternal mental health (Laurenzi, Field, and Honikman 2020). Beyond their potential to have a direct effect on food security, agricultural interventions may serve as a means to provide or facilitate psychosocial support structures through Farmer Field Schools (FFSs), women's groups, or other participatory methodologies. The interactions among mental health, social support, agriculture interventions, and nutrition outcomes are not well understood, however (Young 2020).

Complex emergencies are characterized by a breakdown in support systems and structures, such as social networks. This breakdown can adversely affect child nutrition because social support is a critical factor in caregiving and can be protective for maternal mental health. Mothers with higher rates of social support have been found to have children with a more diverse diet in some contexts (Ickes et al. 2018; Matare et al. 2020). Social support networks in unsettled households can have an enabling effect on psychological well-being through several pathways (Posselt et al. 2019). For example, social support in the form of assistance with household chores, finances, and sharing of resources can help households meet their practical needs. Sharing emotional burdens, offering encouragement, and sharing coping strategies can improve mood. Sharing stories can preserve values of culture, identity, and belonging, and social support can be important for safety and security (Posselt et al. 2019). In addition, social support as part of maternal mental health interventions has been found to reduce child stunting and underweight (Mukuria et al. 2016; WHO 2009). However, there is limited evidence of the relationship between social support and child dietary diversity in conflict-affected populations.

The Food Security and Nutrition Monitoring System (FSNMS) is a national survey established to monitor food security indicators and malnutrition in South Sudan. Round 27 of the survey was conducted between October 2021 and January 2022 (FAO and WFP 2022), with a recall period corresponding with ELRP program activity. In this round, survey modules were added to capture information about dietary diversity among women of reproductive age (15–49 years) and children (aged 6–23 months) as well as women's social support. This representative survey thus can be used to evaluate the effectiveness of the ELRP at improving dietary diversity and perceptions of social support. To supplement this household-level data, we conducted an online survey of implementing partners to assess their experiences implementing the program.

## Conceptual Framework

We reviewed potential conceptual frameworks in consultation with BHA to guide development of the research questions. We determined that it would be useful to use a conceptual framework rather than the project theories of change because the study is an exploration of the relationship between agricultural interventions and dietary diversity, which was not necessarily included in the project plan. This study is not a project evaluation. Conceptual frameworks could help determine factors that might affect the relationship in question. We used Young’s conceptual framework for acute malnutrition in Africa’s drylands to develop the research questions (annex 4). Young’s framework builds on the United Nations Children’s Fund’s (UNICEF’s) malnutrition framework with evidence that has emerged over the past 30 years; it also incorporates seasonality, resilience, and other underlying issues and drivers that are relevant beyond drylands contexts (Young 2020).

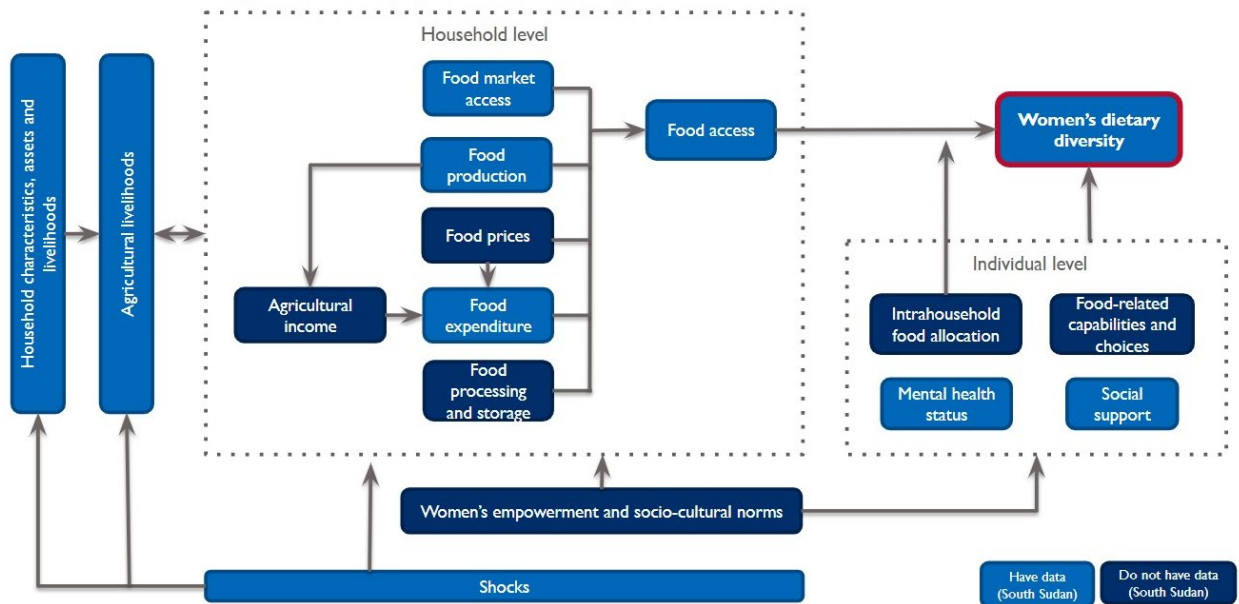
We used this framework to determine the underlying and basic/systemic factors that are connected to our outcome of interest—inadequate dietary intake (as measured by dietary diversity). We identified the components of the framework the project targeted directly and related factors the project did not target directly but that may affect dietary outcomes. We used these categories to inform the research questions and data-collection instruments to develop a more comprehensive understanding of what influences dietary diversity in complex emergency contexts. We explored agricultural livelihoods and household food security as the project aimed to directly improve those. We also explored the two other mediating factors along the pathway between livelihoods and dietary intake: idiosyncratic shocks and inadequate social and care environment. Although the project did not aim to improve shocks or the social and care environment, we still explored them to better understand the factors that influence dietary intake. Because this is not a project evaluation, we were not limited to exploring the factors that the project aimed to address.

*Idiosyncratic* shocks are those that affect individual households as opposed to communities. In protracted crises, households are typically more exposed and vulnerable to shocks that can negatively affect their livelihoods and health (Quak 2018). Food systems are typically weak in these contexts, and households may have to resort to negative coping strategies in the face of shocks (Global Panel 2020).

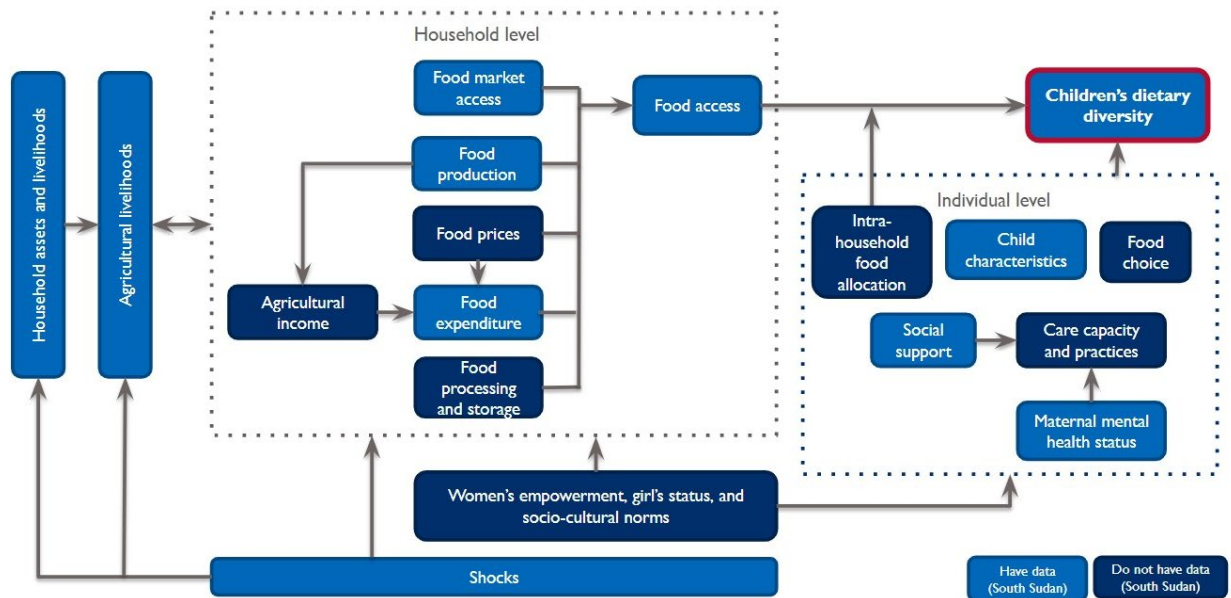
In complex emergencies, the social and care environment often undergo stress or breakdown. This breakdown can adversely affect child nutrition because social support is a critical factor in caregiving and can be protective for maternal mental health. Mothers with higher social support have been found to have children with a more diverse diet in some contexts (Matare et al 2020; Ickes et al. 2018; Baye, Laillou, and Chitekwe 2021). Social support networks in unsettled households can have an enabling effect on psychological well-being through several pathways (Posselt et al. 2019), but evidence of the relationship between social support and child dietary diversity in conflict-affected populations is limited.

To inform the analytic models for this study, we developed two conceptual frameworks—one for MDD for women (MDD-W) and one for children’s MDD—presented in figures 4 and 5, respectively. These frameworks use the conceptual pathways between agriculture and nutrition logic presented in figure 1. We adjusted the agriculture-nutrition pathways to end at our outcome of interest—dietary diversity. We also updated the framework to include shocks from Young’s framework (2020) and to include additional factors that evidence shows influences dietary intake, namely food market access (Ruel, Quisumbing, and Balagamwala 2018; Innovation Lab for Nutrition 2020), food-related capabilities and choices (Herforth and Ahmed 2015), mental health status (Surkan and Behbehani 2020; Madeghe et al. 2021; Rahman et al. 2008; Rabbani et al. 2020), and social support (Matare et al 2020; Ickes et al. 2018; Baye, Laillou, and Chitekwe 2021). The light blue boxes represent factors for which we had available South Sudan data.

**Figure 4. Conceptual Framework for Women’s Dietary Diversity**



**Figure 5. Conceptual Framework for Children’s Dietary Diversity**



## Research Questions

This report addresses the following five research questions:

1. Which factors influenced implementation of the nutrition-sensitive agriculture interventions within emergency activities?
2. What is the prevalence of meeting MDD among women of reproductive age (15–49 years) and among children (aged 6–23 months)?
3. What is the association between participation in agricultural activities and meeting MDD among women of reproductive age (15–49 years) and among children (aged 6–23 months)?
4. Which household-level factors are associated with meeting MDD among women of reproductive age (15–49 years) and among children (aged 6–23 months)?
5. What is the association between maternal social support and meeting MDD among women of reproductive age (15–49 years) and among children (aged 6–23 months)?

### Online Survey (Research Question 1)

#### Data Sources and Sample

For research question 1, USAID Advancing Nutrition collected data through an online survey (annex 2) with 24 implementers who had received funding for implementation for April 2020 through April 2021. We administered an online survey in English using Google Forms for implementing partners to collect information about how the interventions were implemented, the perceived quality of training and outcomes achieved, and implementation challenges faced. We used an online survey because it was a feasible way to get information from the large number of implementing partners that operated under the FAO program. The survey included closed and open-ended questions and is considered a qualitative method because of the small sample size. We used convenience sampling for the survey. FAO sent the survey to 89 of its implementing partner representatives and requested that they complete it. We received 27 completed responses. Twenty-five respondents reported the organization they were affiliated with, while two respondents did not identify their organization. The data represent at least 25 implementing partners. Of those who completed the survey, 20 were project management or leadership, 4 were technical staff, and 1 was an outreach or field staff member. We also reviewed program documents provided by FAO to inform our understanding of the program implementation.

#### Data Analysis

For research question 1, we cleaned and summed the responses to the online survey in Microsoft Excel.

### Quantitative Household Survey (Research Questions 2–5)

#### Data Sources and Sample

For research questions 2 through 5, this study conducted a secondary data analysis of the cross-sectional survey results from the 27th round of the FSNMS. Data for this analysis were collected across South Sudan in October 2021 through January 2022. The FSNMS survey was administered and conducted by FAO in collaboration with the World Food Programme (WFP), UNICEF, and other UN agencies.

A random sample of households that is representative at the county level (78 counties in all 10 states) was selected. A total of 14,215 households were sampled and completed the survey (an additional 16 were selected but did not provide consent). A sample of 13,572 was estimated to be needed to reach a confidence level of 0.95 with 10 percent margin of error. Two-stage stratified sampling was used first to randomly select 12 to 20 enumeration areas per county. Then, a minimum of 12 households were selected per enumeration area. In cases where local authorities or leaders were able to provide or



prepare a list of all the households within the enumeration area, 12 households were randomly selected from the list by picking a number from a hat or generating 12 random numbers using a smartphone app. When a household list could not be prepared, systematic random sampling was used using geometric order and estimated total number of households. Then, a sampling interval was calculated. The first household was randomly selected from the list between 1 and the sampling interval. The subsequent household was selected using the sampling interval (previous household number + sampling interval). Households were selected following a walking route passing all households in the settlement or site in a systematic manner, starting from the northwest corner. If the population was dispersed or the enumeration area was too large (not walking distance), a segmentation approach was taken. The cluster was divided into equal or unequal segments so that each had a smaller population and included an area of walkable distance. This approach allowed for a buffer of 0.05<sup>2</sup> and a design effect of 1.5. The sampling was conducted without replacement.

For purposes of analysis for research questions 2 through 5, only data from rural households were included, given the nature of the agricultural activities. Research questions 2 through 4 were assessed using the full sample of women and children who had complete data in the FSNMS survey ( $N = 14,215$ ). Research question 5 restricted analysis to a smaller subsample of households that reported just one woman in the household ( $n = 9,503$ ). This was done because the survey instrument contained no individual-level identifiers for respondents within the household. Because of this issue, there was no way to match individual-level modules within the same household (i.e., one woman's response to the dietary diversity module with the same woman's response to the social support module). Nor was it possible to match mothers to children within the same household. Therefore, to understand the relationship between maternal social support and the diet diversity of either the mother or the child, the sample was restricted to households with only one woman. We assumed that the same woman answered each module and that this woman was the mother or primary caregiver to all children in the household.

### Primary Outcomes of Interest

MDD-W and MDD for children were primary outcome indicators of interest for this study and have been standard modules in the FSNMS. Table 2 lists the food groups used for the calculation of each indicator and how they compare with each other:

- **MDD for women** of reproductive age is defined as consumption of 5 of 10 food groups in the previous day. The 10 possible food groups were (1) grains, roots, and tubers; (2) pulses; (3) nuts and seeds; (4) dairy; (5) meat, poultry, and fish; (6) eggs; (7) dark leafy greens and vegetables; (8) other vitamin A-rich fruits and vegetables; (9) other vegetables; and (10) other fruits (FAO et al. 2016).
- **MDD for children** (aged 6–23 months) is defined as consuming 5 of 8 food groups in the previous day. The eight possible food groups were (1) breast milk; (2) grains, roots, and tubers; (3) legumes and nuts; (4) dairy products; (5) flesh foods; (6) eggs; (7) vitamin A-rich fruits and vegetables; and (8) other fruits and vegetables (WHO and UNICEF 2021).

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<sup>2</sup> The buffer is a percent of households that is added (in this case 5 percent) to ensure that access constraints in a certain location can be compensated for by the additional interviews done in a different location.

**Table 2. Food Group Categories Used for MDD-W and MDD Calculations**

Women (Aged 15–49 years)	Children (Aged 6–23 months)
Food group (MDD-W categories)	Food group (MDD categories)
–	Breastmilk
Grains, roots, tubers	Grains, roots, tubers
Pulses	Legumes and nuts
Nuts and seeds	
Dairy	Dairy products
Meat, poultry, and fish	Flesh foods
Eggs	Eggs
Dark leafy greens and vegetables	Vitamin A–rich fruits and vegetables
Other vitamin A–rich fruits and vegetables	
Other vegetables	
Other fruits	Other fruits and vegetables

### Exposure Variables

For research question 3, the primary exposure variable of interest was participation in agricultural activities, which was used as an indicator of participation in the ELRP. Participation in agricultural activities was assessed through four survey questions (annex 3), which asked about training and humanitarian services received in the past 3 months, the source of seeds for crops planted in the past year, and the source for fishing equipment. Each question was asked of participants predicated on their response to a previous question. For example, to understand whether respondents participated in agricultural training, all respondents were first asked if they had received any training in the previous 12 months. Then, only those who responded yes to the first question were asked to select what type of training they received. Given this pattern, there were different numbers of respondents to each of the four questions used to assess participation.

Because nongovernmental organizations (NGOs), both international and local, were often the implementing partners delivering the ELRP, we considered a *respondent* a participant in the program if that person had participated in, received, or used any of the defined activities, which included agricultural training, receipt of agricultural inputs, agricultural tools, fishing equipment, veterinary assistance, or seeds from FAO or an NGO.

For research question 4, the selection of exposure variables was based on the conceptual framework (presented previously in figures 1 and 2) developed for purposes of this analysis. Several household characteristics reflecting socioeconomic status and livelihoods, source of food, food security, residency status, participation in social groups, experiences of economic shocks, or other burdens on the household were considered (annex 5). Some factors likely associated with dietary diversity, such as food price, intrahousehold food allocation, food-related capabilities and choices, and women’s empowerment, were not considered in this analysis because of a lack of survey data.

For research question 5, the primary exposure of interest was maternal social support. Social support was measured using a 10-question scale adapted from an instrument developed by Martin et al. (2017). The scale aims to capture three major dimensions of social support, including having a confidant, affect

support, and instrumental support (annex 6). Affect support aims to assess whether people feel that they are shown love, and instrumental support aims to assess support available to complete household tasks and chores. This social support may come from any source, whether familial or non-familial. Each question could have a total score of 0 to 2. Scores are summed to create a total, which can range from 0 to 20. Total scores under 16 are considered low social support, score from 16 to 19 are considered moderate support, and a score of 20 is considered high support.

Because of a survey skip pattern error, approximately a third of women were missing a response to question 6 on the social support scale. This question asked, “Do your husband and family tell or show you that they are thankful for the things you do for your family?” To include these women in the final social support analysis, a value for question 6 was predicted through a model that estimated the value based on their response to the other nine questions. The mean score of the nine social support questions (without including responses to question 6) was not significantly different between those who had a response to question 6 and those who did not respond. We predicted a question 6 response for all women, even those that had responded. We found that the mean difference between the predicted and actual scores for those who had responded was zero, signifying that the model was accurate at predicting question 6 values. In addition, 70 percent of the responses were predicted correctly, and an additional 28 percent were predicted within 1 point of their actual value.

### Data Analysis

For research question 2, we estimated the prevalence of MDD-W and MDD, accounting for the complex survey sampling weights. For research question 3, we first calculated crude prevalence ratios through bivariate analyses between the exposure (participation in agricultural activities as a dichotomous variable) and outcome of interest (MDD or MDD-W). Adjusted prevalence ratios were calculated using multivariable models that included covariates associated with the outcome variable. Prevalence ratios were estimated using binomial regression with log-link function and robust variance. We conducted additional exploratory analyses by examining relationships between participation in agricultural activities and individual food group consumption patterns. We further explored how specific types of agricultural activities (e.g., receipt of seeds, types of seeds) were associated with food group consumption patterns. For research question 4, we developed a conceptual model illustrating the relationships among community-level, household-level, and individual-level factors with dietary diversity. This model guided the selection of a predetermined set of factors that were assessed in bivariate analyses with MDD and MDD-W. Those that were significant at  $p < .1$  were included in multivariable models. Research question 5 was assessed using the same approach as for research question 3. In this case, the primary exposure of interest was maternal social support, which was analyzed on a continuous scale. All data analysis for research questions 2 through 5 were conducted using Stata statistical software, version 17 (StataCorp, College Station, TX).

### Ethics and Confidentiality

USAID Advancing Nutrition submitted the study for review by JSI Research & Training Institute, Inc.’s (JSI’s) Institutional Review Board (IRB). The JSI IRB determined that JSI’s involvement did not constitute being engaged in human subjects research because our involvement was limited to analyzing deidentified data that others had collected. Similarly, the University of California, Davis IRB reviewed the protocol and determined that the analysis of deidentified data constituted nonhuman subjects research.

The Government of South Sudan was aware of the survey plans, but at the time of data collection, it did not give approval for the 27th round of the FSNMS survey to FAO and the other implementing UN agencies. During data collection, FAO worked to resolve the issues with the Government of South Sudan, which were not directly related to the data collection itself but rather were larger issues between the government and the UN. Because of the lack of government approval for data collection, we asked the FAO to remove a mental health module we had asked its staff to include in the survey due to the sensitive nature of the questions. In consultation with JSI’s IRB and USAID, we determined that

we could proceed with secondary analysis of the survey data because of the nonsensitive nature of the data and the IRB determinations that USAID Advancing Nutrition's involvement did not constitute engagement in human subjects research.

# Chapter 4. Project Background and Implementation

## Overview

FAO implemented the ELRP in South Sudan (see table 3). It has been a multi-donor initiative funded by BHA; the governments of the United Kingdom, Norway, and the Netherlands; and the UN Central Emergency Response Fund. The program has been implemented in annual cycles since 2014 due to the protracted nature of the ongoing humanitarian crises in the country (FAO 2021b). FAO contracted with implementing partner organizations to carry out activities in different localities. In 2020, there were 38 implementing partners (FAO 2020), many of which were local NGOs. The ELRP was primarily implemented in rural areas across the country, with the 2021 activities focused on eight states: Central Equatoria, Eastern Equatoria, Jonglei, Lakes, Northern bahr el Ghazal, Warrap, Western bahr el Ghazal, and Western Equatoria (FAO 2021b).

**Table 3. Program Summary**

<b>Program name</b>	Emergency Livelihood Response Programme, South Sudan
<b>Awardee</b>	Food and Agriculture Organization of the United Nations
<b>Funding amount</b>	\$25 million
<b>Location</b>	Rural areas of eight states in South Sudan: Central Equatoria, Eastern Equatoria, Jonglei, Lakes, Northern bahr el Ghazal, Warrap, Western bahr el Ghazal, and Western Equatoria
<b>Period of performance</b>	April 2020–April 2021
<b>Participant household criteria for agriculture component</b>	<ul style="list-style-type: none"> <li>• Households with acute food insecurity (IPC phase 3<sup>3</sup> or worse)</li> <li>• Aims to ensure that 60 percent of participants are women</li> <li>• Household is agropastoralist and has access to land and labor for production</li> <li>• Vulnerable populations, including internally displaced people, host communities, refugees, and other vulnerable groups (e.g., female-headed household, households with malnourished children, single mothers, widows, older adults, people who are disabled or chronically ill, youths at risk, survivors of gender-based violence)</li> </ul>
<b>Agriculture interventions</b>	<ul style="list-style-type: none"> <li>• Agricultural production training</li> <li>• Distribution of crop and vegetable seeds and agricultural tools for main and secondary planting seasons</li> <li>• Agricultural production training</li> <li>• Demonstration plots</li> <li>• Distribution of fishing equipment</li> </ul>

Source: FAO 2021a.

<sup>3</sup> IPC phase 3 is when households either “have food consumption gaps that are reflected by high or above-usual acute malnutrition; or are marginally able to meet minimum food needs but only by depleting essential livelihood assets or through crisis-coping strategies” (IPC 2020).

The intended impact of the program was to protect the livelihoods of the most vulnerable communities, enhance food production, and strengthen resilience (FAO 2021b). Two outcomes were expected to contribute to achieving that impact:

- “The livelihoods of vulnerable households are protected and their food production is increased” (FAO 2021b)
- “Absorptive capacity is strengthened and resilience is built at household and community level” (FAO 2021b)

The ELRP targeted households that were food insecure (IPC phase 3 or worse) and had members in a vulnerable group. The target was to reach 100 percent of households facing IPC phase 3 or worse. These groups included internally displaced people (IDPs) (i.e., those who have been forced to flee or leave their homes because of conflict, violence, or other disasters but have not crossed an international border), refugees (i.e., those who have been forced to flee and who have crossed an international border), and refugee returnees (i.e., those who had fled but have recently returned to their own country). In addition, the ELRP targeted other vulnerable groups, including female-headed households, older adults, and people with disabilities or chronic illness. It aimed to have 60 percent female participation. The ELRP used a participatory process that involved community leaders and elders as well as local authorities to identify program participants. In 2021, the ELRP target was to reach 1 million households (6 million people) (FAO 2020).

The ELRP distributed seeds and agricultural tools, provided agricultural training and demonstration plots, and provided fishing equipment. A post-distribution monitoring survey was conducted in April to August 2021, corresponding to the main season immediately after the distribution of the agricultural kits, to monitor whether distribution had been conducted according to project plans and to assess how participants used the inputs. The survey was conducted with an average purposive sample size of about 50 households per intervention (crop, fish and vegetable kits, and tools), selected from participant lists for each implementing partner in each county. The total sample size was 8,868. Of those, 3,893 received crop seed kits, 2,701 received vegetable seed kits, and 2,274 received fishing kits (FAO 2021b). Below we provide more detail from this monitoring survey on the support participants received and their perceptions of the support. Please note that social desirability bias may have influenced participants’ responses to this survey.

## Seed Kits

Each year, FAO decides the package of seeds that will be provided to eligible households through the local implementing partners. In 2021, although FAO aimed to provide 10 percent of seeds through vouchers, it was unable to do so because of COVID-19. The project distributes seed kits for the main and secondary planting seasons. Nearly half of respondents in the post-distribution monitoring survey had received seeds the previous year, as well (FAO 2021b). The majority of households walked for less than an hour to reach the seed distribution sites (FAO 2021b).

In 2021, the main season crop seed kit included 5 kg of maize, 5 kg of sorghum, and 3 kg of cowpeas. The post-distribution monitoring survey found that sampled households across states received these uniform quantities of crop seeds. Most households reported in the survey that they were satisfied with the crop seeds distributed (83.7 percent) and that the seeds were of good or excellent quality (80.9 percent). However, a lower portion of households in Western Equatoria were satisfied with the crop seeds provided (37.9 percent). Those who were dissatisfied would have liked the kits to have included groundnuts, millet, rice, and beans (FAO 2021b). Among participants, 34.7 percent of households identified late distribution of seeds in the FAO post-distribution monitoring survey. This issue primarily occurred in Jonglei and Warrap states (FAO 2021b).

Eligible households could also receive vegetable seed kits for the main season, which included five types of vegetable seeds: amaranth, tomato, onion, cabbage, carrot, collard, watermelon, eggplant, and okra (FAO 2021b). There was variation in the type and amounts of seeds provided, which varied by agroecological zone, context, and type of seed. Households reported that they would have preferred receiving about double the quantity of vegetable seeds provided and would have liked additional varieties, such as pumpkin, jute mallow, garlic, *riggila*, kale, soya, *tulla*, cucumber, sunflower, and spinach (FAO 2021b). Of those who received vegetable seeds in 2021, 62 percent had also received vegetable seeds from the program the previous year (FAO 2021b). Most vegetable seed recipients rated the seed quality as good (69 percent) or satisfactory (22 percent). In addition, more than 70 percent of respondents reported that they experienced good or very good germination rates when planting the seeds received. Poor germination rates were mostly experienced in Jonglei and Western Equatoria, which may have been the result of the late distribution in these states, as noted previously (FAO 2021b).

## Fishing Kits

For households in fishing communities, they also received fishing kits that typically included hooks, monofilament, and twine. A small portion of households received fishing nets. Not all households received all types of items. With the exception of Central and Western Equatoria and Warrap, households were largely satisfied with the type and quantity of equipment provided (FAO 2021b). Households largely (79 percent) reported receiving the fishing kits on time, although this was less common in Warrap, Western Equatoria, and Jonglei (FAO 2021b). On average, households had to walk 62 minutes to the distribution sites (FAO 2021b).

## Agricultural Tools

All eligible households also received agricultural tools—typically, one *maloda* (shovel), one rake, and one hoe, although there was some variation by state. Although respondents in the post-distribution monitoring survey were largely satisfied with the type of tools provided (73.5 percent), most (81.3 percent) said that they would have preferred to receive other tools that were not included, such as a sickle, ax, panga, wheelbarrow, and watering can. Two-thirds of households said that the tools were distributed on time for seasonal farming activities, with lower rates in Jonglei and Warrap (as with the seed distribution) (FAO 2021b).

## Agricultural Training

The ELRP also provided agricultural training and supported demonstration plots. The implementing partners used consistent curriculum, guidance, and tools for the training and demonstration plots. Households receiving inputs received basic training on cultivation. The implementing partners used a training-of-trainers approach, and each season they worked with local authorities as well as community leaders and elders to select vulnerable community members to receive the in-depth training. Community members were eligible to receive this in-depth training if they had experience with vegetable production, were over 18 years of age, were a member of a vulnerable group (e.g., widow, youth, returnee, IDP), had available land to establish a demonstration plot, and were willing to work in a group. These identified community members established crop and vegetable demonstration plots and received training on:

- strengthened good agricultural practices
- soil and water management
- integrated pest management
- nutrition
- climate change—adaptive agricultural practices
- postharvest management and technique.

These community members provided training to others in the community, including farmers and community leaders, at the demonstration plots to show best agronomic practices. Nutrition education was integrated into at least one vegetable training session per community. Households with malnourished children were the primary targets for these trainings. Each demonstration plot also had between 10 and 20 members each for training, practical demonstrations, and hands-on learning.

Training on fishing was provided by other community members. These participants received in-depth training on fish production, management, preservation, and postharvest management. They then worked through existing or established fishing groups with 15 to 25 members to share knowledge. FAO provided fishing equipment to the groups, and the extension volunteer provided training to the group members on fish production and separately on postharvest management and preservation of fish. During field days, there was also training on the nutritional importance of fish.

In the post-distribution monitoring survey that FAO conducted, 76 percent of households that received crop seed kits also received training on crop production, but two-thirds of respondents in Western Equatoria did not receive training. Most (99.6 percent) respondents reported that the training sessions on crops were useful (FAO 2021b), and 73.8 percent were satisfied or very satisfied with the trainings. Only 3.7 percent were dissatisfied or very dissatisfied, while the remaining portion rated the trainings of average quality (FAO 2021b). Of those participants who received vegetable seeds, 76 percent received training on vegetable production, although this portion was also lower in Western Equatoria (35 percent). Of those, 74 percent reported that the knowledge and skills they gained were helpful, and most were able to share what they learned with others (FAO 2021b). Of those who received fishing kits, 70 percent received training on using the equipment, although this figure was lower in Central and Eastern Equatoria (FAO 2021b). This training covered topics such as improved fishing methods, making and mending nets, postharvest handling and storage, good sanitation and hygiene practices, sustainable fisheries management, and marketing (FAO 2021b). Most respondents (99.6 percent) found this fishing training to be useful and said that they were able to share their knowledge with others (99.7 percent) (FAO 2021a). Overall, 60 percent of households were satisfied or very satisfied with the fishing training, although dissatisfaction was higher in Lakes and Northern Bahr el Ghazal (FAO 2021b).

## Other Agricultural Support

Although the focus of this study was on ELRP, FAO also implemented a complementary livestock project titled Emergency Livestock Support for Agropastoralists in South Sudan. It was a \$2 million project funded by BHA and implemented in January 2020 to March 2021. The aim was to “protect the livestock-based livelihoods of vulnerable agro-pastoral households and enhance their food security, nutrition and income” (FAO 2021a:1). The project provided access to veterinary services, including vaccination and disease treatment for small and large ruminants. It reached 350,930 households with services and trained 952 community-based animal health workers. At the end of the project, 35.1 percent of households had an acceptable Food Consumption Score (FCS) compared with 27 percent at baseline (FAO 2021a).

## Project Outputs and Outcomes

In 2020, the ELRP reached 850,134 households, or 5.1 million people, in 78 counties. This was 96 percent of people facing IPC phase 3 food insecurity or worse (IPC 2022). In 2021, the program target was 6 million people, and it reached approximately 4.1 million. The FAO post-distribution monitoring survey had information about use of crop seeds and fishing kits. Seventy one percent of households planted the crop seeds they received, with similar rates for the three types of crop seeds provided. Those who did not plant the seeds used them for other purposes, including storing for later use, exchanging or trading, sharing, and consumption. Seeds received from FAO were an important source of seeds for households in 2021 as households planted 60 percent of their planted land with the seeds received from FAO on average. In 2021, households planted 34.6 percent more land than in 2020.



Many households (72.5 percent) also planted seeds that they sourced from their seed stocks, purchases, or from friends or relatives, although this percentage was low in Jonglei (17.5 percent) and Central Equatoria (31.8 percent) (FAO 2021b). Of those who received fishing kits, 75 percent used the inputs for fishing, while the rest stored, exchanged, shared, or sold the inputs (FAO 2021b). Fishers caught the largest quantity of fish using nets (2.1 kg per day on average), followed by hook and line (1.7 kg per day on average) and hook single (1.5 kg per day on average) (FAO 2021b).

## Factors Influencing Implementation (Research Question 1)

This research question explores factors that influenced program implementation. We gathered qualitative data through an online survey with 27 implementing partners that received subawards from FAO to implement the program. In the survey, we gathered information about the interventions implemented across the organizations, factors that influenced implementation, the perceived outcomes from implementation, and the perceived results. We also reviewed project documents provided by FAO to identify factors that influenced implementation.



### Key Findings

- In the online survey, respondents predominantly had positive perceptions about the quality of implementation and confirmed that the quality of agriculture as well as nutrition-related training provided was high to very high. This work included training sessions done in collaboration with the Ministry of Agriculture and the Ministry of Health.
- The challenges affecting implementation were largely external and included insecurity and safety issues, poor infrastructure, and the short program implementation cycle.
- The primary project impacts, as perceived by the respondents, were improved food security, increased crop yields, and improved household dietary diversity.

In the online implementing partner survey, all respondents reported providing agricultural training and seeds, and 96 percent (26 respondents) said that their organization provided agricultural tools or equipment. The agricultural training was provided by 46 percent (12 respondents) of implementing partner organizations and jointly with the Ministry of Agriculture for 54 percent (14 respondents) of implementing partner organizations. Respondents reported a wide range of topics that were covered in the agricultural training, including land and soil management; pest, weed, and disease management; crop selection, planting, and growth; and harvesting, storage, and processing. Less common topics covered in the training were water management and conservation, crop sales and marketing, farm planning, and climate-smart agriculture. According to their own perceptions, nearly all respondents rated the quality of agricultural training their organization provided as high or very high quality. Most also rated the quality of the training provided jointly with the Ministry of Agriculture as high.

As noted above, nutrition education was integrated into at least one vegetable training session per community. In the online implementing partner survey, 78 percent of respondents (21 respondents) reported that they provided nutrition training and cooking demonstrations. The most common topics covered in nutrition trainings were providing information about food groups and nutrients, dietary diversity, nutrition for pregnant and lactating women, food preparation and cooking, and infant and young child feeding. This training was provided by 67 percent (14 respondents) of implementing partner organizations, jointly with the Ministry of Health for 29 percent (6 respondents) of implementing partners, and UNICEF for 1 implementing partner (1 respondent). Most respondents reported that the nutrition training, whether provided solely by the implementing partner or in collaboration with the Ministry of Health, were of high or very high quality.

According to respondents, facilitators that eased implementation related to internal factors, while challenges to implementation were largely external. The primary program strengths reported were strong program management and leadership (12 respondents), high staff technical capacity (11 respondents), a strong relationship with the donor (9 respondents), efficient distribution of inputs (8 respondents), a strong relationship with the community (8 respondents), and strong participant interest and engagement (7 respondents). The challenges faced during implementation were primarily insecurity and safety challenges (17 respondents), poor infrastructure (15 respondents), and the short program implementation cycle (13 respondents). Although 10 respondents reported insufficient funding as a challenge, 6 reported sufficient funding as a strength.

In reviewing the program monitoring reports, there were more implementation challenges in Western Equatoria, Jonglei, and Warrap than in the other states. In Western Equatoria, lower rates of farmers were trained on crop and vegetable seeds, vegetable seed recipients more commonly experienced poor germination rates, and some received fishing kits late. In Jonglei, agricultural tools, crops seeds, and fishing kits were distributed late for a larger portion of households than in other states. Vegetable seeds also had poor germination rates in Jonglei compared with other states. In Warrap, agricultural tools, crop seeds, and fishing kits were distributed late to some households. Fishing kits were distributed late to a majority of households in Central and Eastern Equatoria (FAO 2021b). In Jonglei and Warrap, external factors may have contributed to these challenges. Jonglei and Warrap experienced a resurgence of violence and Jonglei was hit with severe flooding that damaged over 45 percent of the states' total cereal growing area (FAO 2021c).

In the online survey, we asked respondents about what outcomes they thought participants experienced from the support. The top three benefits from the agricultural training reported by more than half of respondents were increased agronomic knowledge (21 respondents), improved sustainability of agricultural practices (17 respondents), and increased crop yields (15 respondents). Similarly, most respondents (22 respondents) reported that the demonstration plots helped increase farmers' agronomic knowledge and that they provided hands-on experience using sustainable and other improved agricultural practices (20 respondents). However, few reported other potential benefits such as improved decision-making and planning skills or labor or cost savings. Respondents most commonly reported that the seed distribution benefited farmers by improving food security (23 respondents) and improving farmers' ability to grow crops (19 respondents). In open-ended responses, a few implementing partner staff noted that farmers readily adopted new crop varieties provided in the seed kits. As a result of the agricultural tools or equipment distribution, respondents reported most commonly that they helped improve farmers' ability to grow crops (19 respondents), increase crop yields (18 respondents), and expand the land area under production (17 respondents). The tools and equipment distribution however did not help improve soil, pest, or crop management or post-harvest storage. Respondents noted a range of benefits from the nutrition training, including increased general awareness about nutrition (14 respondents), improved knowledge about food groups and nutrients (7 respondents), and improved food preparation and cooking skills (7 respondents). Respondents largely did not think nutrition training resulted in increased motivation to purchase or eat nutritious foods, confidence about IYCF, or knowledge about recommended portion sizes.

The primary project impacts, according to implementing partner respondents, were improved food security (21 respondents), increased crop yields (14 respondents), and improved household dietary diversity (10 respondents). They reported the project did not increase marketing or trade opportunities. In response to open-ended questions, a few respondents said that the agricultural support contributed to increased production of nutritious foods and that farmers, including women, were able to sell surplus products in local markets. Over half of respondents thought that the agricultural support increased MDD-W (17 respondents) MDD (14 respondents) to a significant to very significant degree.

In response to open-ended questions, the implementing partner respondents provided several recommendations to improve the ELRP's implementation and impact in the future. Primary among them was to lengthen the implementation period. Several implementing partners noted that they only had a 3-month implementation period, which was too short. Suggested time periods were at least six months and one respondent suggested one to three years. Several respondents also recommended increasing the funding for the ELRP and ensuring that agricultural inputs are delivered early. A few respondents thought that the ELRP should focus more on children's and women's nutrition rather than just food security and that nutrition could be included more strongly in training. Additional suggestions included providing support to address access to water for agriculture, including by providing small irrigation pumps; taking a more participatory approach with community stakeholders; tailoring program support to the local context and needs; and developing or working with groups (e.g., women's groups, village savings and loan groups) to increase effectiveness and sustainability.

# Chapter 5. Dietary Diversity Findings

## Participant Characteristics

A total of 14,231 households were approached to participate in the survey, and 14,215 provided verbal consent. For research question 4, a subsample of households that reported having only one woman aged 15 to 49 years living in the household ( $n = 9,503$ ) was included in the analysis. The household characteristics of the full sample and the subsample were similar, with no notable differences between the two groups (table 4).

In the full survey sample, there was a high proportion of female-headed households (63.5 percent). Most households were residents (67.7 percent) or IDPs (15.9 percent). The median household size was 7 members, with a mean of 4.6 children per household. Household diets and food security appeared to be low overall, with a mean household dietary diversity score (HDDS) of 4.3 food groups out of a total of 12; 53.8 percent of households had a “Poor” FCS, defined as scoring 0 to 21 points on the FCS of the sum of weighted food group consumption; and 54.3 percent experienced moderate to severe hunger based on the household hunger scale (HHS). More than 50 percent of households produced more than half of their own food.

Male-headed and female-headed households had similar household characteristics, both reflecting the general characteristics of the full sample presented in table 4.

**Table 4. Household Characteristics among the Full Survey Sample and Analytic Survey Sample of Households with One Female Respondent**

	Subsample $n = 9,503$		Full Survey Sample $N = 14,215$	
	% or Mean (SD)	n	% or Mean (SD)	n
Female-headed household	65.2	6,191	63.5	9,027
Household head education				
No formal schooling	67.0	6,371	67.0	9,524
Started but did not complete primary school	21.5	2,038	21.6	3,067
Finished primary school but did not start secondary school	4.8	453	4.6	655
Started but did not complete secondary school	3.2	302	3.2	459
Finished secondary school	2.9	273	2.9	412
Tertiary education	0.7	66	0.7	98
Resident status				
Resident	67.1	6,378	67.7	9,619
IDP	16.5	1,572	15.9	2,257
IDP returnee	12.0	1,144	12.1	1,721

	Subsample n = 9,503		Full Survey Sample N = 14,215	
	% or Mean (SD)	n	% or Mean (SD)	n
Refugee returnee	4.1	390	4.2	593
Voluntary migrant	0.2	19	0.2	25
Proportion of household expenditure spent on food				
<50%	39.1	3,718	40.8	5,797
50%–65%	31.0	2,942	30.3	4,305
65%–75%	19.1	1,811	18.4	2,616
>75%	10.9	1,032	10.5	1,497
Household shelter				
<i>Tukul</i>	74.0	7,033	73.4	10,430
<i>Rakooba</i>	16.8	1,597	16.9	2,398
Improvised shelter	3.1	293	3.4	482
Semi/concrete building	2.7	254	2.8	402
Community building	0.7	65	0.7	97
Communal shelter	0.8	83	1.0	139
No shelter	1.1	103	1.0	146
Emergency transitional shelter by agency	0.4	41	0.5	72
Other	0.4	34	0.3	49
Household hunger				
Little to no hunger	46.1	4,378	45.6	6,495
Moderate hunger	48.3	4,592	48.5	6,898
Severe hunger	5.6	533	5.8	822
Proportion of food that comes from own production				
<50%	47.3	4,493	46.8	6,663
50%–65%	30.7	2,914	30.5	4,341
65%–75%	15.2	1,443	15.7	2,229
>75%	6.9	653	6.9	982
Household size, median (Q1, Q3)	7	(5, 9)	7	(5, 10)

	Subsample n = 9,503		Full Survey Sample N = 14,215	
	% or Mean (SD)	n	% or Mean (SD)	n
Number of children aged <18 years	4.5 (2.7)		4.6 (3.0)	
Number of children aged <18 years				
0–1	8.6	819	10.8	1,543
2–4	46.1	4,384	42.2	5,998
5–7	34.6	3,286	33.8	4,803
8–10	8.0	758	9.3	1,329
>10	2.7	256	3.9	558
Household head age, years	35.4 (11.2)		37.7 (12.4)	
Household head age, years				
18–25	20.4	1,942	17.6	2,500
26–40	52.1	4,952	46.9	6,679
41–65	25.7	2,446	32.9	4,690
>65	1.7	163	2.5	362
Number of shocks experienced in the past 6 months				
0	0	0	0.1	16
1	49.9	4,738	49.9	7,095
2	21.5	2,039	21.3	3,030
3	28.7	2,726	28.7	4,090
HDDS	4.3 (2.5)		4.3 (2.5)	
FCS				
Poor	54.2	5,147	53.8	7,651
Borderline	24.5	2,324	24.5	3,491
Acceptable	21.4	2,032	21.7	3,089
Woman’s age, years	28.1 (6.7)		28.3 (8.7)	
Child’s age, months	13.9 (4.9)		13.8 (5.0)	

	Subsample n = 9,503		Full Survey Sample N = 14,215	
	% or Mean (SD)	n	% or Mean (SD)	n
Household member with difficulty seeing, hearing, walking, remembering, self-care, or communication	39.6	3,767	42.4	6,031
Household member affected by a safety or security incident	6.6	630	7.0	990
Distressed household member	19.4	1,844	20.4	2,903
Household hosting child, IDP, or returnee	33.9	3,223	34.4	4,901
Household member is part of a social group	17.1	1,627	17.1	2,436
Distance to market				
<15 minutes	14.3	1,360	15.0	2,069
15–29 minutes	13.5	1,286	13.8	1,904
30–59 minutes	16.3	1,546	16.9	2,324
1–2 hours	21.1	2,006	21.8	3,000
>2 hours	31.6	3,004	32.4	4,457
Don't know/prefer not to answer	3.2	301	3.4	477
Land in <i>feddans</i> for cultivation of crops*	7.1 (77.5)		6.8 (71.7)	

\* 1 feddan = 0.42 hectares.

## Participation in Agricultural Activities

Overall, just over one-third (33.7 percent) of respondents reported participating in any agricultural activity (table 5). The two most common types of activities were the receipt of seeds from FAO or an NGO (13.8 percent of respondents) and receiving fishing equipment from FAO or an NGO (14.9 percent of respondents). Receiving veterinary assistance was the least common, with less than 1 percent of households reportedly receiving it. The questions for each type of activity and number of respondents to each question are shown in table 5.

**Table 5. Percentage of Respondents Reported to Have Participated in Agricultural Activities (N = 14,215)**

Type of Activity	n	% of All Households	% of Respondents to the Question
<b>Types of training received, among those who received training in the past 12 mo (n = 2,259)</b>			
Agricultural training <sup>1</sup>	969	6.8	42.9
<b>Type of services received among those who reported any humanitarian services in the past 3 months (n = 6,181)</b>			
Agricultural inputs (eg, seeds)	1,073	7.5	17.4
Agricultural tools	736	5.2	11.9
Fishing gear	230	1.6	3.7
Veterinary assistance	66	0.5	1.1
<b>Source of seeds among households that planted crops in the past year (n = 10,274)</b>			
Seeds from FAO or NGO	1,967	13.8	19.2
<b>Source of fishing equipment among households that had access to fish for consumption now (n = 5,517)</b>			
Fishing equipment from FAO or NGO	2,120	14.9	38.4
Participation in any of the above programs	4,800	33.7	—

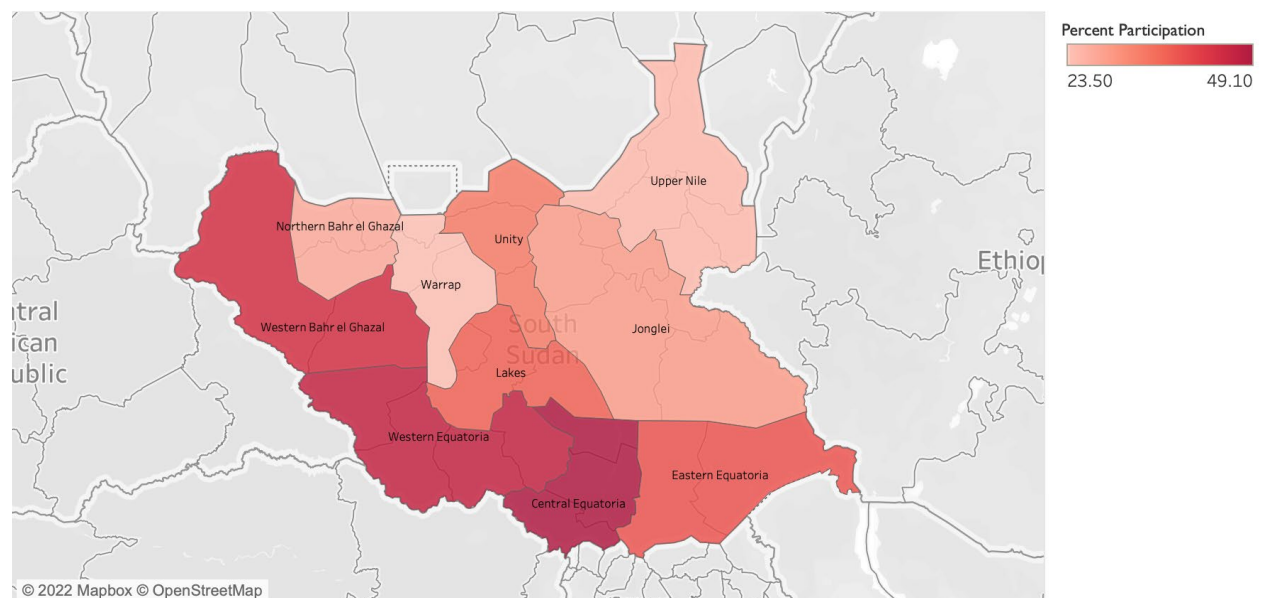
Agricultural activities differed across the country, varying in frequency and the types of activities conducted. Overall participation rates within states ranged from 23.5 percent to 49.1 percent, with the highest rates in the states of Central Equatoria, Western Equatoria, and Western Bahr el Ghazal and lowest in Warrap and Upper Nile (figure 6). Participation in the different types of activities also varied greatly by state (annex 7), likely because of the differences in activity distribution. For example, most of the households receiving fishing equipment from FAO were in Jonglei and Unity, whereas seeds were most common in Western Equatoria and Western Bahr el Ghazal. Central Equatoria had the highest percentage of participants receiving agricultural inputs.

Although some differences exist between these responses and those noted in the post-distribution monitoring survey described in chapter 4, it is important to note that the FSNMS used a random sample and was not designed to evaluate the ELRP. As such, the sample was not designed specifically to capture project participants. The post-distribution monitoring survey, in contrast, was designed to monitor ELRP activities and drew the survey sample from lists of participant households. Further, self-reported data are subject to reporting bias and reporting errors. If the post-distribution monitoring survey was conducted in such a way that respondents perceived it to be directly related to the ELRP, they may have misreported. For instance, they could have over-reported their participation for social desirability reasons or under-reported if they thought that their responses might make them eligible for future benefits. The national FSNMS may have been less subject to reporting bias if it had not been perceived to be tied to the ELRP. In addition, beyond FAO, other organizations may have been carrying out agricultural activities during the same period. Because the FAO activities were carried out through



implementing partners, survey respondents may have been unable to distinguish between FAO program activities and those of other organizations; even if they were, the FSNMS survey questions were not designed to allow them to make this distinction. Second, the timing of the two surveys differed: April to August 2021 for the post-distribution monitoring survey and October 2021 to January 2022 for the FSNMS. Third, the period of recall for some of the FSNMS survey questions may not have been well aligned with the timing of program activities. For example, the FSNMS had survey questions that asked if agricultural inputs, such as seeds or tools; fishing gear; or veterinary assistance had been received in the past three months. This recall time frame does not align with the program period of performance (April 2020–April 2021).

**Figure 6. Participation in Any Type of Agricultural Activity by State, as Reported in the 27th Round of the FSNMS, South Sudan**



Household characteristics were generally similar between those who had participated in agricultural activities and those who had not (annex 8), but a higher percentage of male-headed households received agricultural training, tools, and inputs compared with female-headed households (annex 9). A higher percentage of female-headed households received fishing equipment, veterinary assistance, and seeds compared with male-headed households. Overall, female-headed households were slightly more likely to have participated in agricultural activities than male-headed households (35.1 percent vs. 31.4 percent).

## Prevalence of MDD (Research Question 2)

The second research question was, “What is the prevalence of meeting MDD among women of reproductive age (15–49 years) and among children (aged 6–23 months)?”



## Key Findings

- The percentage of women and children meeting MDD in the overall sample was low, with only 30 percent of women and 22 percent of children having consumed five or more food groups in the previous 24 hours.
- Seventy percent of women reported consuming grains, roots, and tubers and 56 percent consumed dark green leafy vegetables. Among children, 74 percent consumed breastmilk and 55 percent consumed grains, root, and tubers. All other food groups were consumed by less than 50 percent of women and children.

In the full sample, 30.4 percent of women and 22.7 percent of children met the MDD-W and MDD thresholds, respectively. The mean (standard deviation [SD]) HDDS was 4.3 (2.5) out of a possible score of 12, with each point representing the consumption of one food group. HDDS was related to MDD-W and MDD in this sample (table 6), wherein mean HDDS is lower among women and children not meeting MDD-W and MDD, respectively, than the mean score for women and children who were meeting MDD-W and MDD, respectively.

**Table 6. Mean HDDS by MDD-W and MDD Category (N = 14,215)**

	HDDS, Mean (SD)
Total population	4.3 (2.5)
MDD-W	
<5	3.8 (2.3)
≥5	5.6 (2.6)
MDD	
<5	3.9 (2.5)
≥5	5.7 (2.5)

In a subsample of households with one woman of reproductive age to allow for identification of mother-child pairs ( $n = 9,503$ ), we found a strong correlation between women and children’s dietary diversity scores (table 7). Sixty-two percent of households in this subsample had both a woman and a child or children who did not meet the MDD score. Conversely, in 15.2 percent of households, both the woman and the children met the MDD score. The remaining households showed discordance, wherein about 14.7 percent of households had a child who did not meet the MDD while the mother met the MDD-W, and the remaining 8.4 percent of households had a child who met the MDD with a mother who did not meet the MDD-W. The discordance could be caused by factors related to intrahousehold food allocation decisions or the age of the child. Often, very young children (e.g., aged 6–12 months) are offered less diverse diets due to barriers such as difficulty in processing solid foods into a consistency easy for infants to eat, cultural beliefs about healthy foods for infants, or food safety concerns (Creed-Kanashiro et al. 2018; Pachón et al. 2007; Thorne-Lyman et al. 2017).

**Table 7. Women’s Dietary Diversity by Child’s Dietary Diversity (N = 9,503)**

MDD	MDD-W			
	<5 Food Groups		≥5 Food Groups	
	n	%	n	%
<5	2,475	61.8	588	14.7
≥5	335	8.4	609	15.2

Consumption of grains, roots, and tubers was relatively high among both women and children (table 8). Around one-third of women and children were consuming pulses, legumes, nuts, and seeds. Consumption of vitamin A–rich fruits and vegetables, including dark leafy greens in women, was relatively high among both groups (56.1 percent of women and 46.7 percent for children). Consumption of meat, poultry, and fish was also relatively common, with more than one-third of women or children reporting having consumed those foods. Dairy products were consumed by 22 percent of women and 36 percent of children. By contrast, egg consumption was low in both groups (<7 percent).

**Table 8. Food Group Consumption (N = 14,215)**

Women (Aged 15–49 years)		Children (Aged 6–23 months)		HDDS	
Food Group (MDD-W Category)	%	Food Group (MDD Category)	%	Food Group (HDDS Category)	%
–		Breastmilk	74.1	–	
Grains, roots, tubers	70.7	Grains, roots, tubers	55.1	Cereals	42.0
				Roots and tubers	26.6
Pulses	37.3	Legumes and nuts	30.2	Pulses, legumes, and nuts	56.6
Nuts and seeds	41.2				
Dairy	22.0	Dairy products	36.2	Milk and milk products	34.0
Meat, poultry, and fish	41.6	Flesh foods	31.5	Meat, poultry, offal	4.2
				Fish and seafood	15.5
Eggs	6.5	Eggs	7.9	Eggs	6.6
Dark leafy greens and vegetables	56.1	Vitamin A–rich fruits and vegetables	46.7	Vegetables	67.1
Vitamin A–rich fruits and vegetables	29.8				
Other vegetables	45.5	Other fruits and vegetables	30.1	Fruits	23.4
Other fruits	16.1				

–		–		Oil/fats	52.0
–		–		Sugar/honey	45.7
–		–		Miscellaneous	54.6
<b>Proportion meeting minimum (MDD-W, &gt;5 food groups)</b>	<b>30.4</b>	<b>Proportion meeting minimum (MDD, &gt;5 food groups)</b>	<b>22.7</b>	–	

## Association between Project Participation and Dietary Diversity (Research Question 3)

The third research question was, “What is the association between participation in agricultural activities and meeting MDD among women of reproductive age (15–49 years) and among children (aged 6–23 months)?”



### Key Finding

Participation in agricultural activities was associated with a higher prevalence of MDD-W, suggesting that agricultural activities are potentially important investments in complex emergencies.

Participation in any agricultural activity was positively associated with MDD-W (table 9). The prevalence of MDD-W was about 9 percent higher among women who had participated in agricultural activities than among women who had not participated in any agricultural activity in adjusted statistical models. Among children, the prevalence of MDD was about 11 percent higher among children in households that had participated in agricultural activities than among children in households that had not participated in any agricultural activity, but this difference was not statistically significant. HDDSs were also significantly higher in households that participated in agricultural activities, with a 0.2-point mean difference in scores between groups.

**Table 9. Prevalence of MDD-W and MDD by Participation Status (N = 14,215)\***

	<b>Participant</b>	<b>Nonparticipant</b>	<b>Adjusted Prevalence Ratio/ Mean Difference</b>
% meeting MDD-W	32.6	29.4	1.09 (1.01–1.16) <sup>†</sup>
% meeting MDD	26.4	21.9	1.11 (0.99–1.24) <sup>‡</sup>
Mean HDDS	4.60	4.13	0.22 (0.10–0.35) <sup>§</sup>

\*This table presents only adjusted prevalence ratios and mean differences (95% CI). Full analysis, including crude prevalence ratios, can be found in annex 9.

<sup>†</sup>Adjusted for covariates that were significant in bivariate models at  $p < .1$ : woman’s age, total number of household assets, family size, proportion of income spent on food, most important source of food and income, proportion of food that comes from own production, having a distressed family member, having a family member who is part of a social group, distance to market, and HDDS.

<sup>‡</sup>Adjusted for covariates that were significant in bivariate models at  $p < .1$ : household hunger score, child age, total number of household assets, proportion of income spent on food, most important source of food and income, proportion of food that comes from own production, having a family member who is part of a social group, distance to market, and HDDS.

<sup>§</sup>Adjusted for covariates that were significant in bivariate models with MDD-W at  $p < .1$ : woman's age, total number of household assets, family size, proportion of income spent on food, most important source of food and income, proportion of food that comes from own production, having a distressed family member, having a family member who is part of a social group, and distance to market.

We further examined differences in individual food group consumption patterns by participation status. There were significant differences in the reported prevalence of consumption of most food groups (table 10), but there was no consistent trend across all food groups. For example, among women, grains, roots, and tubers; nuts and seeds; and other fruits were all consumed by a higher percentage of nonparticipants compared with participants. Conversely, meat, poultry, and fish; eggs; vitamin A-rich fruits and vegetables; and other vegetables were all consumed by a larger proportion of participants compared with nonparticipants. Among children, legumes and nuts, flesh foods, and eggs were consumed by a significantly higher proportion of participants compared with nonparticipants. In contrast, dairy was consumed by a slightly lower proportion of participants compared with nonparticipants.

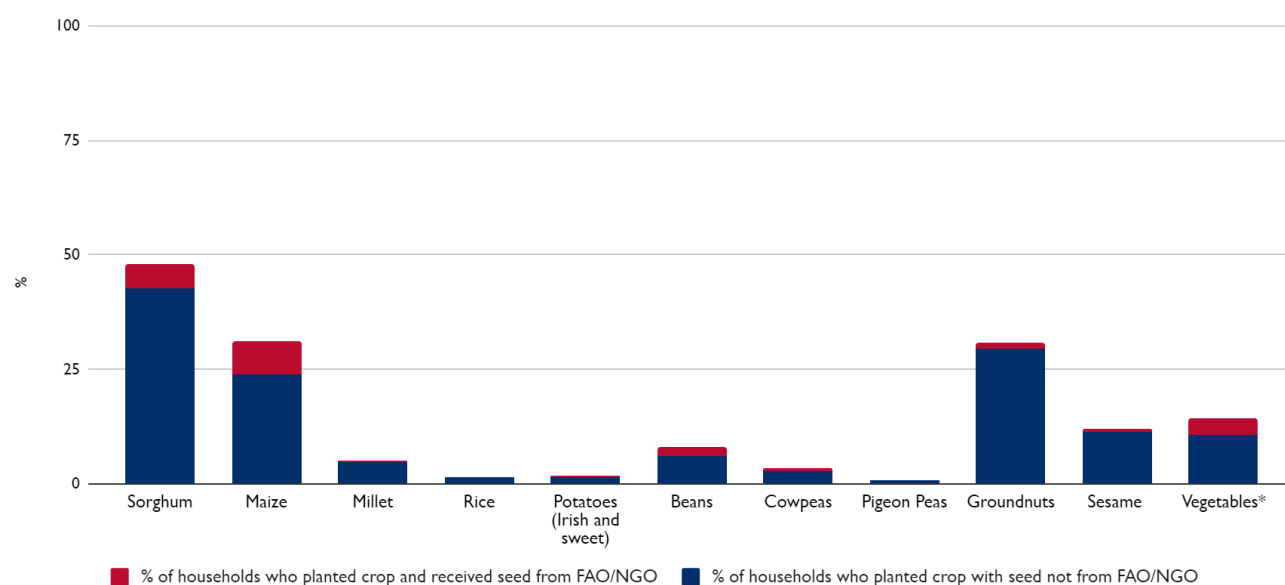
**Table 10. Percentage of Food Group Consumption by Participant Status (N = 14,215)**

Women (Aged 15–49 y)				Children (Aged 6–23 mo)			
Food Group (MDD-W Category)	Participant, %	Non-participant, %	p-Value	Food Group (MDD Category)	Participant, %	Non-participant, %	p-Value
			–	Breastmilk	74.6	73.9	.633
Grains, roots, tubers	67.9	72.1	<.001	Grains, roots, and tubers	55.6	54.9	.681
Pulses	44.3	34.0	<.001	Legumes and nuts	34.8	28.0	<.001
Nuts and seeds	36.1	43.7	<.001				
Dairy	22.4	21.8	.578	Dairy products	34.2	37.3	.050
Meat, poultry, and fish	51.3	37.1	<.001	Flesh foods	38.3	28.1	<.001
Eggs	8.8	5.4	<.001	Eggs	10.5	6.7	<.001
Dark leafy greens and vegetables	54.6	56.7	.065	Vitamin A–rich fruits and vegetables	47.3	46.5	.612
Vitamin A–rich fruits and vegetables	31.4	29.0	.021				
Other vegetables	46.2	43.8	.043	Other fruits and vegetables	30.7	29.8	.518
Other fruits	15.5	17.2	.042				

To further explore whether the type of program participation influenced dietary diversity, we calculated prevalence ratios for MDD-W and MDD as well as mean difference for HDDS for each type of intervention activity (annex 10). All interventions except fishing equipment and seed distribution were positively and significantly associated with MDD-W and MDD. Results were also similar for HDDS.

We investigated the provision of seeds more closely by examining the relationship between the types of crops or vegetables planted and dietary diversity. We examined whether the types of crops planted as well as source of seeds for those crops were associated with dietary diversity or food group consumption. Sorghum, maize, groundnuts, sesame, and vegetables were the most frequently planted crops (figure 7). The most common types of seeds reported to have been received from FAO or an NGO were sorghum and maize. Among all crops, however, most individuals who reported planting crops reported using seeds from a source other than FAO or an NGO.

**Figure 7. Percentage of Households Planting Crops and Source of Seeds for Those Crops**



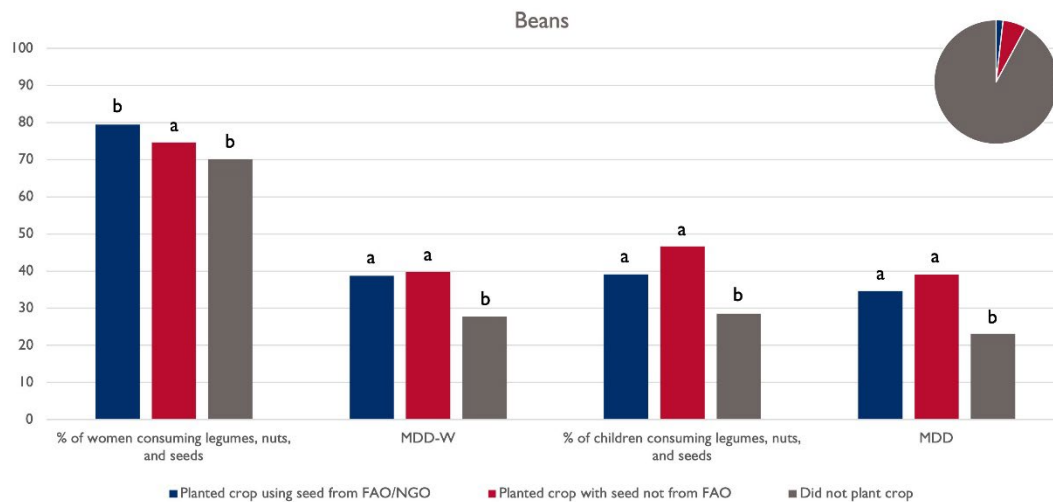
There were some notable differences in dietary patterns between those who planted certain types of crops and those who did not. There were no differences in MDD or MDD-W comparing those who planted maize or sorghum to those who did not. However, there were statistically significant differences for the other types of crops. For example, MDD and MDD-W were significantly higher among those who planted beans or vegetables compared to those who did not, but there were no significant differences by seed source (i.e., whether the seeds were received from FAO vs some other source). Similarly, the prevalence of MDD and MDD-W were significantly higher among those who planted groundnuts compared to those who did not. There were no differences by seed source in MDD, but MDD-W was highest among those who received their seeds from FAO or an NGO.

For the most part, these patterns were mirrored in the individual food group consumption data. Differences were apparent between those who planted the seeds and those who did not, with few differences by seed source. For example, consumption of legumes, nuts, and seeds was higher among both women and children in households who planted beans, but there were no differences by seed source. Consumption of legumes, nuts, and seeds was also higher among both women and children in households who planted groundnuts. Among children, there was no difference by seed source whereas among women, consumption was significantly higher among those who received their seeds from FAO or an NGO. Vegetables were the only notable exception, wherein the group with the highest prevalence of consumption was among women in households who received their seeds from a source other than FAO.

This trend was similarly reflected among children, but differences between groups were not statistically significant.

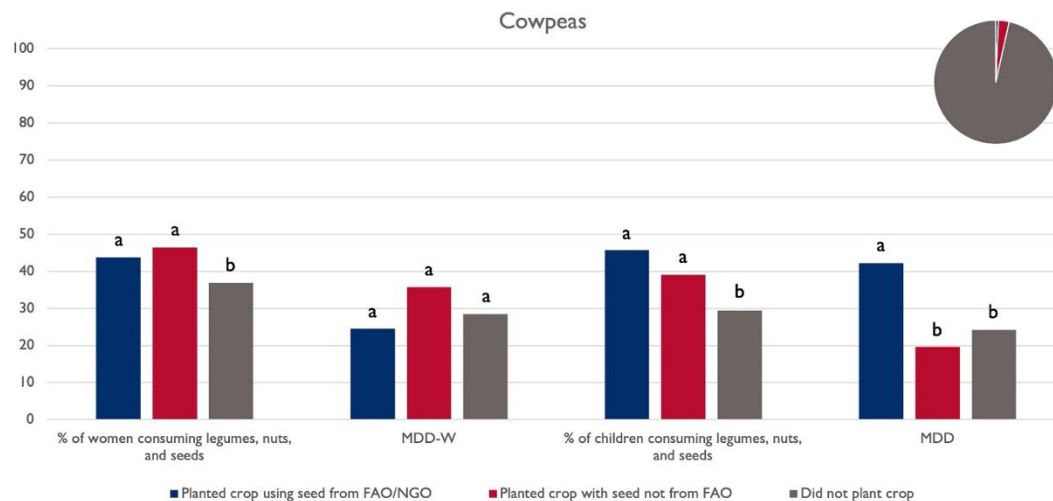
As shown in figure 8, few households planted millet, rice, pigeon peas, and potatoes, so they are not included in this figure, and few conclusions can be drawn.

**Figure 8. Food Group Consumption and Dietary Diversity Patterns among Women and Children by Type of Seed Planted\***



Footnote:

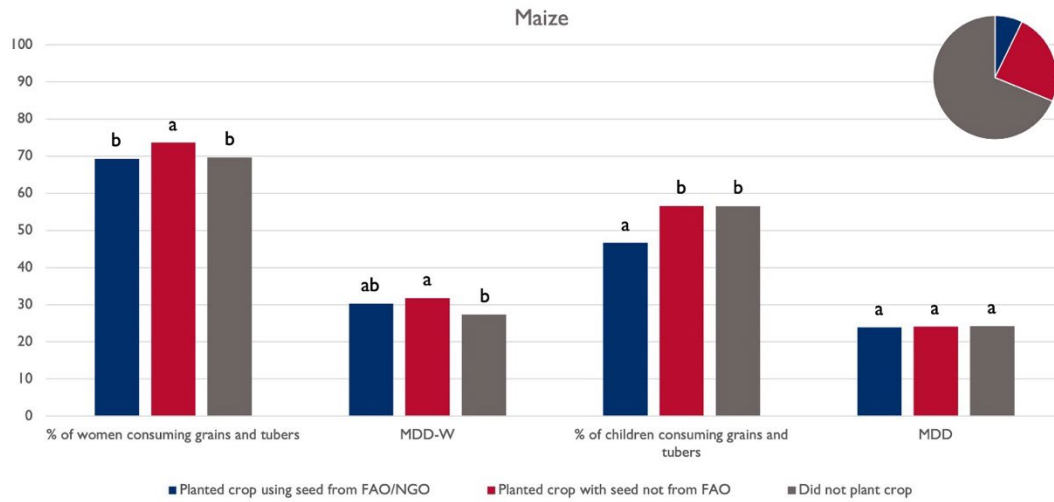
\*Each panel illustrates the consumption of the food group to which the crop type belongs. The bar charts reflect the proportion of women or children consuming the food group or meeting the MDD score criteria. Different letter superscripts indicate statistically significant differences between groups. The pie charts reflects the proportion of households in each category in the full survey sample.



Footnote:

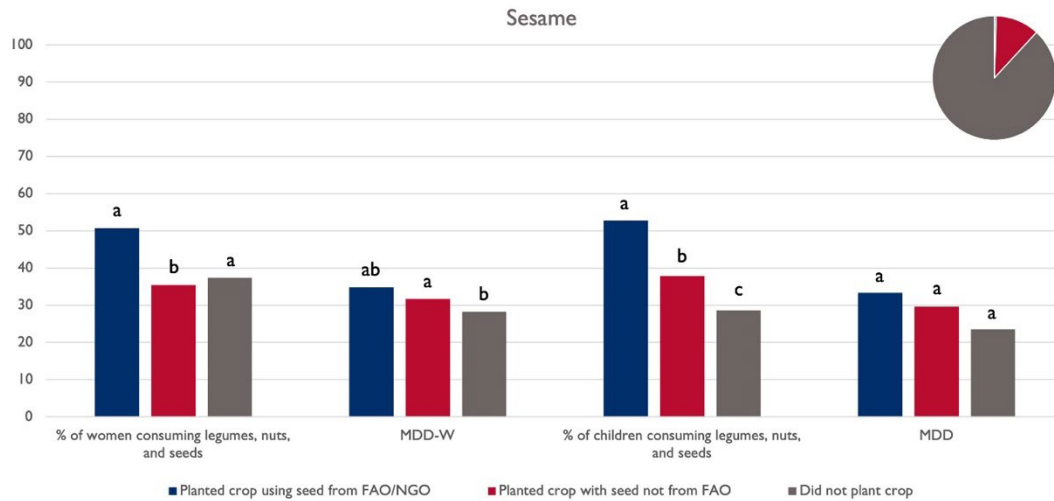
\*Each panel illustrates the consumption of the food group to which the crop type belongs. The bar charts reflect the proportion of women or children consuming the food group or meeting the MDD score criteria. Different letter superscripts indicate statistically significant differences between groups. The pie charts reflects the proportion of households in each category in the full survey sample.





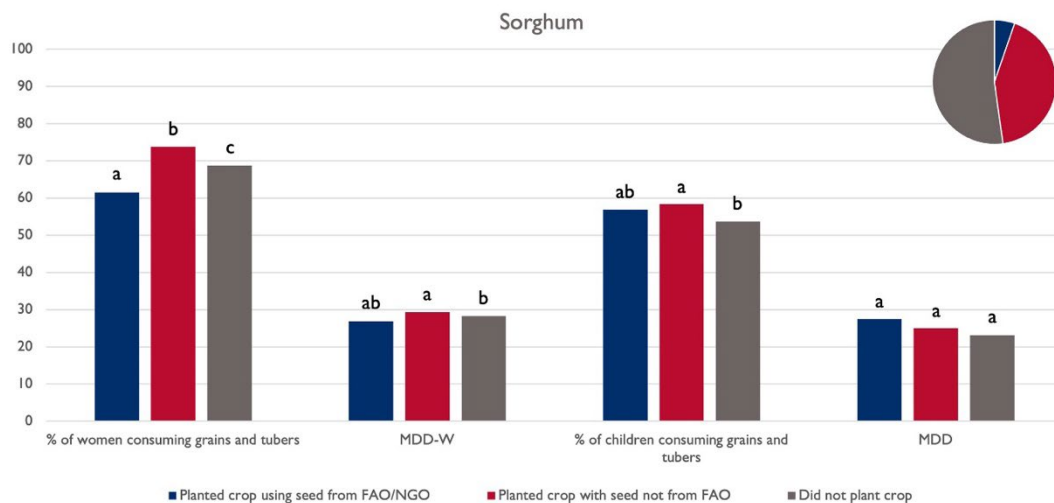
Footnote:

\*Each panel illustrates the consumption of the food group to which the crop type belongs. The bar charts reflect the proportion of women or children consuming the food group or meeting the MDD score criteria. Different letter superscripts indicate statistically significant differences between groups. The pie charts reflect the proportion of households in each category in the full survey sample.



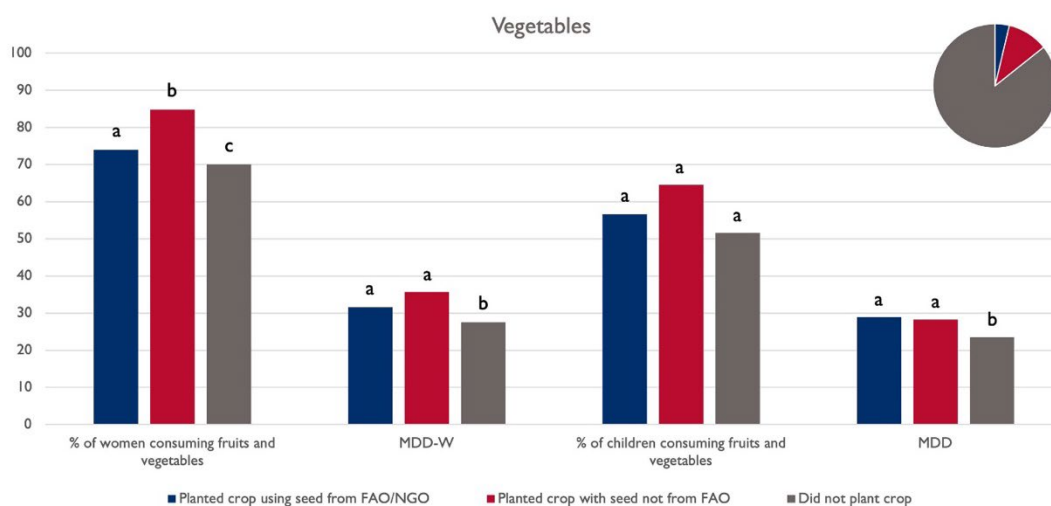
Footnote:

\*Each panel illustrates the consumption of the food group to which the crop type belongs. The bar charts reflect the proportion of women or children consuming the food group or meeting the MDD score criteria. Different letter superscripts indicate statistically significant differences between groups. The pie charts reflect the proportion of households in each category in the full survey sample.



Footnote:

\*Each panel illustrates the consumption of the food group to which the crop type belongs. The bar charts reflect the proportion of women or children consuming the food group or meeting the MDD score criteria. Different letter superscripts indicate statistically significant differences between groups. The pie charts reflects the proportion of households in each category in the full survey sample.



Footnote:

\*Each panel illustrates the consumption of the food group to which the crop type belongs. The bar charts reflect the proportion of women or children consuming the food group or meeting the MDD score criteria. Different letter superscripts indicate statistically significant differences between groups. The pie charts reflects the proportion of households in each category in the full survey sample.

Taken together, these results suggest that planting crops other than staple grains and tubers is associated with greater dietary diversity. While the source of seeds did not appear to matter, the provision of seeds from FAO or an NGO may have enabled a greater proportion of households to plant those crops than otherwise would have. It is important to interpret these results in the context of the agricultural activities program, which were targeted to particularly vulnerable households. Therefore, meeting or exceeding food group consumption of other households that may not have been as vulnerable (i.e., those planting the crops but not receiving the seeds through FAO or an NGO) demonstrates the ELRP's success in preventing further food insecurity and poorer diet in those most at risk. It is also clear, however, that few households were planting a diverse array of crops. Future programs should strive to understand whether

strengthening production diversity is feasible and, if not, why not and how this could be promoted to further support dietary diversity.

We did not conduct similar analyses for animal-source foods (e.g., meat, fish, dairy, or eggs) for two reasons. First, receipt of veterinary assistance was extremely low (<1%), a frequency that would have been unlikely to have had an impact on consumption of meat, dairy, or eggs. Second, many large livestock are not used for household consumption. Third, the question about receipt of fishing equipment from FAO or an NGO was conditioned on the availability of fish for consumption. The higher reported consumption in this group was in part the result of the way in which the questionnaire was structured. This finding reflects a limitation in the survey design to answer the specified research questions.

Participation in agricultural activities was beneficial in improving MDD-W. This finding is particularly notable given that the agricultural activities were targeted to the most vulnerable households (IPC phase 3 or above), which may have otherwise been at greater risk of poor dietary diversity. Therefore, the fact that participation in the activity appeared to be related to higher prevalence of meeting dietary diversity among women suggests that these activities could be important in buffering vulnerable households during crises in South Sudan.

## Household Factors Associated with Dietary Diversity (Research Question 4)

The fourth research question was, “Which household-level factors are associated with meeting MDD among women of reproductive age (15–49 years) and among children (aged 6–23 months)?”



### Key Findings

- A few household factors were shown to be associated with dietary diversity of both women and children, including having a household member who was part of a social group and the proportion of food that comes from own production.
- The association with social groups, such as community organizations, farmers’ associations, savings groups, youth groups, mothers support groups, or health committees suggests that these may be important opportunities for agricultural programs to increase their impact.
- Factors associated with dietary diversity for women and children, such as total number of assets owned, suggest that increasing the production and income of the most vulnerable households may be associated with improved dietary diversity.

Overall, several household factors were associated with both MDD-W and MDD (tables 10 and 11). Factors that were associated with MDD-W in both bivariate and multivariate analysis were woman’s age, total number of assets the household owned, household size, proportion of household expenditures spent on food, most important source of food and income, proportion of food that comes from own production, household member who is part of a social group, distance to market, and HDDS. Having a distressed family member was significant in bivariate but not multivariate analyses.

Total asset ownership and larger household size were both positively associated with MDD-W. With increasing asset score, there was a 2 percent increase in MDD-W. Similarly, there was a 2 percent increase in MDD-W with each additional person living in the household. Conversely, woman’s age was negatively associated with dietary diversity: For each one-year increase in age, there was a 1 percent lower prevalence of MDD-W.

Source of household income was also associated with MDD-W. Considering agricultural income as the reference category, households whose primary source of income was from the sale of alcoholic beverages, unskilled casual labor, skilled labor, sale of firewood, fishing/sale of fish, and gathering wild food/hunting had a significantly lower prevalence of MDD-W. Those without access to land for their own food production may need to spend a greater proportion of their income on food. Indeed, the proportion of household expenditures spent on food was negatively associated with MDD-W. Those who spent 65 percent to 75 percent of their expenditures on food had a 13 percent lower prevalence of MDD-W compared with those who spent less than 50 percent. In this context, although agricultural income appeared to be associated with relatively greater dietary diversity scores, there was a non-linear relationship between the proportion of food from own production and MDD-W. The two groups with the highest prevalence of MDD-W were those who reported that 50–75 percent of their food came from their own production. The groups with the lowest prevalence of MDD-W were those at either extreme—those with the lowest fraction of food from their own production (<50 percent) or those with the highest fraction of food from their own production (>75 percent). This finding may be because those who are wholly reliant on subsistence agriculture are unable to supplement their diets with a greater variety of foods obtainable through markets. It is also worth noting that for households that relied on support from family/friends and food assistance programs as their primary source of household income had a lower prevalence of MDD-W compared with agricultural households. Agricultural households were likely better off because of land ownership and other resources than households that were reliant on food assistance programs, which may be part of the reason why agricultural households may have had greater dietary diversity. It is also possible, however, that food assistance programs are not providing sufficient access to fruits and vegetables or animal-source foods, the types of food groups that would lead to improvements in dietary diversity scores.

Having a household member who was part of a social group was associated with an 18 percent greater prevalence of MDD-W. Social groups included community organizations, farmers' associations, savings groups, youth groups, mothers support groups, and health committees. These organizations may enable households to become better connected to support systems, information, and other resources. In addition, projects may cascade agricultural production training through organized groups, particularly farmers' associations.

There were some unexpected associations in these analyses. Distance to market was positively associated with dietary diversity. Those who lived within a 15-minute walk of the market were considered the reference category and had the lowest dietary diversity scores. This finding might be related to those households having a greater dependence on nonagricultural activities for their livelihoods or possibly being poorer. One might expect that households living outside the immediate vicinity but still near markets would be relatively better off. This was true to some degree, but with those living 30 to 60 minutes from market having 15 percent greater prevalence of MDD-W, the highest prevalence was among those who lived a one- to two-hour walk from the market (22 percent greater prevalence compared with the reference category). Those living farther away from a market may be more likely to depend on their own production. It was also unexpected to find no association between household food insecurity, as indicated by the HHS score, and MDD-W; nor was there an association with household residency status.

**Table 11. Association of Household Factors with MDD-W (All Women, N = 14,572)\***

<b>Variable</b>	<b>Number of Respondents</b>	<b>Prevalence of MDD-W, %</b>	<b>Adjusted Prevalence Ratio† (95% CI)</b>	<b>p-Value‡</b>
Woman's age	14,572	–	0.99 (0.989–0.995)	<.001
Total number of assets the household owns	14,572	–	1.02 (1.00–1.02)	<.001
Proportion of household expenditure spent on food				.0209
<50%	5,781	34.2	[Reference]	
50%–65%	4,525	33.0	0.99 (0.92–1.06)	
66%–75%	2,709	26.2	0.87 (0.79–0.95)	
>75%	1,577	24.0	0.95 (0.83–1.09)	
Most important source of food and income				<.001
Agriculture	8,286	36.5	[Reference]	
Livestock	713	28.8	0.86 (0.74–1.01)	
Sale of alcoholic beverages	800	26.3	0.83 (0.72–0.96)	
Unskilled casual labor	635	25.0	0.80 (0.68–0.93)	
Skilled labor	236	28.3	0.77 (0.60–0.98)	
Trader/shop owner	339	35.4	0.94 (0.79–1.12)	
Salaried work	233	40.3	0.88 (0.70–1.10)	
Sale of firewood	799	26.3	0.87 (0.76–0.99)	
Fishing/sale of fish	428	8.4	0.28 (0.20–0.41)	
Support from family/friends/community	187	19.3	0.69 (0.50–0.95)	
Begging	36	41.7	1.53 (1.03–2.29)	
Food assistance	1,272	23.5	0.70 (0.60–0.82)	
Gathering wild food/hunting	483	10.6	0.28 (0.20–0.40)	
Other	125	18.4	0.88 (0.53–1.47)	

Proportion of food that comes from own production				.007
<50%	6,689	29.2	[Reference]	
50%–65%	4,510	33.7	1.07 (1.00–1.15)	
66%–75%	2,340	34.9	1.09 (1.00–1.19)	
>75%	1,033	25.1	0.87 (0.76–1.00)	
Household member is part of a social group				<.001
No	11,971	29.3	[Reference]	
Yes	2,601	40.2	1.18 (1.10–1.27)	
Distance to market				<.001
<15 min	2,134	31.4	[Reference]	
15–29 minutes	2,025	31.7	1.06 (0.94–1.19)	
30–59 minutes	2,438	33.6	1.15 (1.03–1.29)	
1–2 hours	3,094	35.9	1.22 (1.10–1.35)	
>2 hours	4,387	26.7	1.05 (0.95–1.17)	
HDDS	14,572	–	1.19 (1.18–1.20)	<.001

\*This table only shows significant results. In addition to the factors shown here, we examined associations with HHS score; household size; resident status; number of shocks experienced in the past six months; receipt of other humanitarian assistance; household member with difficulty seeing, hearing, walking, remembering, self-care, or communication; household member affected by safety or security incident; having a distressed household member; and household hosting a child, IDP, or returnee. A complete table presenting all household characteristics tested can be found in annex 11.

†Adjusted for all covariates found to be significant in bivariate analysis at  $p < .1$

‡For categorical variables with multiple categories, a single  $p$ -value is presented, indicating that any one of or multiple categories are associated with the outcome.

Child's age, total number of assets the household owns, proportion of food that comes from own production, a household member who is a part of a social group, and HDDS were all associated with MDD in bivariate and multivariate analyses (table 12). Child age was positively associated with MDD. For each month of age increase, there was a 3 percent increase in the prevalence of MDD. This pattern is seen consistently across studies: As infants age, they are gradually introduced to a wider variety of family foods.

Some patterns of relationships with MDD differed from those described above for MDD-W. For example, household size was not associated with MDD; nor was there a consistent pattern with primary source of income. MDD did not differ significantly between many of the nonagricultural forms of household income (e.g., skilled or unskilled labor, sale of firewood or alcohol, traders, or salaried work) compared with households reliant on agricultural income. Also in contrast to the patterns observed with MDD-W, there was not a strong association with the proportion of household income spent on food or an association with distance to market.

We observed some important similarities with the patterns observed with MDD-W, however—specifically, that a high proportion (>75 percent) of food from own production was associated with a 30 percent lower prevalence of MDD compared with households with less than 50 percent of food from their own production. This finding may be the result of burdens on women’s time: If they need to devote significant time to agricultural production, there may be less time for caregiving and infant feeding. This issue may be further compounded by the high proportion of female-headed households with reportedly low levels of social support. Also, the prevalence of MDD was lower in households reliant on livestock (17 percent lower), fishing (51 percent lower), or hunting/gathering (47 percent lower) compared with agricultural households. Household membership in a social group was also associated with a 19 percent higher prevalence of MDD. Finally, children in households reliant on food assistance had a 16 percent lower prevalence of MDD compared with agricultural households. Although this finding was not statistically significantly different, the pattern mirrored that seen for MDD-W among women and underscores the likely lack of food group diversity within food assistance programs or may be a symptom of poverty.

**Table 12. Association of Household Factors with MDD (All Children, N = 5,906)\***

Variable	Number of Respondents	Prevalence of MDD, %	Adjusted Prevalence Ratio† (95% CI)	p-Value‡
HHS score				.331
Little to no hunger	2,707	27.5	[Reference]	
Moderate hunger	2,854	21.9	0.93 (0.83–1.04)	
Severe hunger	345	17.1	0.85 (0.63–1.15)	
Child’s age	5,906	–	1.03 (1.02–1.04)	<.001
Total number of assets the household owns	5,906	–	1.03 (1.01–1.04)	<.001
Proportion of household expenditure spent on food				.704
<50%	2,356	25.7	[Reference]	
50%–65%	1,823	25.5	0.98 (0.87–1.11)	
66%–75%	1,089	20.5	0.91 (0.77–1.08)	
>75%	638	21.2	1.03 (0.82–1.30)	
Most important source of food and income				.053
Agriculture	3,324	26.7	[Reference]	
Livestock	303	19.5	0.73 (0.54–0.98)	
Sale of alcoholic beverages	317	23.7	0.96 (0.76–1.22)	
Unskilled casual labor	251	22.7	0.96 (0.75–1.24)	
Skilled labor	105	31.4	1.11 (0.79–1.56)	
Trader/shop owner	121	36.4	1.20 (0.92–1.57)	

Salaried work	108	30.6	0.93 (0.65–1.32)	
Sale of firewood	299	18.7	0.93 (0.71–1.23)	
Fishing/sale of fish	159	12.0	0.49 (0.28–0.84)	
Support from family/friends/community	70	17.1	0.64 (0.36–1.16)	
Begging	14	28.6	1.24 (0.52–2.94)	
Food assistance	571	21.2	0.84 (0.67–1.04)	
Gathering wild food/hunting	220	8.6	0.53 (0.30–0.94)	
Other	44	15.9	0.86 (0.43–1.71)	
Proportion of food that comes from own production				.001
<50%	2,736	23.1	[Reference]	
50%–65%	1,863	28.0	1.16 (1.02–1.32)	
66%–75%	893	23.0	0.97 (0.82–1.15)	
>75%	414	16.9	0.70 (0.52–0.93)	
Household member is part of a social group				.005
No	4,833	22.2	[Reference]	
Yes	1,073	32.9	1.19 (1.05–1.34)	
Distance to market				.089
<15 minutes	922	27.8	[Reference]	
15–29 minutes	773	24.8	0.92 (0.76–1.11)	
30–59 minutes	975	28.2	0.95 (0.80–1.13)	
1–2 hours	1,211	25.4	0.94 (0.80–1.10)	
>2 hours	1,792	18.9	0.79 (0.66–0.94)	
HDDS	5,906	–	1.17 (1.15–1.19)	<.001

\*This table shows only significant results. In addition to the factors shown here, we examined associations with HHS score; household size; resident status; number of shocks experienced in the past six months; receipt of other humanitarian assistance; household member with difficulty seeing, hearing, walking, remembering, self-care, or communication; household member affected by safety or security incident; having a distressed household member; and household hosting a child, IDP, or returnee. A complete table presenting all household characteristics tested can be found in annex 11.

†Adjusted for all covariates found to be significant in bivariate analysis at  $p < .1$

‡For categorical variables with multiple categories, a single p-value is presented, indicating that any one of or multiple categories are associated with the outcome.

Overall, several factors, including total number of assets the household owns, proportion of food that comes from own production, having a household member who is part of a social group, and HDDS, are all associated with both women's and children's dietary diversity. This finding suggests that increasing own production and increasing social support through social groups may be important avenues to support in



humanitarian contexts. These are only associations, however, so such a relationship may be confounded by other factors that could not be controlled for in this study.

## Association between Maternal Social Support and Dietary Diversity (Research Question 5)

The fifth research question was, “What is the association between maternal social support and meeting MDD among women of reproductive age (15–49 years) and among children (aged 6–23 months)?”



### Key Findings

- Overall, in this study sample with a high proportion of female-headed households in an emergency context, women’s perceived social support was low.
- Social support was not associated with dietary diversity in this sample, but this finding is likely affected by the low levels of social support overall.

Overall, women felt low social support, whether familial or non-familial, with a mean score of 13.0 (table 13). A total of 70 percent of women scored in the lowest category (score <16 points), while 21 percent scored in the moderate social support category (16–19 points). Only 9 percent of women scored in the highest category (20 points). The two questions with the lowest scores were Q8 (having help with money in an emergency) and Q9 (having help with transportation when needed).

**Table 13. Mean score by Social Support Scale Question**

Question	Mean (SD)
Q1. Visits from friends and neighbors	1.4 (0.68)
Q2. Useful advice about important things	1.4 (0.68)
Q3. Someone trusted to talk to about personal and family problems	1.4 (0.67)
Q4. People who hope you are doing well	1.5 (0.66)
Q5. Feel loved by family	1.7 (0.56)
Q6. Husband and family shows/says that they are thankful	1.5 (0.62)
Q7. Help with household chores	1.3 (0.76)
Q8. Help with money in an emergency	0.7 (0.83)
Q9. Help when transportation when needed	0.8 (0.82)
Q10. Cared for when sick at home	1.4 (0.70)
<b>Total score</b>	<b>13.0 (4.4)</b>

Overall, social support was not significantly associated with MDD-W or MDD in crude or adjusted models (table 14). The levels of social support in this humanitarian emergency context may have been too low to have seen an association with dietary diversity. Women who participated in agricultural activities had a slightly lower social support score (mean [SD], 12.8 [4.6]) compared with nonparticipants (mean [SD], 13.0 [4.4]). This finding may reflect reverse causality in that participants were selected on the basis of their

vulnerability. Although agricultural activities were designed to address food security and income generation, they were not intentionally designed to address the lack of social support directly.

**Table 14. Association of Social Support with MDD-W and MDD\***

	<b>Adjusted Prevalence Ratio (95% CI)</b>	<b>p-Value</b>
MDD-W	1.00 (0.99–1.01)†	.950
MDD	1.00 (0.98–1.01)‡	.637

\*The crude prevalence ratios and p-values can be found in annex 12.

†Adjusted for covariates that were significant at  $p < .1$  in bivariate analyses with MDD-W. These are woman’s age, total number of household assets, family size, proportion of income spent on food, most important source of food and income, proportion of food that comes from own production, having a distressed family member, having a family member who is part of a social group, distance to market, HDDS, and participation in the intervention.

‡Adjusted for covariates that were significant at  $p < .1$  in bivariate analyses with MDD. These are HHS score, child age, total number of household assets, proportion of income spent on food, most important source of food and income, proportion of food that comes from own production, having a family member who is part of a social group, distance to market, HDDS, and participation in the intervention.

It is worth noting that these results differ from a somewhat similar factor examined in research question 3 (participation in a social group). There, we found that social group membership was positively associated with both MDD and MDD-W. Social groups, such as community organizations, farmers’ associations, savings groups, youth groups, mothers support groups, and health committees, are organizations outside the household that may enable households to become better connected to external support systems. Many of the questions in the social support scale used in the analysis for research question 4 reflect factors within the home or family. This could be one reason for the difference in results. In this context, where the typical family structures may have become eroded, family-level social support may be quite weak, particularly for female-headed households. However, access to outside social groups may enable households to derive important forms of social support that facilitate greater dietary diversity. These social groups may provide access to knowledge, resources, and other tools to enable households to better consume nutritious diets. A study in South Sudan found that social support typically comes from social networks made up of relatives by blood and marriage and those who have exchanged livestock gifts. Social networks have been weakened significantly because livestock-based transactions, which are central to forming social networks, have been hindered by conflict, poverty, livestock diseases, cattle raiding, and other issues that have decimated livestock holdings (Cullis 2021).

A further reason for the difference in relationships may reflect two dimensions of social support: perceived social support, as assessed by the social support scale, and received social support in the form of participation in social groups. Other studies have also found contrasting results when comparing perceived social support with received social support (Posselt et al. 2019). For example, a study of Bhutanese refugees found that receiving social support but not perceived social support was associated with reduced depression. In contrast, a study of Eritrean and Sudanese refugees found that perceived social support but not received social support was associated with lower levels of post-traumatic stress. As this is an emerging area of study with respect to nutrition outcomes, more research is needed to understand the nuanced relationships among these dimensions of social support, mental health, and nutrition outcomes.

## Chapter 6. Discussion and Conclusions

We found that women’s dietary diversity is positively associated with participation in agricultural activities in South Sudan’s complex emergency context. A key priority in complex emergencies is to protect, promote, and maintain food production to reduce food insecurity. It is important to maintain agricultural production while also reducing the need for external resources to feed communities and meet their persistent food security needs. These findings suggest that indeed agricultural interventions are good investments in complex emergency contexts not only to maintain food production and reduce food insecurity but also as a means to improve MDD-W. Dietary diversity is important because it is positively associated with nutrient adequacy—the ability of the diet to meet all essential nutrient requirements (Arimond et al. 2010; Steyn et al. 2006). In addition, improved dietary quality among women is associated with lower odds of anemia and low mid-upper arm circumference, an indicator of undernutrition (Bromage et al. 2021).

The finding that women’s dietary diversity is positively associated with participation in agriculture activities is also important because the vast majority of emergency food assistance programming prioritizes protecting food access and meeting basic food needs, and there has been little shift to prioritize dietary diversity in complex emergency contexts. Moreover, this study helps fill the evidence gap about whether agricultural interventions in emergency contexts can improve diet diversity. These findings show that women’s dietary diversity can improve in complex emergency contexts with targeted interventions that go beyond providing food assistance and meeting basic needs. We observed that there was a higher prevalence of consumption of pulses (among women) and legumes, nuts, and seeds (among children). There was also a small increase in the prevalence of consumption of vitamin A-rich vegetables and other vegetables (among women). This finding mirrored what was seen with individual types of seeds received. The data suggest that seed distribution did reach many households, but the most common types of crops planted with seeds from FAO or an NGO were sorghum and maize. Planting seeds for these two staple crops was not associated with improvements in dietary diversity.

Improving women’s dietary diversity can be challenging because women are often the last to benefit from efforts to improve household dietary diversity, and often, household diet has to improve for women’s diets to improve in tandem. In this sense, seeing improvements in women’s dietary diversity in a complex emergency suggests that improvement is possible, particularly in cases where households plant diverse crops. However, as noted in this report, only a small subset of households planted diverse crops. Nevertheless, those that did had greater dietary diversity among both women and children, suggesting that if this aspect of programming were expanded further, more may benefit. There is literature to suggest that promotion of farm production diversity may improve household or women’s dietary diversity, particularly when market access is limited (Habtemariam et al. 2021; Khandoker, Singh, and Srivastava 2022; Khonje et al. 2022). That said, there is likely a threshold beyond which further diversification may harm benefits to household income that could be gained through specialization (Sibhatu, Krishna, and Qaim 2015). Further, nutrition-sensitive agriculture interventions have been found to be positively associated with improvements in dietary diversity, likely through a combination of behavior change communication and intentionality in the design of the program to focus on nutrition objectives (Margolies et al. 2022; Ruel and Alderman 2013). In the South Sudan context, the intervention approach may need to be flexible and tailored to specific agroecological zones. From this study, it is difficult to provide any specific recommendations as to which agricultural interventions would be best suited to different regions because the sample size of those participating in agricultural interventions by region was too small to draw any conclusions.

Despite these promising findings, overall dietary diversity remained low among both women and children, and agricultural programs only reached approximately one-third of households. Although there have been some improvements in dietary diversity over previous survey rounds, more progress is

needed. The mean (SD) HDDS in this survey sample was 4.3 (2.5), which is about 1 point higher than previous FSNMS estimates for South Sudan (3.3 in December 2019) (WFP et al. 2020). The prevalence of MDD-W was 30.4 percent, and MDD was 22.7 percent in the present survey, which also is higher than previous survey estimates. Data from December 2018 found the percentage of children meeting MDD to be 20 percent (WFP et al. 2019a). Data from December 2019 showed that MDD was 17.5 percent, whereas data from August 2019 showed that the prevalence of MDD was 12.8 percent (WFP et al. 2019b, WFP et al. 2020). Dietary diversity may vary seasonally because of harvest season availability of food. The survey period for this round of the FSNMS (September 2021–January 2022) corresponds to the main harvest season and, therefore, the period likely with the highest levels of food security and dietary diversity. MDD-W has not been reported in previous analyses of the FSNMS in South Sudan.

This study also suggests that there will be a continued need to reach households that do not rely on agriculture for income through other types of programs. Service workers, laborers, and sales/market vendors had significantly worse dietary diversity. These groups are likely more reliant on markets to obtain most of their foods. Thus, programs should additionally consider how to move diverse foods through the food system to reach beyond agricultural households and further how to ensure affordability of these foods. Recognizing the challenges of implementing agricultural and food systems programs in emergency contexts, greater emphasis on this type of programming could potentially mitigate the impact of emergencies on dietary diversity.

Another avenue to consider strengthening in future programs is that of community-based social groups. Although the social support scale was not associated with dietary diversity in this study, other indicators of social support were associated. Specifically, household membership in a social group was significantly positively associated with dietary diversity among both women and children. The types of groups that people participated in included community organizations, farmers' associations, savings groups, youth groups, mothers support groups, and health committees. These organizations may enable households to become better connected to support systems, information, and other resources. The social support scale used in this survey, however, did not capture these specific dimensions of social support or may not have been well suited to this context. It was primarily focused on social support within the household. In this setting, but with a high proportion of female-headed households, there may have been few options for women to feel supported within their families. In this context, men may be away from their homestead for the majority of the year. Thus, social support from external groups may be an important factor in the relationship with dietary diversity, especially in complex emergency contexts, when usual household social support may be eroded.

This study has important strengths. The large, nationally representative survey enables us to generalize these results broadly geographically in South Sudan. It also enables us to have sufficient statistical power to detect household factors associated with dietary diversity.

This study also has several important limitations. These data are from self-reports and subject to reporting bias and reporting errors. The survey was administered by trained enumerators who were required to translate questions into the local languages. This challenging task may have led to differences in meaning conveyed to the respondents, which could have led to reporting errors. In addition, reporting bias could have occurred because of social desirability factors. This is particularly a risk in the online implementing partner survey.

Further, the survey structure and questions included have important limitations, particularly as they relate to our definition of program participation. The question about receipt of humanitarian assistance (agricultural inputs, agricultural tools, fishing gear, and veterinary assistance) had a recall period of only three months. Given that the survey was conducted from September 2021 to January 2022, this question was not well aligned with program activities that occurred between April 2020 – April 2021. Many people may have received these services before the period of recall. Second, the question about

receipt of fishing equipment was conditioned on a positive response to a prior question about access to fish for consumption. Thus, one element of the definition of program participation was conditioned on fish available for consumption now. Therefore, it is impossible to determine whether the observed higher consumption of this food group can be attributed to access to the program or to the way in which the question was asked. From this question, we are missing households that may have received fishing equipment, but that equipment did not result in greater access to fish for consumption (e.g., if the fishing equipment was sold or traded or had broken or if supplies had been fully exhausted by the time of the survey). Similarly, the questions about receipt of seeds was asked only of people who reported planting the crop. This question flow would have missed participants who received seeds but had not planted them. For instance, the post-program monitoring survey noted that households in some regions felt that seeds were provided too late. Finally, as noted above, beyond FAO, other organizations may have been carrying out agricultural activities during the same period. Because the FAO activities were carried out through implementing partners, survey respondents may have been unable to distinguish between FAO program activities and activities of other organizations; even if they were able to tell the difference, the FSNMS survey questions were not designed to allow them to make this distinction.

A third limitation is that this survey was not designed to be subnationally representative. There are limited data to allow for analysis of specific types of program activities by region, state, county, or agroecological zones. Existing data do not allow for this kind of analysis given the small sample sizes for each intervention within each state.

Finally, this study is a cross-sectional analysis of a representative survey that was not designed to directly evaluate the ELRP. Further, there is no relevant control group to which we can compare program impacts. We have compared program participants to nonparticipants, but these two groups are likely different from each other in many ways, apart from the program itself. While we have attempted to control for confounding in all analyses, it is possible that residual confounding remains because of factors that were not collected in the FSNMS survey. Thus, we cannot directly attribute causal effects of the program to dietary diversity.

To our knowledge, there are no other, similar secondary data analyses of the FSNMS survey in complex emergencies. Previous rounds of the FSNMS surveys in South Sudan did not measure women's dietary diversity. These findings suggest that this analysis could be integrated into the survey tool and may be useful to monitor on a regular basis. Taken together, these findings suggest that agriculture interventions in complex emergencies can improve women's dietary diversity by enabling households to plant more diverse crops, suggesting that increasing diverse food production can be beneficial to women's dietary diversity in these contexts. At the outset of this activity, a primary objective was to identify nutrition-sensitive agriculture programs to study to determine whether they could improve nutrition outcomes in complex emergencies. Although no nutrition-sensitive agriculture programs in complex emergencies could be identified, this study does suggest that intentionally designing nutrition-sensitive agriculture programs in complex emergencies could have important benefits for nutrition outcomes by promoting diverse crop production, particularly on women and children's dietary diversity. A second important finding is that social support through participation in group activities can help improve women's and children's dietary diversity, particularly in contexts where there are a disproportionate number of female-headed households. These types of social groups likely serve as social networks from which women can derive support and could help strengthen their resilience, as well.

## Chapter 7. Recommendations

Although this study offers promising results with respect to women’s dietary diversity, there are several opportunities for improvement. This study suggests a few avenues for further refinement of program design and research to enable stronger evidence-based decision-making. Below we offer recommendations based on the findings from this study in addition to knowledge and best practices from USAID Advancing Nutrition’s work researching and developing guidance for nutrition-sensitive agriculture and SBC.

### Donors

Our findings have implications for donors that fund nutrition and agriculture programs in complex emergencies:

- Consider promoting and funding nutrition-sensitive agriculture in South Sudan and in other complex emergencies to improve women’s diets. As these findings show, agriculture projects can be appropriate for improving women’s dietary diversity within South Sudan’s highly food-insecure, complex emergency contexts and may in other similar contexts. However, more research is needed to understand why similar associations were not apparent among children. These projects can be implemented within short time frames provided that the project aligns with the seasonal calendar and production cycles and distributes inputs in time for production cycles. We found that among households that planted diverse, nutrient-rich crops, women’s dietary diversity improved. Importantly, the nutrition outcomes from these interventions will likely be stronger if nutrition is an explicit component of the project design and implementation. Key to this is determining the nutritional gaps in diets (e.g., gaps in consumption by food group), the main constraints related to household access to the foods that would fill the nutritional gaps, and how agricultural support could help address the nutritional gaps and food access constraints. Complementary nutrition interventions should also be provided. Emphasis should be placed on the production of nutrient-rich foods coupled with social and behavior change (SBC) approaches that promote the consumption of such foods. A context-specific (taking into account seasonality for production and market availability during different seasons), nutrition-sensitive agricultural project could provide inputs and training to support fodder and legume production and postharvest storage and also provide tailored, modular, and time-bound SBC interventions, such as trials of improved practices to support consumption of those foods by nutritionally vulnerable household members. In instances where agricultural production cannot adequately address dietary needs or nutritional gaps, other nutrition interventions can be provided alongside nutrition-sensitive agriculture, such as micronutrient powders or lipid-based nutrient supplements (Ruel and Alderman 2013; Ruel, Quisumbing, and Balagamwala 2018). For more guidance on nutrition-sensitive agriculture programming design, please see USAID Advancing Nutrition’s *Designing Effective Nutrition-Sensitive Agriculture Activities Workshop: Facilitator’s Guide and Slides*. This design guide was developed for programs in development settings, but many elements will be useful and applicable for emergency settings, as well.
- Consider promoting diverse crop production as feasible in complex emergencies and strengthening social networks as a means of improving dietary diversity. Our findings on social support warrant further consideration as factors that may influence women’s diets. Importantly, agriculture interventions that are implemented by creating and implementing group activities can serve a dual purpose—one for improving agricultural practices and the other to serve as a social network that provides women with social support. This may particularly be important in South Sudan given the low social support experienced by women and the high portion of female-headed households in the country. At the same time, while seeking to promote agriculture activities, donors should carefully consider potential unintended consequences of agriculture interventions

on women's time and labor burdens, particularly as these can adversely affect children's dietary diversity and other aspects of child care.

- Explore other nutrition activities to improve children's diets in complex emergencies. Children's diets are affected by care and feeding practices that are not necessarily related to household food access. Even in development contexts, nutrition-sensitive agriculture tends to benefit children less than other nutritionally vulnerable household members, in part because efforts to increase agricultural production rely heavily on women's labor, reducing the time they have available for child care and adversely affecting nutrition outcomes (Ruel, Quisumbing, and Balagamwala 2018). Other evidence-based nutrition-sensitive and specific activities for infant and young child feeding should be considered in line with the context and needs of the population.

## Bureau for Humanitarian Assistance

The following recommendation is for consideration by BHA and applicable when an implementing partner identifies nutrition as an objective for agricultural activities in an application for BHA emergency funding:

- **Evaluate the appropriateness of agricultural activities to improve diets.** When evaluating emergency applications with nutrition objectives, BHA should consider whether the agricultural activities proposed are indeed nutrition sensitive and are likely to improve diets in the specific context (e.g., given agroecology, production systems, markets). The theory-of-change statement in the application should provide logic for how the agricultural activities are nutrition sensitive and will improve diets and should include both crop-based interventions as well as animal-source food production efforts. This approach requires developing objectives and hypotheses that go beyond improving food security. The response analysis the implementing partners conduct should provide justification for the design of the nutrition-sensitive agriculture programming, including timeline considerations based on production cycles and seasonality.

## FAO, WFP, and Emergency Implementing Partners

Through thoughtful program design, implementing organizations can increase the likelihood that their programs will have an impact on improving dietary quality:

- **Bring nutrition goals to the forefront of the design of agricultural programs.** Nutrition-sensitive agriculture interventions are most likely to have impacts on dietary diversity when there is explicitly stated intent to achieve nutrition-related objectives (Margolies et al. 2022). Laying the foundation through clearly established nutrition goals and targets can help refine the implementation strategy. For more guidance on nutrition-sensitive agriculture programming design, please see USAID Advancing Nutrition's [Designing Effective Nutrition-Sensitive Agriculture Activities Workshop: Facilitator's Guide and Slides](#). Although this design guide was developed for programs in development settings, many elements will be useful and applicable for emergency settings, as well.
- **Standardize and integrate the women's dietary diversity measures into FSNMS survey modules.** Women's dietary diversity was integrated into the FSNMS for the purposes of this secondary analysis, and the results suggest that the use of this indicator should be standardized and integrated into future rounds of the FSNMS survey and the survey tool. MDD-W is now a well-established and meaningful indicator that is also important to include in monitoring food security and nutrition in complex emergency contexts. There is thus a need to review the opportunities to develop brief, standardized survey modules that can be incorporated into national surveys to better capture nutrition-specific outcomes and ensure that program design and monitoring on nutrition interventions are strengthened.

- **Place greater emphasis on diverse crop varieties and timely delivery.** The most common types of seeds received from FAO or an NGO were sorghum and maize. Only a small fraction of households reported receiving seeds for legumes, nuts, seeds, fruits, or vegetables. Among the small proportion of households that did receive these types of seeds, there appeared to be higher dietary diversity scores. Evidence suggests that crop diversity can translate into increased dietary diversity in some contexts (Khandoker, Singh, and Srivastava 2022), particularly when market access is limited (Habtemariam et al. 2021; Khandoker, Singh, and Srivastava 2022; Khonje et al. 2022). In complex emergency contexts, where there may be limited access to markets, diverse homestead food production may enable households to access a wider variety of foods than would otherwise be available to them. See annex 1 for livelihood zones with limited market access in South Sudan. It is also critical that the seeds are provided in a timely manner, in line with the growing seasons in the region. There is heterogeneity in planting seasons across the country and the seeds cannot be used effectively by farmers if they are provided late.
- **Strengthen delivery and monitoring of nutrition SBC components to improve women’s and children’s diets.** Evidence suggests that agriculture interventions that include SBC components are more likely to have an impact on improving dietary diversity (Margolies et al, 2022; Ruel, Quisumbing, and Balagamwala 2018). While the ELRP contained some nutrition education elements, this study could not assess the effectiveness of this aspect of the program. Further, the program’s post-distribution monitoring reports do not collect data on participation in nutrition SBC sessions or change in nutrition knowledge. Therefore, data are lacking to assess how strong this element of the program was. Key messages of the SBC strategy should focus on the primary goals of the program and the likely barriers to adoption. For more information, see USAID Advancing Nutrition’s guidance on [prioritizing multi-sectoral nutrition behaviors](#), [designing complementary feeding activities](#), and [engaging family members in nutrition](#).
- **Strengthen social group activities to share knowledge and resources and to build social networks.** This study suggests that participation in social groups, such as community organizations, farmers’ associations, savings groups, youth groups, mothers support groups, and health committees, is associated with greater dietary diversity. Although the ELRP included some social group activities, such as the cascade training for agricultural activities and the nutrition education activities, group activities in complex emergency contexts should integrate a deliberate focus on strengthening social capital, social support, and social cohesion as a means for households and particularly women to receive the support they need. By purposefully including these types of group activities in the program design, the program may enable households to have greater access to knowledge, resources, and social support. These external support systems may be particularly important in emergency contexts, where typical household or extended family social support systems may be weakened.

## Further Research

Although there is a growing body of evidence on the effectiveness of agricultural interventions on improving dietary diversity outcomes in development contexts, there is limited research on such programs in emergency contexts, which hinders the development of evidence-based operational guidance for program implementation. Recognizing the challenges of conducting research in these difficult settings, there are nevertheless opportunities to use large-scale surveys or tailor studies to assess the reach and effectiveness of agricultural programs:

- **Develop survey modules that specifically assess program activities to strengthen monitoring.** The questionnaire was not well aligned with the design of the ELRP and made interpretation of program participation challenging. In protracted crises, there may be opportunities to develop brief, standardized survey modules that can be incorporated into



national surveys. Particularly in contexts where there are repeated surveys over time, such standardized data-collection tools can be used to evaluate the reach of large-scale programs over time and in response to situational changes. This approach might not be feasible in shorter-term, acute crises, but the longer time horizon of protracted, complex emergencies may warrant greater investment in survey tools designed to evaluate program activities.

- **Consider conducting a study specifically designed to evaluate the effectiveness of emergency agricultural programs.** The study presented in this report used secondary data of a survey that was not explicitly designed to evaluate the program. However, a well-designed study with tailored data collection tools and a well-designed analysis strategy could provide substantial insight and target key implementation questions that could not be addressed through this analysis.

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## Annex I. Livelihood Zones in South Sudan

Livelihood Zone	Agro-Ecology	Main Economic Activities	Market Access	Primary Hazards
1. Equatorial maize and cassava zone	One of the highest potential cereal producing areas with fertile soils, bi-modal rainfall pattern, diverse vegetation cover	Rainfed farming (e.g., cassava, maize), livestock raising, fishing, and use of forest products	Access to external markets in neighboring countries	Prolonged dry spells, crop pests and diseases, seasonal flooding, conflict and sporadic political insurgency
2. Ironstone Plateau agropastoral	Moderately productive with a mix of plateaus and river valleys, moderately fertile soil, and single rainy season.	Rainfed farming (e.g., sorghum, groundnuts, sesame, millet, cowpeas), livestock raising, and use of forest products	Access has improved with improved road network since peace agreement	Drought, crop pests and diseases, livestock diseases, conflict, floods
3. High land forest and sorghum	Low production, mountainous area with low rainfall and one rainy season	Rainfed agriculture (e.g., sweet potatoes, vegetables, millet, cassava) with less reliance on livestock	Poor road conditions, distance, flooding and insecurity limit access	Crop pests and diseases, floods, prolonged mid-season dry spells, conflict, mining accidents
4. Western plains groundnuts, sesame and sorghum	Mix of highlands and foothills, unimodal rainfall	Rainfed agriculture (e.g., sorghum, groundnut, sesame), use of wild foods and forest products, and livestock production	Limited access due to flooding, poor road infrastructure, and insecurity; low population density.	Prolonged dry spells, insecurity, cross-border conflict, price spikes, HIV/AIDs, crop pests and diseases, livestock diseases
5. Southeastern semi-arid pastoral	Semi-arid, dry Sahelian savannah	Primarily pastoral with livestock production (e.g., cattle, camels, goats, and sheep)	Most food access through cross-border markets	Inter-communal conflict and cattle raiding, flooding, livestock diseases, drought
6. Eastern plain sorghum and cattle	Flat, low-lying terrain, relatively fertile soil, unimodal rains	Agro-pastoral with crop (e.g., sorghum, millet, groundnuts, pumpkins) and livestock production (e.g., cattle goats, sheep)	Relatively good due to improved roads	Inter-communal conflicts and cattle raiding, flooding, livestock diseases, crop pests and diseases, drought, health issues

7. Northwestern flood plain sorghum and cattle	Flood plains with unimodal rainfall,	Mixed agro-pastoral, with rainfed agriculture (e.g., sorghum, groundnuts, sesame), livestock production, and fishing	Cross-border trade is important	Rainfall variability, flash floods, crop pests and diseases, livestock diseases, localized cattle raiding
8. Nile basin fishing and agro-pastoral	Swampy flood plain, unimodal rainfall	Rain-fed agriculture (e.g., sorghum) and livestock production (e.g., cattle, goats, sheep)	Does not have active trade or market system due to transportation challenges	Flooding, crop pests, livestock diseases, localized cattle raiding
9. Northwestern Nile basin cattle and maize	Flat flood plains, unimodal rainfall	Agro-pastoral with focus on livestock production (e.g., cattle, goats, sheep)	One primary market with trade routes to other areas	Floods, dry spell, bird plagues, crop pests and diseases, livestock diseases
10. Northeastern maize, cattle and fishing	Flood plains, unimodal rainfall	Rainfed agricultural production (e.g., maize, cowpeas) and fishing	Poor access due to insecurity	Interruptions in rainfall, sudden heavy rains, crop pests, livestock diseases
11. Northern sorghum and livestock	Low lying, flat plains, open savannah, unimodal rains	Rainfed agricultural (e.g., sorghum, maize, cowpeas, sesame, vegetables) and livestock production	Strong cross-border trade and market access	Floods, delays and disruptions in rains, crop pests and diseases, livestock diseases, persistent conflict
12. Maize, sorghum, fish and natural resources	Mountainous and hill ranges, generally fertile soils, one long rainy season	Rain-fed agriculture (e.g., maize, sorghum) supplemented with livestock and gathering wild food	Constrained due to terrain and poor road quality, particularly during rains	Floods, livestock diseases, dry spells, inter-communal conflict, cattle raiding, human diseases, crop pests and diseases

Source: FEWS NET 2018



# Annex 2. Online Survey for ELRP Implementing Partners

## Program Implementation Questionnaire

### Introduction

[USAID Advancing Nutrition](#) is a global multi-sectoral nutrition project. It is funded by the United States Agency for International Development (USAID) and it is implemented by a consortium led by John Snow International (JSI), which is based in the United States.

We are conducting a study with FAO to learn about the effectiveness of agriculture interventions on dietary diversity in protracted emergency contexts. This study is funded by USAID's Bureau for Humanitarian Assistance. The results of this study will be used to inform USAID guidance on applying agriculture approaches and interventions in protracted emergencies.

**We would like to get your perspective on how the agriculture component of the Emergency Livelihoods Response Programme, South Sudan was implemented and the successes and challenges faced.** Your participation is entirely voluntary. You can decline to participate without any impact on your employment or your supervisor being informed. You are free to skip any questions or stop participating at any time without any penalty.

This short online survey will take approximately 10 minutes to complete. This survey is anonymous. We will not collect your name or email address.

We will combine the information that you provide us with the information that we gather from other people in all reports and presentations. We will only identify respondents by the organization that they work for. We will share the combined information with FAO, USAID, government officials, and the public.

Thank you in advance for participating. If you have any questions about participating in this survey, please contact the Activity Lead, Susan Cantella ([susan\\_cantella@jsi.com](mailto:susan_cantella@jsi.com)).

Do you consent to participate in this online survey?

- Yes (if yes, go to A01)
- No (end survey and show thank you)

A	Introduction
A01	What is the name of the organization you work for? ( <i>open text</i> )
A02	What is your organization's role in the FAO-led Emergency Livelihoods Response Programme in South Sudan? ( <i>open text</i> )
A03	What is your role in the programme? ( <i>select one</i> ) <ul style="list-style-type: none"><li>• Project management/leadership</li><li>• Technical staff</li><li>• M&amp;E staff</li><li>• Outreach or field staff</li><li>• Other (<i>specify</i>)</li></ul>
A04	Please specify which county/counties you work in on this programme.

<b>B</b>	<b>Program Implementation</b>
<i>The next questions are about the activities that were implemented in the agriculture components of the programme and what you think the direct benefits were for participants.</i>	
B01	<p>What agriculture activities were part of the project? <i>(select all that apply)</i></p> <ul style="list-style-type: none"> <li>• Agriculture training (if yes, go to B02)</li> <li>• Distribution of seeds or seedlings (if yes, go to B03)</li> <li>• Distribution of agricultural tools, equipment, or agro-chemicals (if yes, go to B04)</li> <li>• Demonstration plots or gardens (if yes, go to B05)</li> <li>• Nutrition training and demonstrations (if yes, go to B06)</li> <li>• Other <i>(specify)</i></li> </ul>
B02	<p>What topics were covered in the agriculture training? <i>(select all that apply)</i></p> <ul style="list-style-type: none"> <li>• Crop and seed selection</li> <li>• Land preparation</li> <li>• Planting and sowing</li> <li>• Crop growth and development</li> <li>• Irrigation</li> <li>• Weed management</li> <li>• Agro-chemical application</li> <li>• Climate smart agriculture</li> <li>• Agro-ecology practices</li> <li>• Soil management and conservation</li> <li>• Water management and conservation</li> <li>• Pests and pest management</li> <li>• Crop diseases and management</li> <li>• Harvesting</li> <li>• Post-harvest storage and processing</li> <li>• Farm planning</li> <li>• Crop sales and marketing</li> <li>• Other <i>(specify)</i></li> </ul>
B02.1	<p>Who provided the agriculture training? <i>(select all that apply)</i></p> <ul style="list-style-type: none"> <li>• Your organization (if yes, go to B02.2)</li> <li>• Ministry of Agriculture (if yes, go to B02.3)</li> <li>• Your organization and the Ministry of Agriculture jointly (if yes, go to B02.4)</li> <li>• Other <i>(specify)</i> (if yes, go to B02.5)</li> </ul>
B02.2	<p>How would <u>you</u> rate the overall quality of the agriculture training provided by your organization? <i>(select one)</i></p> <ul style="list-style-type: none"> <li>• Very high quality</li> <li>• High quality</li> <li>• Moderate quality</li> <li>• Low quality</li> <li>• Very low quality</li> </ul>

B02.3	<p>How would <u>you</u> rate the overall quality of the agriculture training provided by the Ministry of Agriculture? (select one)</p> <ul style="list-style-type: none"> <li>• Very high quality</li> <li>• High quality</li> <li>• Moderate quality</li> <li>• Low quality</li> <li>• Very low quality</li> </ul>
B02.4	<p>How would <u>you</u> rate the overall quality of the agriculture training provided jointly by your organization and the Ministry of Agriculture? (select one)</p> <ul style="list-style-type: none"> <li>• Very high quality</li> <li>• High quality</li> <li>• Moderate quality</li> <li>• Low quality</li> <li>• Very low quality</li> </ul>
B02.5	<p>How would <u>you</u> rate the overall quality of the agriculture training provided by other organizations? (select one)</p> <ul style="list-style-type: none"> <li>• Very high quality</li> <li>• High quality</li> <li>• Moderate quality</li> <li>• Low quality</li> <li>• Very low quality</li> </ul>
B02.6	<p>How do you think the <u>trainees</u> would rate the overall quality of the agriculture training? (select one)</p> <ul style="list-style-type: none"> <li>• Very high quality</li> <li>• High quality</li> <li>• Moderate quality</li> <li>• Low quality</li> <li>• Very low quality</li> </ul>
B02.7	<p>What were the <u>main three benefits</u> of the agriculture training for participants? (select up to three)</p> <ul style="list-style-type: none"> <li>• Increased agronomic knowledge</li> <li>• Improved decision-making and planning skills</li> <li>• Improved sustainability of agricultural practices</li> <li>• Labor savings</li> <li>• Cost savings</li> <li>• Increased crop diversity</li> <li>• Increased crop yields</li> <li>• Improved post-harvest storage</li> <li>• Increased confidence to try new practices</li> <li>• Raised awareness about environmentally unsustainable practices</li> <li>• Other (specify)</li> </ul>

B03	<p>What were the <u>main three benefits</u> of the seed distribution for participants? (select up to three)</p> <ul style="list-style-type: none"> <li>• Ability to farm/grow crops</li> <li>• Increased crop diversity</li> <li>• Expansion of area under production</li> <li>• Increased crop yields</li> <li>• Improved food security</li> <li>• More diverse diets</li> <li>• Other (specify)</li> </ul>
B04	<p>What were the <u>main three benefits</u> of the agricultural tools, equipment, or agro-chemicals distribution for participants? (select up to three)</p> <ul style="list-style-type: none"> <li>• Ability to farm/grow crops</li> <li>• Improved soil fertility</li> <li>• Labor savings</li> <li>• Expansion of area under production</li> <li>• Increased crop yields</li> <li>• Improved weed management</li> <li>• Improved pest management</li> <li>• Improved crop disease management</li> <li>• Improved post-harvest storage</li> <li>• Other (specify)</li> </ul>
B05	<p>What were the <u>main three benefits</u> of the demonstration plots for participants? (select up to three)</p> <ul style="list-style-type: none"> <li>• Increased agronomic knowledge</li> <li>• Improved decision-making and planning skills</li> <li>• Hands on experience with sustainable and best agricultural practices</li> <li>• Exposure to labor saving practices/technologies</li> <li>• Exposure to cost saving practices/technologies</li> <li>• Exposure to crop diversification and intercropping practices</li> <li>• Exposure to harvest and post-harvest storage practices/technologies</li> <li>• Increased confidence and ability to try new practices</li> <li>• Understand benefits of improved practices</li> <li>• Calculating crop yields</li> <li>• Social networking and exchange</li> <li>• Agricultural trade and marketing opportunities</li> <li>• Other (specify)</li> </ul>

B06	<p>What topics were covered in nutrition education? <i>(select all that apply)</i></p> <ul style="list-style-type: none"> <li>• Food groups and nutrients</li> <li>• Dietary diversity</li> <li>• Recommended portion sizes</li> <li>• Infant and young child feeding</li> <li>• Nutrition for pregnant and lactating women</li> <li>• Food preparation and cooking</li> <li>• Food safety and hygiene</li> <li>• Personal hygiene and sanitation practices</li> <li>• Other <i>(specify)</i></li> </ul>
B06.1	<p>Who provided the nutrition training? <i>(select all that apply)</i></p> <ul style="list-style-type: none"> <li>• Your organization (if yes, go to B06.2)</li> <li>• Ministry of Health (if yes, go to B06.3)</li> <li>• Your organization and the Ministry of Health jointly (if yes, go to B06.4)</li> <li>• Other <i>(specify)</i> (if yes, go to B06.5)</li> </ul>
B06.2	<p>How would you rate the overall quality of the nutrition training provided by your organization? <i>(select one)</i></p> <ul style="list-style-type: none"> <li>• Very high quality</li> <li>• High quality</li> <li>• Moderate quality</li> <li>• Low quality</li> <li>• Very low quality</li> </ul>
B06.3	<p>How would you rate the overall quality of the nutrition training provided by the Ministry of Health? <i>(select one)</i></p> <ul style="list-style-type: none"> <li>• Very high quality</li> <li>• High quality</li> <li>• Moderate quality</li> <li>• Low quality</li> <li>• Very low quality</li> </ul>
B06.4	<p>How would you rate the overall quality of the nutrition training provided jointly by your organization and the Ministry of Health?</p> <ul style="list-style-type: none"> <li>• Very high quality</li> <li>• High quality</li> <li>• Moderate quality</li> <li>• Low quality</li> <li>• Very low quality</li> </ul>
B06.5	<p>How would you rate the overall quality of the nutrition training provided by other organizations? <i>(select one)</i></p> <ul style="list-style-type: none"> <li>• Very high quality</li> <li>• High quality</li> <li>• Moderate quality</li> <li>• Low quality</li> <li>• Very low quality</li> </ul>

B07	<p>What were the <u>main three benefits</u> of the nutrition training for participants? (select up to three)</p> <ul style="list-style-type: none"> <li>• Increased general awareness about nutrition</li> <li>• Increased understanding about role of nutrition for health</li> <li>• Improved knowledge about food groups and nutrients</li> <li>• Improved knowledge about recommended portion sizes</li> <li>• Improved understanding about recommended about infant and young child feeding practices</li> <li>• Improved knowledge about nutritional needs of pregnant and lactating women</li> <li>• Exposure to safe and hygienic food practices</li> <li>• Exposure to recommended personal hygiene and sanitation practices</li> <li>• Exposure to new food preparation or cooking practices</li> <li>• Improved food preparation and cooking skills</li> <li>• Increased motivation to eat nutritious foods</li> <li>• Increased confidence to try new infant and young child feeding practices</li> <li>• Increased motivation to purchase nutritious foods</li> </ul>
<b>C Program Perceptions</b>	
<p><i>The next questions are about your perceptions of the challenges and successes faced while implementing the agriculture components of the programme.</i></p>	
C01	<p>What were the <u>main three challenges</u> faced during implementation that affected the agriculture component of the programme? (select up to three)</p> <ul style="list-style-type: none"> <li>• Insufficient funding</li> <li>• Inadequate numbers of staff</li> <li>• Inadequate staff skills and knowledge</li> <li>• Poor infrastructure (e.g., mobile service, internet, roads)</li> <li>• Insecurity and safety challenges at programme implementation sites</li> <li>• Weak leadership or management</li> <li>• Weak monitoring and evaluation</li> <li>• Limited community interest or engagement</li> <li>• Distrust or conflict between programme and community</li> <li>• Difficulty identifying vulnerable households</li> <li>• Difficulty working with political or community leaders</li> <li>• Logistical problems procuring inputs</li> <li>• Logistical problems distributing inputs</li> <li>• Logistical problems delivering training</li> <li>• Short programme period</li> <li>• programme design</li> <li>• Other challenges related to politics</li> <li>• Other challenges related to economy</li> <li>• Other challenges related to socio-cultural factors</li> <li>• Challenges managing partner organizations</li> <li>• Challenges working with donor</li> <li>• Other (specify)</li> </ul>

C02	<p>What do you think were the <u>three strongest aspects</u> of implementation of the agriculture component of the programme? <i>(select up to three)</i></p> <ul style="list-style-type: none"> <li>• Sufficient funding</li> <li>• Strong relationship with donor</li> <li>• High staff technical capacity</li> <li>• Strong programme management and leadership</li> <li>• High quality programme design</li> <li>• Efficient distribution of inputs</li> <li>• High quality training provided to participants</li> <li>• Strong monitoring and evaluation</li> <li>• Strong relationship with the government</li> <li>• High capacity of government staff</li> <li>• Strong relationship with community</li> <li>• Strong interest and engagement from participants</li> <li>• Supportive political or community leaders</li> <li>• Other (specify)</li> </ul>
C03	<p>What do you think the programme could do better next time to improve implementation? <i>(open ended)</i></p>
<p><b>D Perceived Impacts</b></p>	
<p><i>The next questions are about what <u>you</u> think the ultimate impacts were of the agriculture components of the programme.</i></p>	
D01	<p>What do you think the <u>main three impacts</u> were for <u>participants</u> of the agriculture component of the programme? <i>(select up to three)</i></p> <ul style="list-style-type: none"> <li>• Increased crop diversity</li> <li>• Increased crop yields</li> <li>• Decreased agricultural input costs</li> <li>• Increased income from crop sales</li> <li>• Improved food security</li> <li>• Improved access to healthy foods</li> <li>• Improved household dietary diversity (i.e., number of food groups consumed)</li> <li>• Improved resilience</li> <li>• Increased opportunities to market or trade crop surpluses</li> <li>• Other (specify)</li> </ul>
D02	<p>To what extent do you think the agriculture component <u>resulted in increased dietary diversity</u> (i.e., number of food groups consumed) <b>for women</b> in participant households? <i>(select one)</i></p> <ul style="list-style-type: none"> <li>• Very significant increase</li> <li>• Significant increase</li> <li>• Moderate increase</li> <li>• Small increase</li> <li>• No increase</li> </ul>

D03	<p>To what extent do you think the agriculture component <u>resulted in increased dietary diversity</u> (i.e., number of food groups consumed) <b>for children 6–23 months</b> in participant households? (select one)</p> <ul style="list-style-type: none"> <li>• Very significant increase</li> <li>• Significant increase</li> <li>• Moderate increase</li> <li>• Small increase</li> <li>• No increase</li> </ul>
D04	<p>What do you think the programme can do better next time to improve the impacts from the programme? (<i>open ended</i>)</p>
D05	<p>What were any unexpected or surprising impacts from the agriculture components programme? (<i>open ended</i>)</p>
D06	<p>Is there anything else you want to tell us about the agriculture component of the programme? (<i>open ended</i>)</p>

**Thank you for completing this survey! We really appreciate your input.**



# Annex 3. Questions and Corresponding Responses to Assess Agricultural Activity Participation

These survey questions were included in the FSNMS instrument for data collection purposes. The positive responses to the items marked in bold/red were considered as indicators of participation in the ELRP program.

D11: Has anyone in your household received training in the last 12 months?

- a. No
- b. Yes

D12: (If yes) What type of training did they receive in the last 12 months?

- Agricultural training**
- Nutrition
- Childcare
- Business skills
- Vocational training
- Other (specify)

—

R01: Has your household received any form of assistance in the past 3 months?

- No
- Yes

R02: (If yes) Did the household receive any of the following humanitarian assistance in the last 3 months?

- a. General food distribution for vulnerable households
- b. Food for school children
- c. Food for assets
- d. Nutrition (blanket supplementary feeding, etc.)
- e. Unconditional cash
- f. Cash for work/cash for training
- g. Agricultural inputs**
- h. Agricultural tools**
- i. Fishing gear**
- j. Veterinary Assistance**
- k. School fees/uniforms
- l. Health/medicines
- m. Shelter material
- n. Household utensils
- o. Soap and other WASH materials
- p. Protection services
- q. Social cohesion and peace building
- r. Other kinds of aid or services
- s. Don't know
- t. Prefer not to answer
- u. Voucher transfer

—

O01: Does your household have access to land for cultivation?

- a. No
- b. Yes

O02: (If yes) Did your household plant this year?

- a. No
- b. Yes

O04: (If yes) Which crops did you plant this year?

- a. Sorghum
- b. Maize
- c. Millet
- d. Rice
- e. Groundnuts
- f. Sesame/Simsim
- g. Beans
- h. Cowpeas
- i. Pigeon peas
- j. Vegetables
- k. Potatoes (Irish and Sweet)
- l. Other (Specify)

O04.2: (for each crop selected in O04) What was the main source of seeds for each of the crops you planted this year?

- a. Own seed stocks saved from last harvest
- b. Market/Purchase
- c. Gifts from neighbors and/or relatives
- d. FAO**
- e. NGO**
- f. Others (specify)

—

Q01a: Is your household able to get fish for consumption now?

- a. No
- b. Yes

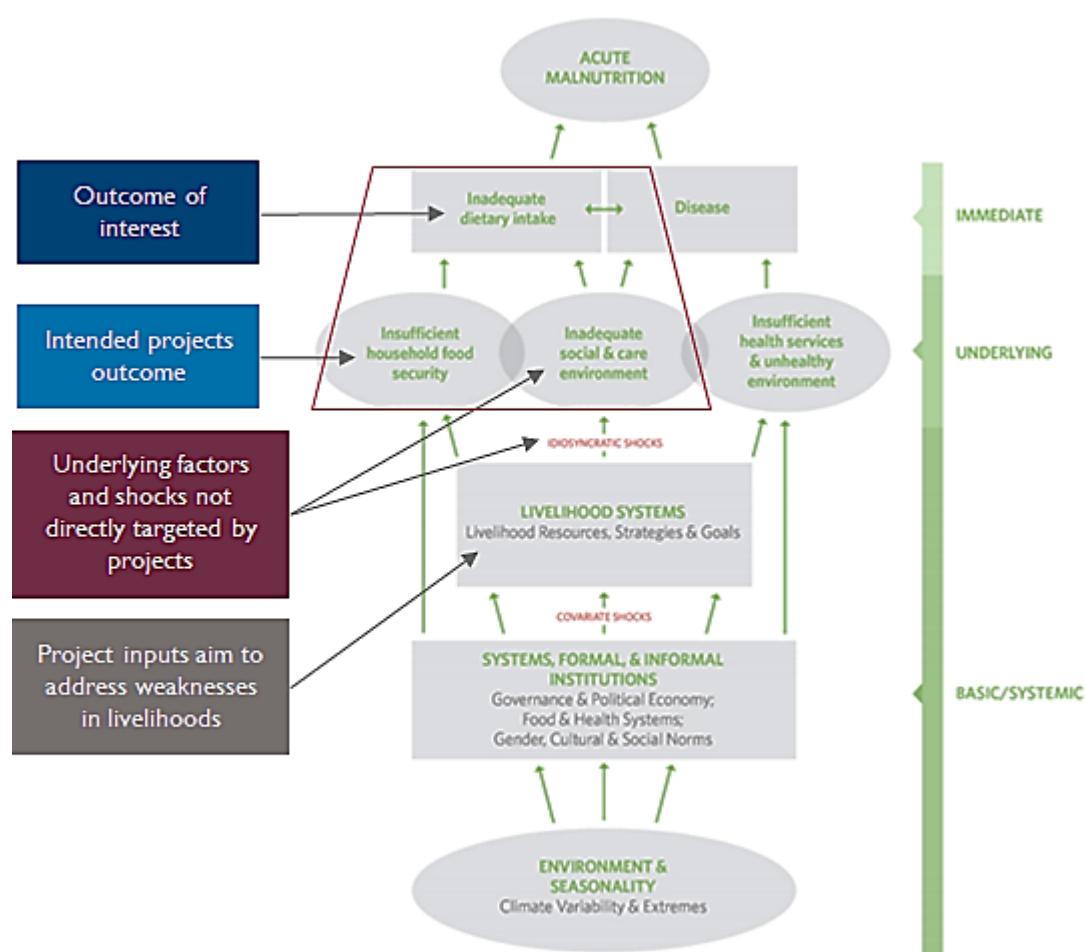
Q01a.2.1: (If yes) Where did you get your fishing equipment?

- a. I do not own any fishing equipment
- b. I make my own fishing equipment (own net, spear, etc.)
- c. FAO**
- d. NGOs**
- e. Purchased from market
- f. Gifts from relatives and friends
- g. I borrow fishing equipment from other community members

## Annex 4. Acute Malnutrition in Africa's Drylands Conceptual Framework

As shown in the conceptual framework below, we identified the components of the framework that were directly targeted by the project and related factors not directly targeted by the project, but which may affect dietary outcomes (as shown by the colored boxes). These mediating factors are idiosyncratic shocks and inadequate social and care environment. In addition to the frameworks described in the Conceptual Framework section of the report, these elements informed the research questions and data collection instruments to develop a more comprehensive understanding of what influences dietary diversity in complex emergency contexts.

Figure 9. Acute Malnutrition Conceptual Framework



Source: Adapted from Young 2020:15

## Annex 5. Definitions of Household Characteristics

Variable	Possible Responses	Notes
Household Hunger	Categorical variable <ul style="list-style-type: none"> <li>• Little to no hunger</li> <li>• Moderate hunger</li> <li>• Severe hunger</li> </ul>	Calculated using Household Hunger Scale and defined categorical cutoffs (Ballard, Coates, Swindale, & Deitchler, 2011)
Woman's age	15–49 years	
Child's age	6–23 month	
Child's sex	Male/Female	Based on women respondents report of each child in the household
Total number of household assets	0–26	Calculated as a numerical response by adding the number of assets selected from a list of possible assets
Household size	1–67	Total number of people of any age reported eating from the pot of the household on a regular basis
Resident status	<ul style="list-style-type: none"> <li>• Resident</li> <li>• IDP</li> <li>• IDP returnee</li> <li>• Refugee returnee</li> <li>• Voluntary migrant</li> </ul>	Households selected the option that best represents their household residency status
Proportion of household expenditures spent on food	Categorical <ul style="list-style-type: none"> <li>• Less than 50%</li> <li>• 50 to 65%</li> <li>• &gt;75%</li> </ul>	Households select the option that best estimates their expenditure
Proportion of food that comes from own production	Categorical <ul style="list-style-type: none"> <li>• Less than 50%</li> <li>• 50 to 65%</li> <li>• &gt;75%</li> </ul>	Households select the option that best estimates their production
Most important source of food and income	<ul style="list-style-type: none"> <li>• Agriculture</li> <li>• Livestock</li> <li>• Sale of alcoholic beverages</li> <li>• Unskilled casual labor</li> <li>• Skilled labor</li> <li>• Trader/shop owner/small trading/sale of crafts</li> <li>• Salaried work</li> </ul>	Households selected the one option that best represents their most important source

	<ul style="list-style-type: none"> <li>• Sale of firewood</li> <li>• Fishing</li> <li>• Support from family, friends, the community</li> <li>• Begging</li> <li>• Food assistance</li> <li>• Gathering of wild foods</li> <li>• Hunting</li> <li>• Other</li> </ul>	
Shocks experienced in the last 6 months	0–3	Calculated by totaling the number of shocks selected by a household from a list of possible shocks
Receipt of other humanitarian assistance	Binary	If a household selected any humanitarian assistance other than the options used for participation, the household was coded 1 for receiving other assistance, otherwise they were coded as 0.
Household member with difficulty seeing	Binary	Based on yes/no response to “Do you or any member of your household have difficulty seeing, even if wearing glasses? “
Household member with difficulty hearing	Binary	Based on yes/no response to “Do you or any member of your household have difficulty hearing, even if using a hearing aid(s)? “
Household member with difficulty walking	Binary	Based on yes/no response to “Do you or any member of your household have difficulty walking or climbing steps?”
Household member with difficulty remembering	Binary	Based on yes/no response to “ Do you or any member of your household have difficulty remembering or concentrating?”
Household member with difficulty completing self-care	Binary	Based on yes/no response to “Do you or any member of your household have difficulty with self-care, such as washing all over or dressing?”
Household member with difficulty communicating	Binary	Based on yes/no response to “Do you or any member of your household have difficulty communicating, for example understanding or being understood?”
Distressed household member	Binary	Based on yes/no response to “ Does any member of your household (including yourself) feel distressed to the extent that he/she has a lot of difficulty, or is unable to, work or perform daily routine activities? For example, very upset,

		sad, worried, sleepless, exhausted, scared, angry, or unable to enjoy activities they previously liked?”
Household hosting a child, IDP, or returnee	Binary	Based on yes/no response to “Is your household hosting any IDPs, or people displaced from somewhere inside South Sudan, now?” or “Is your household hosting any returnees?” or “Is your household hosting any children that have been separated from their parents or other typical adult caregivers, such as orphaned, separated, or unaccompanied children, within your household now?”
Distance to the market	<ul style="list-style-type: none"> <li>• Less than 15 minutes</li> <li>• 15–29 minutes</li> <li>• 30–59 minutes</li> <li>• 1–2 hours</li> <li>• More than 2 hours</li> </ul>	
Household member part of a social group	Binary	Based on yes/no response to “Is anyone in your household a member of any social group, such as a community organization, farmers’ association, savings group, youth group, mother support group, health committee, etc?”
Household Dietary Diversity	0–12	Calculated following standard protocol (Swindale and Bilinsky, 2006)

## Annex 6. Social Support Scale

Here is a list of some things that other people do for us or give us that may be helpful or supportive.<sup>4</sup> This help can be given by a spouse, family members, friends, neighbors, or other members of your community. For each statement, please indicate the answer that is closest to your situation. There are no right or wrong answers.

**S01** Do you get visits from your friends, neighbors, and relatives (who do not live with you)?

S01a If no, would you like to get visits?

S01b If yes, how frequent are the visits?

**S02** Do you get useful advice about important things in your life? For example, from your husband, family members, friends, neighbors, or other members of your community.

S02ba If no, would you like to get advice?

S02b If yes, how much advice do you get?

**S03** Do you get to talk with someone you trust about your personal and family problems? For example, from your husband, family members, friends, neighbors, or other members of your community.

S03a If no, would you like to talk to someone that you trust about your personal and family problems?

S03b If yes, how often do you get to talk to someone you trust about your personal and family problems?

**S04** Are there people who hope you are doing well?

S04a If no, would you like to have people who hope you are well?

S04b If yes, do you feel that people who hope you are doing well are

**S05** Do you feel loved by your family?

S05a If now, would you like to feel loved by your family?

S05b If yes, do you feel that the love from your family is less than you would like or as much as you would like?

**S06** Do your husband and family tell or show you that they are thankful for the things you do for your family?

S06a If no, would you like your husband and family to tell or show you that they are thankful for the things you do for your family?

S06b If yes, how often does your husband and family show you that they are thankful for the things you do for your family?

**S07** Do you get help with your household chores?

S07a If no, would you like to get help with chores?

S07b If yes, what level of help do you get?

**S08** Do you get help with money in an emergency?

S08a If no, would you like someone to help you?

S08b If yes, do you get less help than you would like or as much help as you would like?

**S09** Does anyone help you when you need transportation? For example, money for transportation, horseback, help arrange for travel?

S09a If no, would you like someone to help you when you need transportation

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<sup>4</sup> Martin, S. L., Birhanu, Z., Omotayo, M. O., Kebede, Y., Pelto, G. H., Stoltzfus, R. J., & Dickin, K. L. (2017). "I Can't Answer What You're Asking Me. Let Me Go, Please.": Cognitive Interviewing to Assess Social Support Measures in Ethiopia and Kenya. *Field Methods*, 29(4), 317–332. <https://doi.org/10.1177/1525822X17703393>

- S09b If yes, do you get less help than you would like or as much help as you would like?
- S10** Do you get cared for when you are sick at home?
- S10a If no, would you like to be cared for when you are sick?
- S10b If yes, do you get cared for less than you would like or as much as you would like?



## Annex 7. Percent (n) of Households Participating in Agricultural Activities by State

	Any Agriculture Intervention (n)	Agricultural Training	Agricultural Inputs	Agricultural Tools	Fishing Gear	Veterinary Assistance	Seeds from FAO/NGO	Fishing Equipment from FAO/NGO
Central Equatoria	37.0 (416)	10.3 (116)	21.4 (240)	11.6 (131)	0.4 (4)	0.2 (2)	19.2 (215)	2.9 (33)
Eastern Equatoria	31.1 (461)	4.7 (69)	13.8 (205)	11.8 (175)	1.9 (28)	0.5 (7)	11.5 (170)	2.8 (42)
Jonglei	54.3 (1,032)	4.2 (80)	2.6 (50)	2.5 (47)	3.3 (63)	0.4 (7)	1.3 (25)	41.4 (786)
Lakes	31.6 (472)	9.3 (139)	8.8 (131)	7.3 (109)	4.7 (70)	2.5 (37)	17.3 (259)	15.5 (231)
Northern Bahr el Ghazal	10.5 (103)	4.5 (44)	2.1 (21)	1.1 (11)	0.1 (1)	0.1 (1)	18.5 (181)	0.7 (7)
Unity	41.5 (672)	6.7 (108)	3.0 (49)	2.9 (47)	1.5 (24)	0.2 (3)	4.0 (64)	20.6 (334)
Upper Nile	24.4 (501)	2.8 (57)	3.6 (74)	2.9 (59)	1.6 (33)	0.4 (8)	3.6 (74)	15.3 (314)
Warrap	23.5 (278)	5.3(63)	3.5 (41)	1.4 (16)	0.2 (2)	0.1 (1)	15.4 (182)	2.9 (34)
Western Bahr el Ghazal	44.0 (290)	9.0 (59)	12.3 (81)	7.9 (52)	0.5 (3)	0 (0)	19.3 (127)	13.1 (86)
Western Equatoria	46.4 (799)	13.6 (234)	10.5 (181)	5.2 (89)	0.1 (2)	0 (0)	26.6 (458)	5.5 (94)

## Annex 8. Household Characteristics by Participant Status

	Participants N=4,898		Non-participants N=9,333	
	% or Mean (SD)	n	% or Mean (SD)	n
Female Headed Household	61.4	3,006	64.6	6,021
Household Head Education				
No formal schooling	61.8	3,027	69.7	6,497
Started but did not complete primary school	24.8	1,215	19.9	1,852
Finished primary school, but did not start secondary school	5.5	270	4.1	385
Started but did not complete secondary	3.6	177	3.0	282
Finished secondary school	3.5	173	2.6	239
Tertiary	0.7	36	0.7	62
Resident Status				
Resident	66.5	3,258	68.3	6,361
IDP	15.6	762	16.1	1,495
IDP Returnee	12.4	605	12.0	1,116
Refugee returnee	5.3	260	3.6	333
Voluntary migrant	0.3	13	0.1	12
Proportion of household expenditure on food				
Less than 50%	43.3	2,121	39.5	3,676
50 to 65%	30.4	1,490	30.2	2,815
65 to 75%	17.0	831	19.2	1,785
>75%	9.3	456	11.2	1,041
Household Shelter				
<i>Tukul</i>	75.6	3,701	72.2	6,729
Rakooba	14.5	712	18.2	1,686
Improvised Shelter	3.4	164	3.4	318
Semi/concrete building	3.7	179	2.4	223

	Participants N=4,898		Non-participants N=9,333	
	% or Mean (SD)	n	% or Mean (SD)	n
Community Building	0.5	25	0.8	72
Communal Shelter	0.8	37	1.1	102
No Shelter	0.7	33	1.2	113
Emergency Transitional shelter by agency	0.6	28	0.5	44
Other	0.4	19	0.3	30
Household Hunger				
Little to no hunger	48.4	2,372	44.3	4,123
Moderate hunger	46.5	2,279	49.6	4,619
Severe hunger	5.0	247	6.2	575
Proportion of food that comes from own production				
Less than 50%	45.6	2,232	47.7	4,431
50 to 65%	32.7	1,601	29.4	2,740
65 to 75%	15.0	736	16.0	1,493
>75%	6.7	329	7.0	653
Household Size (Median; Q1, Q3)	7 (5,10)		7 (5,10)	
Number of children (<18 years)	4.6 (3.0)		4.7 (3.1)	
Number of children (<18 years)				
0–1	11.6	566	10.5	977
2–4	42.4	2,076	42.0	3,922
5–7	33.0	1,618	34.1	3,185
8–10	9.2	452	9.4	877
>10	3.8	186	4.0	372
Household head age (years)	38.2 (12.7)		37.4 (12.3)	
Household head age (years)				
18–25 years	17.4	852	17.7	1,648
26–40 years	44.9	2,197	48.0	4,482
41–65 years	34.9	1,711	31.9	2,979

	Participants N=4,898		Non-participants N=9,333	
	% or Mean (SD)	n	% or Mean (SD)	n
Older than 65 years	2.8	138	2.4	224
Number of shocks experienced in the last 6 months				
0	0	0	0.2	16
1	51.7	2,533	48.9	4,562
2	20.6	1,011	21.6	2,019
3	27.6	1,354	29.3	2,736
Household Dietary Diversity Score	4.56 (2.5)		4.14 (2.5)	
Food Consumption Score				
Poor	51.0	2,501	55.2	5,150
Borderline	27.9	1,365	22.8	2,126
Acceptable	21.1	1,032	22.0	2,057
Household Dietary Diversity Score	4.56 (2.5)		4.14 (2.5)	
Household member with difficulty seeing, hearing, walking, remembering, self-care, or communication	43.5	2,128	41.8	3,903
Household member affected by a safety or security incident	7.8	384	6.06	6.5
Distressed household member	23.3	1,143	18.9	1,760
Household hosting child, IDP, or returnee	35.9	1,756	33.7	3,145
Household member is part of a social group	26.4	1,295	12.3	1,141
Distance to market				
Less than 15 minutes	15.9	755	14.1	1,314
15–29 minutes	13.9	662	13.3	1,242
30–59 minutes	17.7	840	15.9	1,484
1–2 hours	23.7	1,125	20.1	1,875
More than 2 hours	28.9	1,374	33.0	3,083
Don't Know/Prefer not to answer	2.9	142	3.6	335

## Annex 9. Percent of Households Participating in Agricultural Activities by Household Head

	Female Headed Household	Male Headed
Training	5.8%	9.1%
Tools	4.6	6.4
Inputs	6.2	10.4
Any Fishing equipment	1.8	1.6
Veterinary Assistance	0.7	0.2
Fishing equipment from FAO/NGO	17.6	10.2
Seeds from FAO/NGO	21.6	15.0
Any of the Above	35.1 (3,170)	31.4 (1,630)

## Annex 10. Difference in Dietary Diversity Scores by Program Participation

Table A10.1. Prevalence of MDD-W and MDD by participation status (N=14,215)

	Participant	Non-participant	Crude Prevalence ratio	Adjusted Prevalence ratio/Mean Difference
MDD-W	32.6	29.4	1.11 (1.03, 1.19)	1.09 (1.01, 1.16) <sup>1</sup>
MDD	26.4	21.9	1.21 (1.08, 1.35)	1.11(0.99, 1.24) <sup>2</sup>
Mean HDDS	4.60	4.13	0.31 (0.19, 0.43)	0.22 (0.10,0.35) <sup>3</sup>

1. Adjusted for covariates that were significant in bivariate models at  $p < 0.1$ : woman's age, total number of household assets, family size, proportion of income spent on food, most important source of food and income, proportion of food that comes from own production, having a distressed family member, having a family member part of a social group, distance to market, and household dietary diversity score.

2. Adjusted for covariates that were significant in bivariate models at  $p < 0.1$ : household hunger score, child age, total number of household assets, proportion of income spent on food, most important source of food and income, proportion of food that comes from own production, having a family member part of a social group, distance to market, and household dietary diversity score.

3. Adjusted for covariates that were significant in bivariate models with MDD-W at  $p < 0.1$ : woman's age, total number of household assets, family size, proportion of income spent on food, most important source of food and income, proportion of food that comes from own production, having a distressed family member, having a family member part of a social group, and distance to market.

Table A10.2. Mean HDDS by Type of Program Participation

	Participant	Non-Participant	p-Value	Mean Difference (95% CI)
Training	4.56	4.27	0.001	0.35 (0.14, 0.57)
Tools	5.00	4.25	<0.001	0.66 (0.39, 0.92)
Inputs	5.00	4.23	<0.001	0.73 (0.51, 0.96)
Any Fishing equipment	4.26	4.29	0.030	-0.49 (-0.94, -0.05)
Veterinary Assistance	6.03	4.28	0.004	1.65 (0.52, 2.79)
Fishing equipment from FAO/NGO	4.74	4.21	0.002	0.27 (0.10, 0.45)
Seeds from FAO/NGO	4.63	4.24	0.004	0.24 (0.08, 0.41)

**Table AI0.3. Prevalence of MDD-W by Type of Program Participation**

<b>% Meeting MDD-W</b>	<b>Participant</b>	<b>Non-Participant</b>	<b>p-Value</b>	<b>Crude Prevalence Ratio</b>
Training	41.0	29.6	<0.001	1.38 (1.24, 1.54)
Tools	44.1	29.7	<0.001	1.48 (1.33, 1.65)
Inputs	43.4	29.4	<0.001	1.48 (1.34, 1.62)
Any Fishing equipment	35.9	30.4	0.126	1.18 (0.95, 1.47)
Veterinary Assistance	71.9	30.3	<0.001	2.37 (1.90, 2.95)
Fishing equipment from FAO/NGO	36.4	29.5	<0.001	1.23 (1.13, 1.35)
Seeds from FAO/NGO	32.3	34.1	0.29	0.94 (0.86, 1.05)

**Table AI0.4. Prevalence of MDD by Type of Program Participation**

<b>% Meeting MDD</b>	<b>Participant</b>	<b>Non-Participant</b>	<b>p-Value</b>	<b>Crude Prevalence Ratio</b>
Training	29.2	23.0	0.016	1.27 (1.05, 1.55)
Tools	36.5	22.6	<0.001	1.61 (1.34, 1.94)
Inputs	32.7	22.6	<0.001	1.45 (1.22, 1.72)
Any Fishing equipment	28.4	23.3	0.237	1.22 (0.88, 1.70)
Veterinary Assistance	23.2	60.5	<0.001	2.61 (1.89, 3.59)
Fishing equipment from FAO/NGO	31.8	22.3	<0.001	1.42 (1.22, 1.66)
Seeds from FAO/NGO	26.5	24.9	0.427	1.06 (0.91, 1.24)

## Annex I I. Full Results of Factors Associated with MDD-W and MDD

Table A I I. I. Factors Associated with MDD-W

Variable	Number of respondents	Prevalence of MDD-W (%)	Prevalence Ratio (95% CI)	p-Value	Adjusted Prevalence Ratio <sup>1</sup> (95%CI)	p-Value
Household Hunger Score				0.839		
Little to no Hunger	6,640	32.6	ref			
Moderate Hunger	7,091	30.6	0.99 (0.92, 1.07)			
Severe Hunger	841	26.3	0.95 (0.81, 1.12)			
Woman's age	14,572		0.989 (0.985, 0.992)	<0.001	0.99 (0.989, 0.995)	<0.001
Total Number Assets Owned by the Household	14,572		1.05 (1.045–1.059)	<0.001	1.02 (1.00, 1.02)	<0.001
Household Size	14,572		1.00 (0.99–1.01)	0.051	1.02 (1.01, 1.02)	0.001
Resident Status				0.400		
Resident	9,869	32.0	ref			
IDP	2,324	29.9	0.96 (0.87–1.06)			
IDP Returnee	1,776	28.6	0.94 (0.84–1.04)			
Refugee Returnee	576	31.9	1.06 (0.91–1.24)			
Voluntary Migrant	27	18.5	0.52 (0.17–1.62)			
Proportion of Household Expenditure Spent on Food				<0.001		0.0209
Less than 50%	5,781	34.2	ref		ref	



50 to 65%	4,525	33.0	1.09 (1.01–1.17)		0.99 (0.92, 1.06)	
65 to 75%	2,709	26.2	0.87 (0.79–0.97)		0.87 (0.79, 0.95)	
>75%	1,577	24.0	0.82 (0.72–0.93)		0.95 (0.83, 1.09)	
Most Important Source of Food and Income				<0.001		<0.001
Agriculture	8,286	36.5	ref		ref	
Livestock	713	28.8	0.77 (0.65–0.90)		0.86 (0.74, 1.01)	
Sale of alcoholic beverages	800	26.3	0.78 (0.67–0.90)		0.83 (0.72, 0.96)	
Unskilled casual labor	635	25.0	0.69 (0.58–0.82)		0.80 (0.68, 0.93)	
Skilled labor	236	28.3	0.76 (0.59–0.98)		0.77 (0.60, 0.98)	
Trader/ shop owner	339	35.4	0.98 (0.81–1.18)		0.94 (0.79, 1.12)	
Salaried work	233	40.3	1.03 (0.82–1.29)		0.88 (0.70, 1.10)	
Sale of firewood	799	26.3	0.74 (0.63–0.87)		0.87 (0.76, 0.99)	
Fishing/ sale of fish	428	8.4	0.19 (0.14–0.29)		0.28 (0.20, 0.41)	
Support from family/friends/community	187	19.3	0.54 (0.38–0.76)		0.69 (0.50, 0.95)	
Begging	36	41.7	1.16 (0.73–1.86)		1.53 (1.03, 2.29)	
Food assistance	1,272	23.5	0.60 (0.52–0.70)		0.70 (0.60, 0.82)	
Gathering wild food/hunting	483	10.6	0.23 (0.17–0.33)		0.28 (0.20, 0.40)	
Other	125	18.4	0.61 (0.37–0.99)		0.88 (0.53, 1.47)	
Shocks Experienced in the Last 6 Months	14,572		0.99 (0.95–1.02)	0.455		
Receipt of Other Humanitarian Assistance				0.308		
No	8,201	30.3	ref			

Yes	6,371	32.5	0.97 (0.90–1.03)			
Proportion of Food That Comes from Own Production				<0.001		0.007
Less than 50%	6,689	29.2	ref		ref	
50 to 65%	4,510	33.7	1.28 (1.19–1.38)		1.07 (1.00, 1.15)	
65 to 75%	2,340	34.9	1.27 (1.16–1.39)		1.09 (1.00, 1.19)	
>75%	1,033	25.1	0.89 (0.77–1.04)		0.87 (0.76, 1.00)	
Household Member with Difficulty Seeing, Hearing, Walking, Remembering, Self-Care, or Communication				0.372		
No	8,248	31.3	ref			
Yes	6,324	31.2	0.97(0.91,1.03)			
Household Member Affected by a Safety or Security Incident				0.641		
No	13,542	31.3	ref			
Yes	1,030	30.8	1.03 (0.90, 1.18)			
Distressed Household Member				0.033		0.184
No	11,493	31.8	ref		ref	
Yes	3,079	29.0	0.91 (0.84,0.99)		0.95 (0.87, 1.02)	
Household Hosting Child, IDP, or Returnee				0.533		
No	9,331	31.2	ref			
Yes	5,241	31.2	0.98 (0.91, 1.05)			
Household Member Is Part of a Social Group				<0.001		<0.001

No	11,971	29.3	ref		ref	
Yes	2,601	40.2	1.41 (1.31,1.52)		1.18 (1.10, 1.27)	
Distance to Market				<0.001		<0.001
Less than 15 minutes	2,134	31.4	ref		ref	
15–29 minutes	2,025	31.7	1.04 (0.92, 1.18)		1.06 (0.94,1.19)	
30–59 minutes	2,438	33.6	1.16 (1.02, 1.30)		1.15 (1.03, 1.29)	
1–2 hours	3,094	35.9	1.24 (1.11,1.39)		1.22 (1.10, 1.35)	
More than 2 hours	4,387	26.7	0.88 (0.79, 0.98)		1.05 (0.95, 1.17)	
Household Dietary Diversity Score (HDDS)	14,572		1.18 (1.16,1.18)	<0.001	1.19 (1.18,1.20)	<0.001

**Table AI I.2 Factors associated with MDD**

Variable	Number of respondents	Prevalence of MDD (%)	Prevalence Ratio (95% CI)	p-Value	Adjusted Prevalence Ratio <sup>1</sup> (95% CI)	p-Value
Household Hunger Score				<0.001		0.331
Little to no Hunger	2,707	27.5	Ref		ref	
Moderate Hunger	2,854	21.9	0.79 (0.71–0.89)		0.93 (0.83, 1.04)	
Severe Hunger	345	17.1	0.56 (0.42–0.74)		0.85 (0.63, 1.15)	
Child's Age	5,906		1.03 (1.02–1.04)	<0.001	1.03 (1.02, 1.04)	<0.001
Child's Sex				0.244		
Male	3,017	23.7	Ref			
Female	2,889	24.7	1.06 (0.96–1.18)			
Total Number of Assets Owned by the Household	5,906		1.06 (1.05–1.07)	<0.001	1.03 (1.01, 1.04)	<0.001
Family Size	5,906		0.99 (0.96–1.00)	0.444		
Resident Status				0.412		
Resident	4,052	24.0	Ref			
IDP	922	25.4	1.06 (0.92–1.23)			
IDP Returnee	681	23.2	0.98 (0.82–1.17)			
Refugee Returnee	239	26.8	1.20 (0.94–1.53)			
Voluntary Migrant	12	0.00	--			
Proportion of Household Expenditure Spent on Food				0.024		0.704
< 50%	2,356	25.7	Ref		ref	
50 to 65%	1,823	25.5	1.04 (0.92–1.19)		0.98 (0.87, 1.11)	

65 to 75%	1,089	20.5	0.88 (0.75–1.03)		0.91 (0.77, 1.08)	
> 75%	638	21.2	0.77 (0.62–0.97)		1.03 (0.82, 1.30)	
Most Important Source of Food and Income				<0.001		0.053
Agriculture	3,324	26.7	Ref		ref	
Livestock	303	19.5	0.65 (0.48–0.86)		0.73 (0.54, 0.98)	
Sale of alcoholic beverages	317	23.7	0.93 (0.73–1.18)		0.96 (0.76, 1.22)	
Unskilled casual labor	251	22.7	0.92 (0.69–1.20)		0.96 (0.75, 1.24)	
Skilled labor	105	31.4	1.20 (0.83–1.71)		1.11 (0.79, 1.56)	
Trader/ shop owner	121	36.4	1.42 (1.08–1.87)		1.20 (0.92, 1.57)	
Salaried work	108	30.6	1.22 (0.89–1.67)		0.93 (0.65, 1.32)	
Sale of firewood	299	18.7	0.75 (0.57–0.98)		0.93 (0.71, 1.23)	
Fishing/ sale of fish	159	12.0	0.38 (0.22–0.64)		0.49 (0.28, 0.84)	
Support from family/friends/community	70	17.1	0.62 (0.35–1.09)		0.64 (0.36, 1.16)	
Begging	14	28.6	0.80 (0.31–2.06)		1.24 (0.52, 2.94)	
Food assistance	571	21.2	0.72 (0.58–0.89)		0.84 (0.67, 1.04)	
Gathering wild food/hunting	220	8.6	0.32 (0.19–0.54)		0.53 (0.30, 0.94)	
Other	44	15.9	0.51 (0.24–0.28)		0.86 (0.43, 1.71)	
Shocks Experienced in the Last 6 Months	5,906		1.00 (0.94–1.07)	0.823		
Receipt of Other Humanitarian Assistance				0.137		
No	3,218	23.0	Ref			

Yes	2,688	25.6	1.09 (0.97–1.22)			
Proportion of Food That Comes from Own Production				<0.001		0.001
< 50%	2,736	23.1	Ref		ref	
50 to 65%	1,863	28.0	1.31 (1.16–1.49)		1.16 (1.02, 1.32)	
65 to 75%	893	23.0	1.09 (0.92–1.29)		0.97 (0.82, 1.15)	
> 75%	414	16.9	0.70 (0.53–0.92)		0.70 (0.52, 0.93)	
Household Member with Difficulty Seeing, Hearing, Walking, Remembering, Self-Care, or Communication				0.762		
No	3,401	23.7	Ref			
Yes	2,505	24.9	1.02 (0.91, 1.14)			
Household Member Affected by a Safety or Security Incident				0.510		
No	5,486	24.0	Ref			
Yes	420	26.4	1.07 (0.87, 1.33)			
Distressed Household Member				0.223		
No	4,731	23.7	Ref			
Yes	1,175	26.1	1.09 (0.95, 1.25)			
Household Hosting Child, IDP, or Returnee				0.903		
No	3,694	23.8	Ref			
Yes	2,212	24.9	1.00 (0.90, 1.13)			
Household Member Is Part of a Social Group				<0.001		0.005

No	4,833	22.2	Ref		ref	
Yes	1,073	32.9	1.52 (1.34,1.72)		1.19 (1.05, 1.34)	
Distance to Market				<0.001		0.089
Less than 15 minutes	922	27.8	Ref		ref	
15–29 minutes	773	24.8	0.88 (0.72, 1.07)		0.92 (0.76, 1.11)	
30–59 minutes	975	28.2	0.95 (0.79, 1.14)		0.95 (0.80, 1.13)	
1–2 hours	1,211	25.4	0.95 (0.80, 1.12)		0.94 (0.80, 1.10)	
More than 2 hours	1,792	18.9	0.62 (0.52, 0.74)		0.79 (0.66, 0.94)	
Household Dietary Diversity Score (HDDS)	5,906		1.17 (1.16, 1.19)	<0.001	1.17 (1.15, 1.19)	<0.001

## Annex 12. Full Results of Association of Social Support with MDD-W and MDD

	Crude Prevalence Ratio (95% CI)	p-Value	Adjusted Prevalence Ratio	p-Value
MDD-W	1.00 (0.99–1.01)	0.77	1.00 (0.99–1.01)	0.950
MDD	1.00 (0.98–1.02)	0.99	1.00 (0.98–1.01)	0.637





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