Food and Agriculture Organization of the United Nations

FOOD AND NUTRITION SECURITY RESILIENCE PROGRAMME IN SOMALILAND

ENDLINE SURVEY REPORT

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Contents

TABLES

FIGURES

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Abbreviations

ABS	Access to Basic Services
AC	Adaptive capacity
AST	Assets
CPF	Country Programming Framework
DiD	difference-in-difference
FAO	Food and Agriculture Organization of the United Nations
FCS	food consumption score
FNS-REPRO	Food and Nutrition Security Resilience Programme
HDDS	household dietary diversity score
IPC	Integrated Phase Classification
MIMIC	Multiple Indicators Multiple Causes
MoPN	Ministry of Planning and National Development
PSM	propensity score matching
RCI	resilience capacity index
rCSI	reduced coping strategy index
RIMA	Resilience Index Measurement and Analysis
SSN	social safety net
TLU	tropical livestock units
USD	United States dollar

Executive summary

The Food and Nutrition Security Resilience Programme (FNS-REPRO), funded by the Government of the Netherlands through FAO, is a four-year programme of USD 28 million that contributes directly to the operationalization of the United Nations Security Council Resolution 2417 by addressing the "cause-effect" relationship between conflict and food insecurity in Somaliland, South Sudan and Sudan (Darfur). The programme, which became operational in October 2019, was designed to foster peace and food security at scale through a multi-year livelihood- and resilience-based approach. The FNS-REPRO component in Somaliland focused largely on support to livestock fodder/feed production and was implemented in the Sool and Sanaag regions.

This report provides an overview of the impact evaluation findings of the FNS-REPRO in Somaliland. The report draws on data collected from a panel and two rounds of surveys (baseline in 2020 and endline in 2023), collected from both intervention and non-intervention areas in Sool and Sanaag regions. This method of panel data collection provides the strongest evidence for attribution of a causal relationship between the implemented interventions and the effect on beneficiaries.

Main findings

1. The Resilience Capacity Index (RCI) among the beneficiary households increased from 28.1 in baseline to 35.9 in endline. The project reported a positive impact in building resilience, with the most notable change recorded in the adaptive capacity (AC) pillar. The AC pillar reported a significant and positive impact with a change of 3.9 points. The project contributed to resilience in this pillar through diversification and an increase in the number of income sources, an increase in productivity in the livestock sector and improved capacity and training in natural resource management and production.
2. The three main sources of income for households in the project area are livestock production, crop production and trade. The FNS-REPRO project reflected a significant positive change in income. The overall annual income among the beneficiary households increased from USD 215 to USD 430. The annual income from livestock production among the beneficiary households increased from USD 242 to USD 379. Positive and significant impacts of the project on both overall income and income from livestock were reported. There was an increase of USD 38 and USD 86 in overall income and income from livestock production respectively. FNS-REPRO in Somaliland aimed to increase income diversification and income generation in the project areas by its actions in the fodder, crop and livestock sectors through capacity building, aggregation, increasing storage capacity and processing capacity, and entrenching good agricultural practices for boosting yields.
3. A comparison between baseline and endline indicated a consistent trend of increases in livestock ownership. Sheep exhibited a noteworthy increase from an average of 22 at baseline to 27 at endline. Goats showed a modest increase from 21 to 26. Chickens experienced a slight decrease from 7 to 6, while camels and cows maintained stable averages at 5 and 4 respectively. The propensity score matching impact analysis results for household livestock holding show the project's significant and positive impact on both livestock wealth (TLU) and involvement in fodder production. This result confirms that the interventions of the FNS-REPRO programme were relevant in improving livestock productivity.

4. Uptake of fodder production due to the project's intervention is observed. Overall, there is a 22 percent increment in households involved in fodder production between baseline and endline surveys. Both the beneficiary and control groups reported an increase in involvement in fodder production, with beneficiaries recording 3 percent more at 26 percent compared with the control group (23 percent).

5. Although an increase in fodder production was reported in the target and neighbouring areas, the commercialization of fodder is still low. However, it is important to note that most target fodder producers use the fodder they produce for feeding their livestock. Fodder producers mainly realize economic gains from the sale of livestock products, especially milk and milk products. At endline, 84.4 percent of the fodder-growing households reported harvesting fodder in the last 12 months preceding the survey, an 8 percent increase from baseline. The majority (78 percent) used the fodder produced to feed their own livestock, 74 percent stored it for future use, 17 percent of the households sold it and 4 percent shared it with others. Compared with baseline, households that mentioned storing their harvested fodder for future use or sold the fodder, increased by 20 percent and 14 percent respectively. This is an indication that the project has contributed to increased availability of fodder for the target communities.

6. Overall, at endline, multiple benefits are realized from the increased availability of fodder. Reduced distance covered in search of fodder and more milk for the family are the top benefits reported at 53.7 percent and 50 percent respectively, a 28.7 percent and 13.7 percent increase compared to baseline. Furthermore, 31.7 percent of the households reported that the increased availability of fodder has provided more income for the family.

7. The project reported a significant impact in improving the food security situation in the area. Both the treatment and control groups showed improvement in food consumption score (FCS), with the treatment group experiencing a more substantial positive shift, particularly in the "acceptable" category. The treatment group showed an increase in FCS from 48.1 to 51.7, accompanied by a noteworthy rise in the "acceptable" category from 64 percent to 71 percent. On average, a household in the survey area consumed six different kinds of food out of the 12 food groups for both treatment and control and in baseline and endline. There is high consumption of cereals, vegetables, oils and sugar in the survey area during baseline and endline. The main sources of protein are milk and meat. Very few households consume other protein-rich foods; fewer than 20 percent consumed pulses, fish and eggs.

8. The four main shocks in the study area in the two rounds of surveys continue to be unusually high food prices, drought, reduced income and unusually high prices of fuel.

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1. INTRODUCTION

1.1 Purpose of the endline in the Food and Nutrition Security Resilience Programme

The Food and Nutrition Security Resilience Programme (FNS-REPRO) funded by the Government of the Netherlands through the Food and Agriculture Organization of the United Nations (FAO) was a four-year programme of USD 28 million contributing directly to the operationalization of the United Nations Security Council Resolution 2417 by addressing the "cause-effect" relationship between conflict and food insecurity in Somaliland, South Sudan and Sudan (Darfur). The programme became operational in October 2019 and ended in December 2023.

FNS-REPRO is the first programme in Eastern Africa specifically designed to foster peace and food security at scale through a multi-year livelihood and resilience-based approach in some of the least stable regions, where interventions have been, until now, of a humanitarian programming nature exclusively. Its design allowed FAO and partners to set examples of building food-system resilience in protracted crises. In this programme, resilience is defined as, "the ability to prevent disasters and crises as well as to anticipate, absorb, accommodate or recover from them in a timely, efficient and sustainable manner. This includes protecting, restoring and improving livelihoods systems in the face of threats that impact agriculture, nutrition, food security and food safety".

FNS-REPRO deliberately focused on unstable regions in the Horn of Africa with a view to address root causes and consequences of protracted crises and food and nutrition insecurity from a conflict-sensitive perspective. The programme aimed to contribute to the potential of sustainable, inclusive growth and climate action by working with other actors and stakeholders on the humanitarian-development and peace nexus.

FNS-REPRO adopted an innovative area- and livelihood-based approach that looks at the multidimensional threats and risks that communities are exposed to, while identifying and utilizing opportunities for improved livelihood resilience. Value chains that can contribute to more resilient food systems resulting in improved food and nutrition security and localized peace dividend were agreed in the proposal. These are fodder (Somaliland), seeds (South Sudan) and gum Arabic (Sudan – Darfur). FNS-REPRO activities were consequently built around these value chains.

FNS-REPRO activities are centred on the fodder value chain in Somaliland to increase the resilience of communities and their food security status by:

- increasing fodder and feed production and reducing production costs through capacity building, aggregation, increasing storage capacity and processing capacity, and achieving economies of scale;
- restoration of degraded rangelands and actions against desertification, such as *Prosopis* management and community tree planting;
- strengthening the capacity of agropastoral and pastoral producer organizations to effectively participate in the feed/fodder value chain, and

- promoting good agricultural practices to maximize crop yields and improve the nutrition quality of crop residues while diversifying food available for people.

This endline study, like the baseline study, was conducted in addition to the analyses undertaken during the development of the proposal and further in-depth context and value chain analysis during FNS-REPRO's inception phase. Its design fed into the overall monitoring, evaluation, accountability and learning agenda of the individual projects. In this regard, both the endline and baseline studies had short-term, medium-term and long-term objectives.

The endline analysis aimed to assess the extent of achievement of the planned project indicators as outlined in the results framework by means of a comparison with baseline values. It further aimed to collect evidence and insights on the extent of achievement of the objectives, shed light on factors that facilitate and/or impede progress towards intended outcomes, and provide concrete recommendations for future programming. Like in the baseline analysis, this was done by providing a snapshot of the current situation regarding resilience capacity and its determinants of access to basic services and infrastructure, adaptive capacities, income-generating activities, formal and informal social safety nets, social networks and productive and non-productive assets, and shocks. By comparing this information with the baseline information, the programming team can better understand how the profiles of the populations with whom they have been working and their needs in terms of resilience to food insecurity have changed as a direct result of the project. The changes are measured by analysing changes over time as well as differences between populations with the same profiles and risk exposure, including between target and control groups whenever possible.

It will also serve as a basis to respond to the learning questions established for the programme. These learning questions explore operational, technical and context-specific questions to better understand what works, and why, in a given context to increase resilience to food crises. Like the baselines of the FNS-REPRO, the endline study was designed to feed into the overall monitoring, evaluation, accountability and learning agendas of the individual country projects.

In addition, just like the baseline, the endline was designed with sufficient rigour in terms of sample size and methodology (outlined in more detail in Chapter 2) to allow for the data and findings to be used for comparison with the baseline after four years of interventions in the same areas. By gathering a wealth of data on the pillars of resilience, the data and analysis may exceed the scope of the current programme; as such, the endline and baseline provide evidence for discussion with programming teams and humanitarian, development and peace partners on how to collaborate and coordinate to meet the needs of the affected population most effectively in future programming. Therefore, the value of the current endline does not stop with its initial analysis, but continues as the findings are shared, discussed and re-examined in collaboration with various partners and stakeholders, including the communities profiled in the report.

In the long term, the endline serves as a point of reference for a comparison with the baseline for impact assessment at the end of the intervention, by analysing both changes over time and differences between populations with the same profiles and risk exposure.

It also serves as a basis to respond to the learning questions established for the programme. These learning questions explore operational, technical and context-specific questions to better understand what works, and why, in each context to increase resilience to food crises.

1.2 Country background

Somaliland is located at the Horn of Africa between latitudes 80 and 110 30′ North and longitudes 430 and 490 30′ East. It borders the Gulf of Aden to the north, Somalia to the east, Ethiopia to the south, and Djibouti to the northwest. It has an estimated area of 137 600 km^2 with a coastline of 850 km.[1] The country

[1] https://somalilandgov.com/somaliland-geography/

is divided into six regions, namely Togdheer, Sahil, Awdal, Marodi Jeex, Sanaag and Sool. The six regions are subdivided into 32 districts and subdistricts.

Somaliland, a former British protectorate, achieved its independence on 26 June 1960 and united with the former Italian colony of Somalia on 1 July 1960 to form the Republic of Somalia. Later, it separated from the rest of Somalia after the collapse of the central government, Said Barre military regime, back to its original colonial boundaries, and restored a democratic rule on 18 May 1991. Constitutionally, Somaliland has a multi-party system of democracy, with an elected president and local councils.

Several conflicts have occurred since the early collapse of the previous military government. The conflicts are complex, with multiple combatants, motives and interests, with the seeds of the instability sown during the military regime from 1969 to 1991 (Adam, 2013). Despite the challenges, Somaliland has established regional administrations, bringing relative stability, which are the product of a local peace process, uniting different clans to form a joint administration (Adam, 2013).

In Somaliland, FNS-REPRO aligns with priorities of the Somaliland National Development Plan II (2017–2021) to achieve Economic Development (Pillar 1) and Environmental Protection (Pillar 5), and contributes to Sustainable Development Goals 1, 2, 5, 8, 9, 10, 12, 13, 15 and 17.

The project primarily contributed to FAO Somalia's Country Programming Framework (CPF 2022–2025) Outcome 1: Food systems strengthening, productive sector value chain development, infrastructure and institutional frameworks and regulations and standards and trade. Within the United Nations Sustainable Development Cooperation Framework for Somalia 2021–2025, the project contributed to Outcome 3.2: "Natural resources are sustainably managed and binding constraints addressed in key productive sector value chains, leading to enduring productivity gains, increased value addition, and enhanced opportunities for decent work" under the Strategic Priority 3 on Economic Development.

Project interventions also contributed to Somalia's Recovery and Resilience Framework, which aims to promote a sustainable recovery from the recent drought while addressing the underlying drivers of drought vulnerability.

In Somaliland, FNS-REPRO focused primarily on people in IPC Phase 3 and above (acutely food insecure households in IPC 2 were also targeted) and on so-called "poor pastoralists". It focused on the fodder value chain in the predominantly pastoral areas, where frequent shortage of animal feed severely affects pastoral livelihoods, food security, nutrition and overall well-being. The fodder value chain was a priority that cut across humanitarian and development interventions, with numerous missing links in between (particularly access to and use by poor pastoralists). Fodder represents both a major need and an opportunity, considering its scarcity, demand and market potential, and it being a recurrent need in humanitarian response that is difficult, costly and unfeasible to import (as experienced during the 2016/17 drought).

Specifically, FNS-REPRO sought to build food system resilience in Sool and Sanaag regions through support to fodder/feed production, without being exclusively geared towards the commercial potential of the value chain *per se*. Although commercial fodder exports and the links with regional trade were explored, improved availability and quality of fodder/feed in Sool and Sanaag (and bordering areas) was the key focus of the interventions. Throughout the project cycle, FAO developed participatory approaches that especially included women and youth in various links of the fodder value chain.

The programme aimed to improve fodder availability and access, while responding to these nexus challenges by (i) deliberately engaging poor pastoralists in animal feed production and range-management practices; and (ii) supporting communities to produce fodder in ways that are climate-savvy and protect the environment. The latter includes sourcing scarce feed ingredients from harvests (crop residues) and from invasive plants that resist drought (*Prosopis* pods and leaves), while contributing to controlling their spread and expansion through utilization.

FNS-REPRO activities were also designed to help communities make the best sustainable use of local resources and manage challenges in innovative ways. The activities were intended to increase the resilience of communities and their food security status by providing technical support and advisory services to increase productivity of fodder/feed, promoting good agriculture practices, restoration of degraded rangelands and actions against desertification, establishing linkages between fodder/feed producers and traders to consumers, and supporting the storage and processing of feed/forages, among other initiatives.

1.3 Objectives of the FNS-REPRO endline survey

The purpose of the current study is two-pronged. Firstly, it aims to collect endline values to assess the extent of achievement for the planned project indicators as outlined in the results framework. Secondly, it aims to gather evidence and insights on objective achievement, identify factors influencing or impeding progress, document lessons learned and provide recommendations for future programming in Somaliland and other parts of the world with almost similar contexts. Overall, the study employed a panel design with both intervention/treatment and non-intervention/controls.

1.4 Scope of the FNS-REPRO endline study

The study seeks to respond to the following broad questions:

1. To what extent has the RCI of the households in the study area changed between the beginning of the FNS-REPRO project and the end of the project?
2. What are the drivers of resilience and resilience change in the study area?
3. To what extent has the income of the households in the study area changed between the beginning of the FNS-REPRO project and the end of the project?
4. Has the FNS-REPRO project supported the formation of fodder production groups/associations that are linked to markets/consumers?
5. To what extent has participation in the FNS-REPRO project improved knowledge of better fodder production and storage methods in the study area?
6. What has been the overall impact of the project on the target community?

2. ENDLINE METHODOLOGY

Like the baseline, the endline used as its basis the Resilience Index Measurement Analysis (RIMA II) model developed by FAO in 2016. This methodology systematically explores the relationship between selected household-level variables of resilience to construct the RCI based on the four pillars of resilience (assets, social safety nets, adaptive capacity and access to basic services) and well-being outcome (food security indicators). The RCI measures a household's capacity to withstand stresses and shocks that have long-lasting effects (FAO, 2016b). The RCI provides a useful baseline to inform or validate targeting decisions, as it can be used as a ranking tool to identify households that are most at risk and the specific weaknesses that increase vulnerability (FAO, 2016b). In addition, the methodology explains how much each pillar contributes to resilience capacity and how each observed variable contributes to its pillar (FAO, 2016b). It is with this information that the theory of change, targeting and implementation strategy can be examined and that selected indicators of the project, including food consumption score, household dietary diversity, coping strategy and RCI, can be calculated.

The sampling strategy used was a two-stage cluster sampling design. All the accessible villages targeted during baseline were listed and categorized according to areas receiving project interventions and those that did not receive any intervention during the project implementation. The study employed an impact evaluation strategy where a quasi-experimental approach was implemented to assess the effectiveness of the FNS-REPRO. The impact evaluation comprised baseline (conducted in 2020) and endline (conducted in 2023) surveys. The selection of the districts where the interventions were to be implemented was based on predefined characteristics as agreed by the project implementation team. During baseline, a two-stage cluster sampling approach was employed. The first stage sampling units were the villages, and the second stage sampling units were the households. For identification of households to be interviewed once the intervention villages had been selected, the sampling frame was derived from the beneficiary list provided by the FNS-REPRO implementing officers. For the non-intervention villages where there were no lists of households, the enumerators were trained to perform k-step systematic sampling based on spinning a pen to choose direction and then choosing every third to fifth household along the line depending on how densely populated the village was. The same households in the different locations as those at baseline were targeted during the endline survey. However, some locations could not be reached due to conflict and insecurity. During the endline, for households that could not be reached even though the same villages could be reached, replacements were sought within the same villages. The decision to opt for a replacement was controlled in the sense that the decision was not made by the enumerator, it required authorization from both the field supervisor and overall supervisor based in Juba.

A random sample of 702 households was drawn from the two regions of Sool and Sanaag, distributed as shown in Table 1. Of the 702 households, 488 were under intervention areas while 214 were under non-intervention areas. The survey was conducted in November 2023. The household questionnaire was designed to capture individual and household well-being parameters/indicators useful for measuring and monitoring progress of the project, while also allowing for analysis of an index for household resilience capacity using the FAO RIMA-II tool (FAO, 2016a).

The questionnaire covered the following topics:

- Household location demographics
- Household assets
- Household access to basic services
- Household participation in social networks and trainings
- Migration pattern
- Water, sanitation and hygiene (WASH)
- Household livelihoods and sources of income (Including livestock, crop and fodder production)
- Remittances and credit
- Expenditure
- Food consumption – food consumption score (FCS), household dietary diversity score (HDDS)
- Shocks and coping strategies
- Assistance/gifts received
- Decision-making
- Operational performance

These endline study results, targeting the same households as the baseline study, are compared with the baseline results to show the impact of the project on the target households and locations. This method of panel data collection provides the strongest evidence for attribution of a causal relationship between the implemented interventions and the effect on beneficiaries.

Table 1. Distribution of sampled households by region/district and treatment/control in baseline and endline

Region	District	Baseline			Endline		
		Non-beneficiary	Beneficiary	Overall	Non-beneficiary	Beneficiary	Overall
Sanaag	El Afwein	22	75	97	32	100	132
	Erigavo	64	339	403	120	229	349
Sool	Caynaba	31	109	140	62	159	221
Overall		**117**	**523**	**640**	**214**	**488**	**702**

The enumerators that were engaged in the survey were government field officers working for the Ministry of Planning and National Development (MoPND). The officers trained for three days in Hargeisa. Important criteria for the selection of the enumerators were their involvement in baseline data collection and their ability to speak English and the native local language. The enumerators received training on the types of questions in the survey and how to ask them. This was covered in both hardcopy questionnaires and tables using KoboCollect software. A total of 18 enumerators were trained and engaged for data-collection purposes. The enumerators were coordinated by an FAO monitoring and evaluation field analyst, supported by five local guides from the study locations. Each enumerator was expected to complete four to five interviews in a working day. The summary statistics for indicators that were not expected to change because of project interventions were analysed by baseline and endline only, and by district, while the rest were analysed by treatment and control. The impact evaluation approach considered both difference-in-difference (DiD) estimator and propensity score matching (PSM) depending on the imbalance observed. The data was analysed using STATA 14 software.

Main limitations

The key challenge encountered was the issue of conflict and insecurity in the study target locations. This mainly affected the Sool region, where most districts were experiencing militia fighting. This led to the dropping of some districts that had been reached during the baseline survey. Specifically, Las Anod, Talex and Xudun districts were dropped from Sool region, with Badhan district in Sanaag district also dropped due to insecurity. To ensure that a robust sample was achieved, the sample size in the accessible locations was boosted. In addition, to ensure data quality, a one-day validation workshop was conducted with the enumerators and the data analyst. This exercise was to check for data inconsistencies and clean up the data before commencement of the analysis.

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3. FINDINGS

This chapter presents the findings of the endline study, divided into three subsections. The first subsection (3.1) provides the descriptive findings of various indicators of interest at household level and linked to the outputs and outcomes of the FNS-REPRO. The second subsection (3.2) presents findings on the impact analysis of various indicators. The last subsection (3.3) presents the findings of logframe indicators for the project.

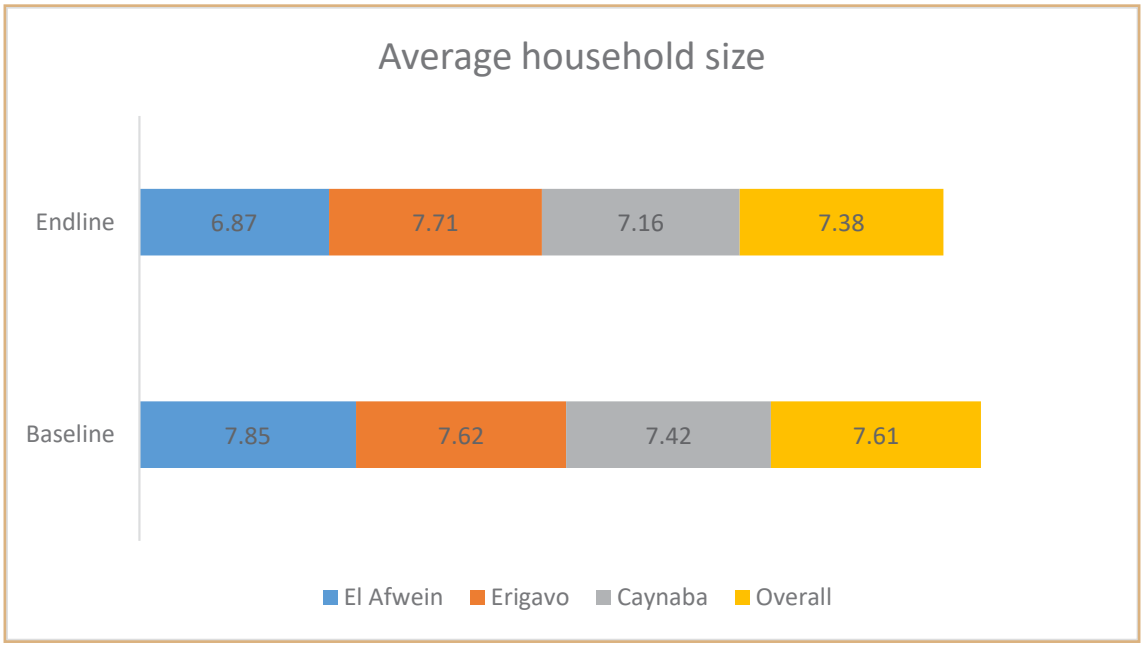
3.1 Descriptive findings

Demographics

i) Household size

The data in Figure 1 indicates the average household size in each district at two different points in time: baseline and endline. In general, when comparing baseline with endline, there is a reduction in household size across all districts. The overall average household size for all districts also decreased from 7.61 to 7.38, suggesting a general trend towards smaller household sizes.

Figure 1. Average household size by district



ii) Dependency ratio

The dependency ratio is the number of dependants in a population divided by the number of working-age people. Dependants are defined as those aged zero to 14 years and those aged 65 years and older. Working age is from 15 to 64 years. The ratio describes how much pressure an economy faces in supporting its non-productive population. The higher the ratio, the greater the burden carried by working-age people.

The overall dependency ratio decreased from 165[2] at baseline to 159 at endline, meaning that for every 100 productive/working community members there are 165 dependants at baseline and 159 dependants at endline. This suggests an overall positive trend, with a reduction in the burden of dependants relative to the working-age population across the surveyed districts. By district, El Afwein showed a notable improvement in its dependency ratio, with a decrease from 166 at baseline to 152 at endline. Erigavo, on the other hand, exhibited relative stability in its dependency ratio, experiencing only a slight decrease from 168.8 to 168.4. Similarly, Caynaba demonstrated a decrease in the dependency ratio from 154 to 150.

For male-headed households, the dependency ratio decreased only slightly from 162.5 at baseline to 162.3 at endline. Female-headed households experienced a more substantial reduction, with the dependency ratio decreasing from 172 to 155.

iii) Household head level of education

Table 2 presents the distribution of education levels among male and female household heads at both baseline and endline. Notably, at baseline, a higher percentage of female household heads had no formal education (69.68 percent) compared to their male counterparts (43.58 percent). However, at endline, this gender gap had decreased slightly with 61.7 percent of females and 44.52 percent of males reporting no education. In terms of incomplete primary education, males had a higher percentage at both baseline (31.64 percent) and endline (28.1 percent) compared to females (21.28 percent at baseline and 21.99 percent at endline). The trend continues across other education categories, with variations in the distribution of educational attainment between male and female household heads. Consistently over the two time periods, for both beneficiaries and non-beneficiaries, 80 percent of the household heads have either not attended formal schooling or attempted but did not complete primary education.

Table 2. Education level by gender of household head

Education vs gender of household head	Baseline			Endline		
	Male	Female	Overall	Male	Female	Overall
None/Never been to school	43.58	69.68	51.25	44.52	61.7	51.42
Primary incomplete	31.64	21.28	28.59	28.1	21.99	25.64
Primary complete	11.28	6.38	9.84	15.24	10.28	13.25
Secondary school incomplete	4.42	1.06	3.44	3.33	2.48	2.99
Secondary school complete	7.3	1.06	5.47	6.9	2.84	5.27
Higher than secondary	1.77	0.53	1.41	1.9	0.71	1.42
Overall	**100**	**100**	**100**	**100**	**100**	**100**

[2] Dependency ratio has been multiplied by 100.

iv) Gender of household head

Table 3 presents the distribution of households based on the gender of the household head across different districts at both baseline and endline. At baseline, 70.6 percent of households were headed by males, and 29.4 percent were headed by females. However, at endline there was a notable shift in this pattern. The percentage of male-headed households decreased to 59.8 percent, while the percentage of female-headed households increased to 40.2 percent.

Table 3. Gender of household head

District/gender of household head	Baseline		Endline	
	Male	Female	Male	Female
El Afwein	59.8	40.2	53.8	46.2
Erigavo	75.9	24.1	63.6	36.4
Caynaba	62.9	37.1	57.5	42.5
Overall	**70.6**	**29.4**	**59.8**	**40.2**

3.1.1 Livelihood

i) Main source(s) of income

Table 4 displays the different sources of income for households in the last 12 months preceding the survey, highlighting notable shifts in livelihood strategies when comparing baseline and endline data. Livestock and the sale of livestock or livestock products remain the predominant income source, showing resilience with a slight increase from 77 percent at baseline to 81 percent at endline. Fodder production and sale also saw an upward trajectory from 5 percent to 8 percent, while agriculture, encompassing the sale of cereals and vegetables, rose from 30 percent at baseline to 42 percent at endline. The category of formal transfers, including cash transfers, witnessed a substantial growth from 4 percent to 16 percent, indicating a changing landscape of external support. Other income sources, such as trader/shop owner activities and casual labour, remained relatively stable. Notably, food assistance saw a decrease from 7 percent to 2 percent. These trends highlight the adaptive nature of income sources in response to changing economic conditions and external support mechanisms over time.

The comparison between treatment and control groups in terms of the sources of income at both baseline and endline reveals distinctive patterns. In the treatment group, livestock-related activities consistently dominate, with an increase from 78 percent at baseline to 85 percent at endline, suggesting a positive intervention effect. Agriculture and the sale of crops also saw substantial growth from 30 percent to 47 percent. Fodder production and sale reflected an increase from 5 percent to 10 percent in the treatment group, showcasing the intervention's impact on diversified income sources. These variations underscore the nuanced effects of interventions on income sources between the treatment and control groups, emphasizing the potential effectiveness of targeted strategies and the importance of considering diversified income streams.

Table 4. Livelihoods by district

	Baseline				Endline			
	El Afwein (%)	Erigavo (%)	Caynaba (%)	Overall (%)	El Afwein (%)	Erigavo (%)	Caynaba (%)	Overall (%)
Livestock and sale of livestock, or livestock products and poultry	60	84	70	77	82	83	76	81
Agriculture and sale of cereals, vegetables and other crops	5	41	16	30	10	52	46	42
Formal transfers, cash transfers (CfW, UCT, internally displaced people/ returnee assistance)	6	4	2	4	8	20	14	16
Trader/shop owner/ commerce/petty trading/handicraft, etc.	32	4	8	9	28	7	8	12
Fodder production and sale	1	4	9	5	2	7	13	8
Skilled labour	12	10	6	9	7	5	4	5
Informal transfers from kinship/ support from family friends/remittances	2	1	2	1	5	4	5	5
Casual labour related to non-agricultural activities	2	5	4	5	8	4	4	5
Salaried work (public/private)	2	1	6	3	5	3	4	4
Casual labour related to agriculture	2	2	4	3	5	2	4	3
Food assistance/sale of food assistance	15	7	3	7	0	3	3	2
Sale of firewood/ poles, charcoal, grass, stones	0	2	3	2	2	1	2	2
Non-skilled labour, e.g. brokerage	0	0	0	0	1	0	1	1
Beekeeping	0	0	1	0	0	0	0	0
Gathering of wild food and hunting	0	0	1	0	0	0	0	0
Gum/resin collection	0	0	0	0	0	0	0	0

Table 5 presents income sources in USD and the percentage of households participating in that income source in parenthesis. Overall, the income of the average household increased from USD 267 at baseline to USD 447 at endline. The treatment group showed an increase from 279 to 454, while the control group increased from 215 to 430. The three main sources of income were crops, livestock and trade. Income from livestock increased for both groups, notably in the treatment group (from 242 to 379) and in the control group (from 96 to 326). Income from trade for the treatment group increased from USD 258 to USD 297. Income from crops saw a decrease in both the treatment and control groups from baseline to endline, with the treatment group dropping from 382 to 266 and the control group from 352 to 336.

Table 5. Income sources (in USD) and the percentage of households participating in that income source

	Baseline			Endline		
	Treatment	Control	Overall	Treatment	Control	Overall
Total income	279 (100%)	215 (100%)	267 (100%)	454 (100%)	430 (100%)	447 (100%)
Income from crops	382 (15%)	352 (28%)	373 (17%)	266 (36%)	336 (31%)	286 (34%)
Income from livestock	242 (78%)	96 (73%)	217 (77%)	379 (85%)	326 (70%)	365 (81%)
Income from non-agricultural casual labour	372 (3%)	-	349 (3%)	244 (4%)	84 (2%)	214 (3%)
Income from agricultural casual labour	335 (6%)	-	335 (5%)	132 (5%)	239 (4%)	159 (5%)
Income from skilled labour	401 (9%)	399 (11%)	401 (9%)	390 (3%)	474 (8%)	432 (5%)
Income from trade	258 (8%)	305 (15%)	272 (9%)	297 (10%)	381 (14%)	329 (12%)
Income from employment	470 (2%)	308 (3%)	440 (3%)	417 (2%)	443 (7%)	431 (4%)

3.1.2 Assets and access to basic services

i) Natural capital, such as access to land

Access to sufficient cultivation and grazing land is important in increasing rural household productivity and diversification of income sources. Overall, the treatment group consistently exhibited a larger area under cultivation compared with the control group at both baseline and endline. Specifically, in Erigavo, the treatment group began with a larger cultivation area of 0.9 hectares compared with the control group's 0.4 hectares at baseline. By endline, the treatment group had expanded its cultivation area to 1.1 hectares, surpassing the control group's increase to 0.7 hectares. Similarly, in Caynaba, the treatment group demonstrated a substantial increase in cultivation area from 0.4 hectares at baseline to 1.3 hectares at endline, while the control group's area increased from 0.3 to 1.0 hectare.

ii) Physical capital: Livestock assets

Access to assets increases the household's ability to manage and mitigate against assorted shocks (including drought and conflict) and helps to smooth consumption during such periods. Furthermore, access to assets can help such households handle income uncertainties and escape poverty. Table 6 presents the number of various livestock assets at both baseline and endline for treatment and control groups. Across all animal species, there is a consistent trend of stability or slight increases in ownership. Sheep owned exhibited a noteworthy increase from an average of 22 at baseline to 27 at endline. Goats owned also showed a modest increase from 21 to 26. There was a slight decrease from 7 to 6 in chickens owned, while camels and cows maintained stable averages at 5 and 4 respectively. The introduction of beekeeping activities in the treatment group is evident, with an average of two beehives at endline. Overall, these findings suggest a positive impact by the interventions on livestock ownership, particularly for sheep and goats, along with diversification into beekeeping activities.

Table 6. Average number of livestock owned

	Baseline			Endline		
	Treatment	Control	Average	Treatment	Control	Average
Sheep	23	19	22	28	22	27
Goats	21	20	21	26	26	26
Chickens	9	5	7	6	5	6
Camels	5	5	5	6	6	6
Cows	4	5	4	4	4	4
Donkeys	2	2	2	2	1	2
Beehives	-	-	-	2	2	2

iii) Access to basic services variables

Significant leaps in alleviating poverty and improving the food security situation in the area are highly dependent on the availability of functioning basic services. Moreover, access to basic services is a key ingredient for economic and social development in rural areas. Improved infrastructure, including transport, electricity connectivity and water facilities, facilitates access to other services such as education, healthcare and access to information, as well as to agricultural extension services. Access to financial services such as mobile money and banking services increases opportunities for doing business. The availability of functioning markets for the purchase of inputs and sale of livestock and agricultural products minimizes exposure to losses emanating from poor prices for smallholder farmers and spoilt perishable products. In this section, access to basic services is explored by looking at how long (in terms of minutes) it takes a person in the survey area to reach the location where selected services are provided and the percentage of households reporting using the various facilities or services.

Figure 3 illustrates the baseline and endline percentages of households who reported using the various facilities or services. Fodder market and financial services saw increases in usage from 54 percent to 75 percent and 88 percent to 72 percent respectively. Farmer field school training plots or grounds and the agricultural extension services office also show substantial increases in usage from baseline to endline.

Notably, there was a decrease in the proportion of individuals making use of primary schools (from 100 percent to 97 percent), and a similar trend was observed for the government office providing weather/climate information, the nearest local government office, the livestock market, petty market and public means of transport. Secondary schools, crop markets and hospitals also experienced reductions in usage.

The use of public and private health facilities showed a decrease from 96 percent to 77 percent. The use of veterinary clinics experienced a notable drop – from 77 percent to 63 percent. These shifts in proportions suggest changes in community preferences or accessibility to certain services over the specified period.

Figure 2. Percentage of households using various facilities or services

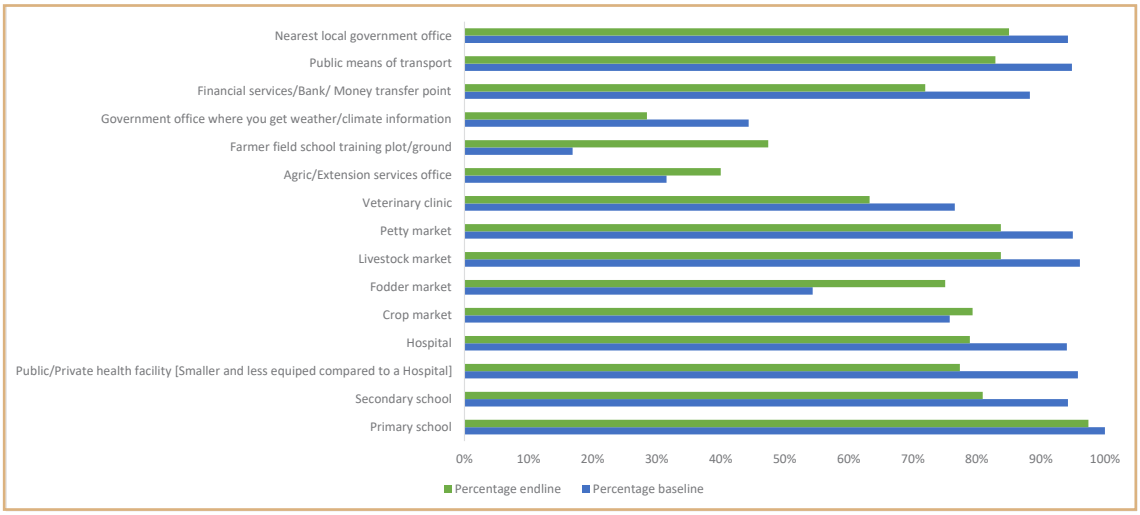
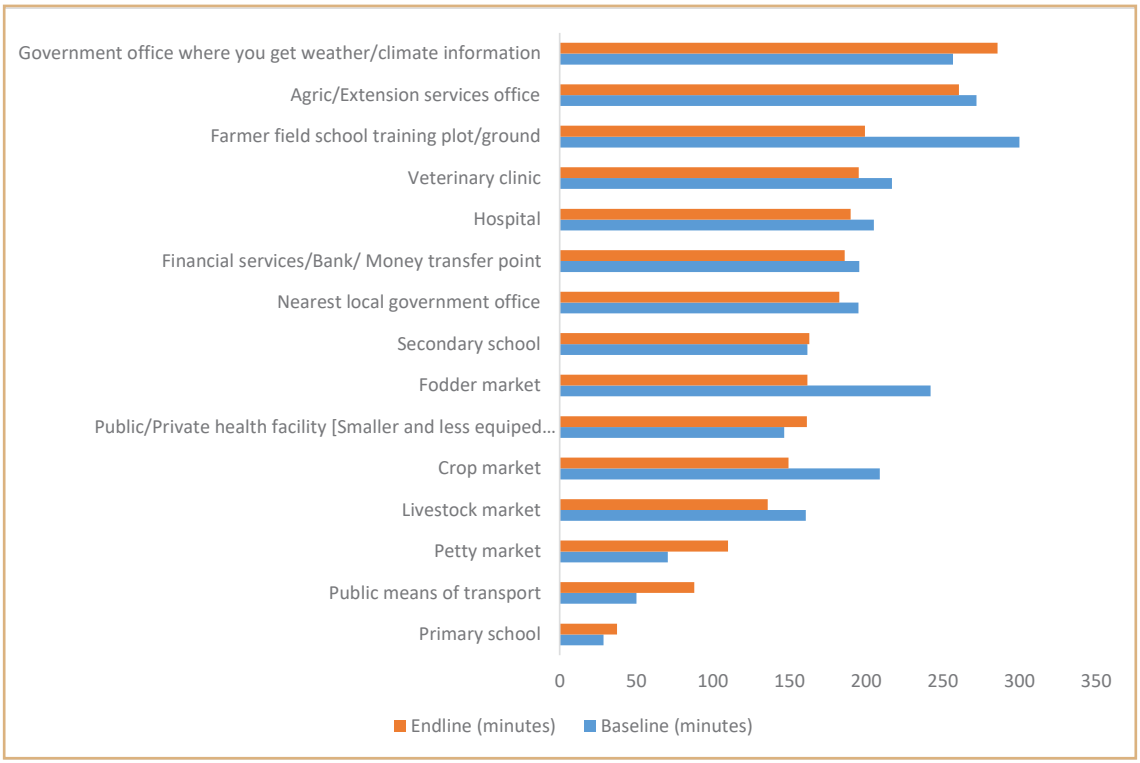


Figure 3. Time in minutes it takes household members to reach the facility (walking one way)

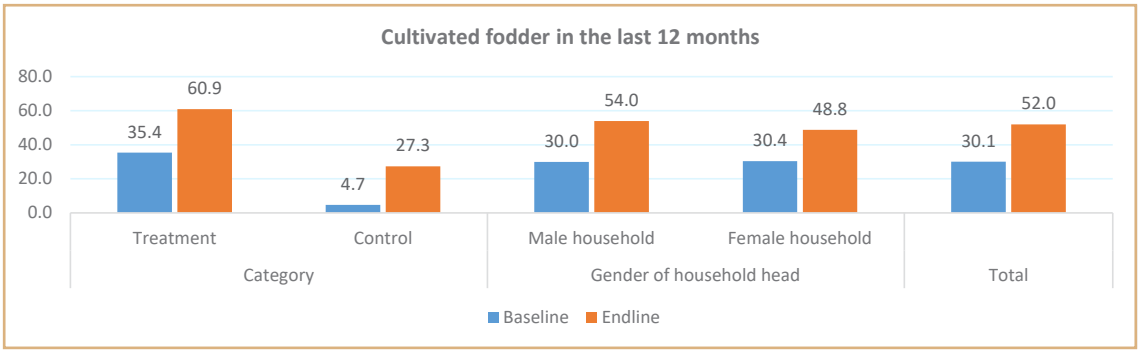


3.1.3 Fodder production aspects

Characteristics of households producing fodder

There was a 22 percent increment in households involved in fodder production between the baseline and endline studies. Both the beneficiary and control groups recorded an increase for those reporting involvement in fodder production, with beneficiaries recording 3 percent more at 26 percent compared with the control group at 23 percent (see Figure 4). The increase can be partly attributed to the efforts of the FNS-REPRO project, which also have a positive ripple effect reaching the control groups. The increment is experienced by both male- and female-headed households by 24 percent and 18 percent respectively. It is worth noting that the beneficiary group's female-headed households recorded a 23 percent increment in those households involved in fodder production compared with 13 percent by the control group's female-headed households. Erigavo district has the highest incidence of surveyed respondents reporting involvement in fodder production at 67.6 percent, followed by Caynaba district (52.1 percent) and El Afwein district (10.2 percent). Caynaba district recorded the highest increment (38.8 percent) of households reporting involvement in fodder production at endline compared with baseline, with Erigavo district recording a 28.1 percent increment and El Afwein a 6.7 percent increment. There was a 47.2 percent increment at endline (47.5 percent) in beneficiary households that reported being registered in fodder production groups/associations; only 0.4 percent had reported the same at baseline.

Figure 4. Percentage of households that cultivated fodder in the last 12 months by phase (baseline and endline)



Although there has been an increase in fodder production in the target area and neighbouring areas, the commercialization of fodder is still low. However, it is important to note that most fodder producers targeted produce the fodder for feeding their livestock. Overall, at endline, approximately 8 percent of the households had relied on fodder production as a livelihood source in the last 12 months (Figure 5). This is a 3 percent increase compared with 5 percent at baseline. Of those that relied on fodder production as a source of livelihood in the last 12 months, it is the beneficiary households that recorded a 10 percent increase; a 5 percent increase from baseline (5 percent). On the flip side, at endline, non-beneficiary households that relied on fodder production as a livelihood source in the last 12 months recorded 2 percent – a decline of 2 percent from 4 percent at baseline.

Figure 5. Percentage of households deriving their livelihood from fodder production by phase (baseline and endline)

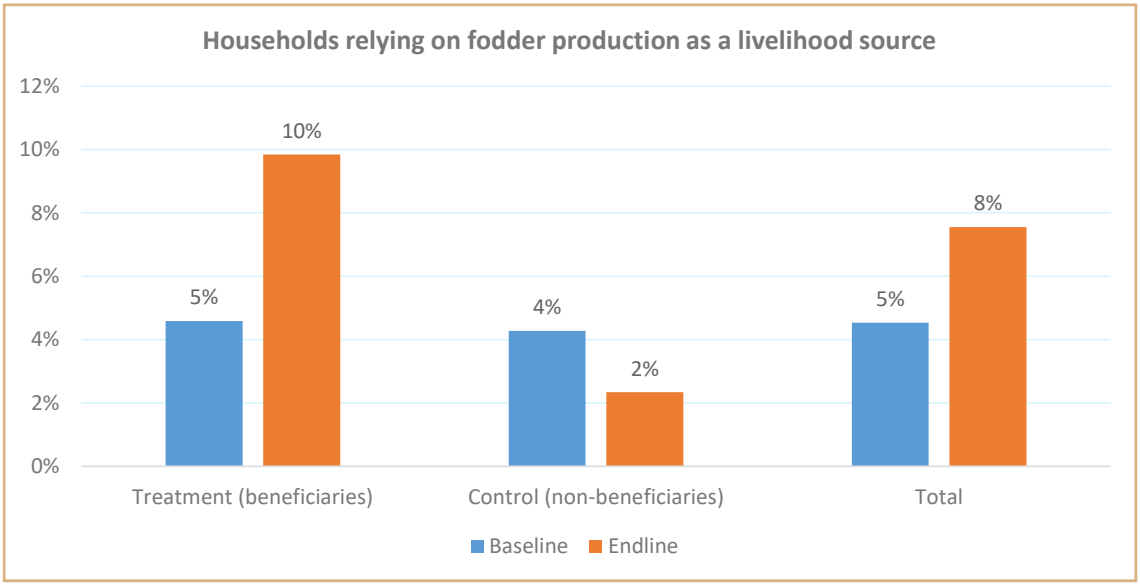
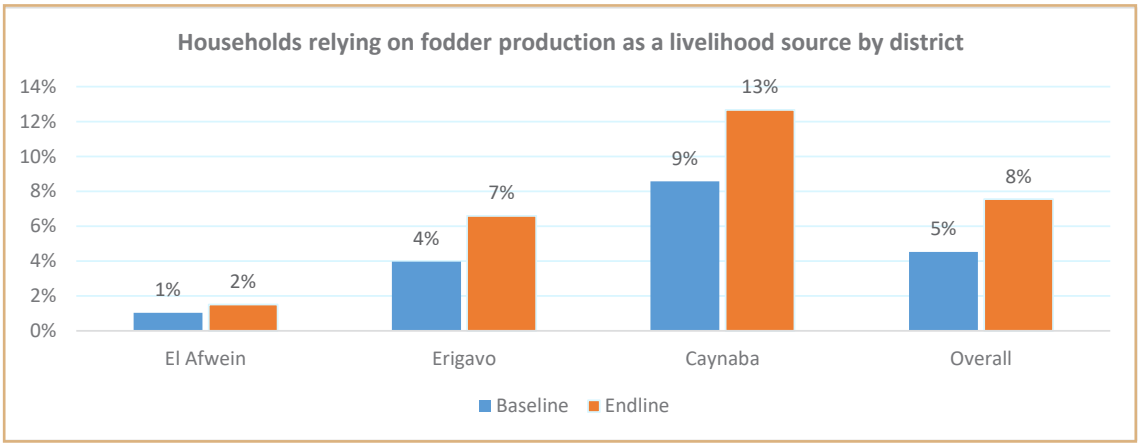


Figure 6 shows the distribution of households involved in fodder production as a livelihood source in the last 12 months by district. At endline, Caynaba district had the highest incidence of households involved in fodder production as a livelihood source in the last 12 months at 13 percent, with Erigavo and El Afwein recording 7 percent and 2 percent respectively.

Figure 6. Fodder-growing households by district



Feed sources for livestock

Natural rangeland grasses and browse forage remain the main sources of feed for households in the study area at 96 percent for both beneficiaries and non-beneficiaries. Overall, cultivated fodder at endline was reported to be 31.6 percent, an increment of 8.3 percent from baseline. The beneficiary households recorded a 10.3 percent increase – from 26.6 percent during baseline to 36.9 percent at endline. Other livestock feed mentioned at endline are agricultural crop residues, cereal grains and purchased concentrate feed at 11.3 percent, 3.5 percent and 3.4 percent respectively.

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Fodder production inputs and training

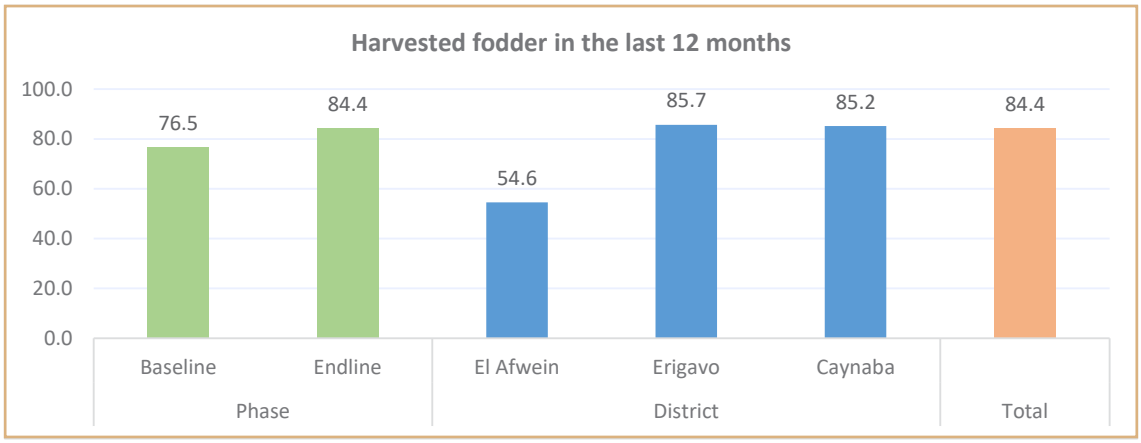
The main types of fodder crops grown by these households include sorghum (81 percent), maize (61 percent) and natural grass (44 percent). At endline, there was a 38 percent increase in households that reported maize to be the main fodder crop they plant, from 24 percent at baseline. This could be attributed mainly to the increase in target households that reported receiving agriculture inputs from emergency projects. The households got their fodder seeds from multiple sources. The majority (54 percent) of the households purchased the seeds, 31 percent used seed stored from the previous harvest, 30 percent received their seed from humanitarian projects and 5 percent borrowed from neighbours.

Among the households growing fodder, 79 percent reported receiving training in the last 12 months, a 75 percent increase from 5 percent reported at baseline. Land preparation, seed production, pest and harvesting were the top three training initiatives mentioned at 68 percent, 45 percent and 41 percent respectively. Other training received included pest and disease control, post-harvest handling practices, weeding and fertilizer application. Training on value addition was mentioned by 3.3 percent.

3.1.4 Fodder harvesting and use

At endline, 84.4 percent of the fodder-growing households reported that they had harvested fodder in the last 12 months preceding the survey, an 8 percent increase from baseline. El Afwein district, compared with Erigavo and Caynaba, recorded the lowest incidence of households that reported harvesting fodder in the last 12 months prior to the survey (Figure 7). The households used the harvested fodder for multiple purposes. The majority (78 percent) used the fodder they produced to feed their own livestock, 74 percent stored it for future use, 17 percent of the households sold it and 4 percent shared the fodder with others. At endline, households that mentioned storing their fodder for future use and selling their harvested fodder increased by 20 percent and 14 percent respectively compared to baseline, an indication that the project has contributed to the increased availability of fodder for the target communities.

Figure 7. Households that harvested fodder in the last 12 months by phase and district



Overall, at endline, there are multiple benefits realized from the increased availability of fodder. Reduced distance in search of fodder and more milk for the family are the top benefits reported at 53.7 percent and 50 percent respectively, a 28.7 percent and 13.7 percent increase respectively compared to baseline. Furthermore, 31.7 percent of households reported that the increased availability of fodder has provided more income for the family (Table 7).

"...Milk production has increased because of the increased availability of the livestock feed; this has increased milk production resulting in improved household food security and nutrition. Also, we sell the surplus milk and this has become a new source of income. We sent our milk to Erigavo through donkey and other means and we are currently selling the milk at 1.0 USD per litre..." – *Male focus group discussion respondent in Buq Village, Erigavo District*

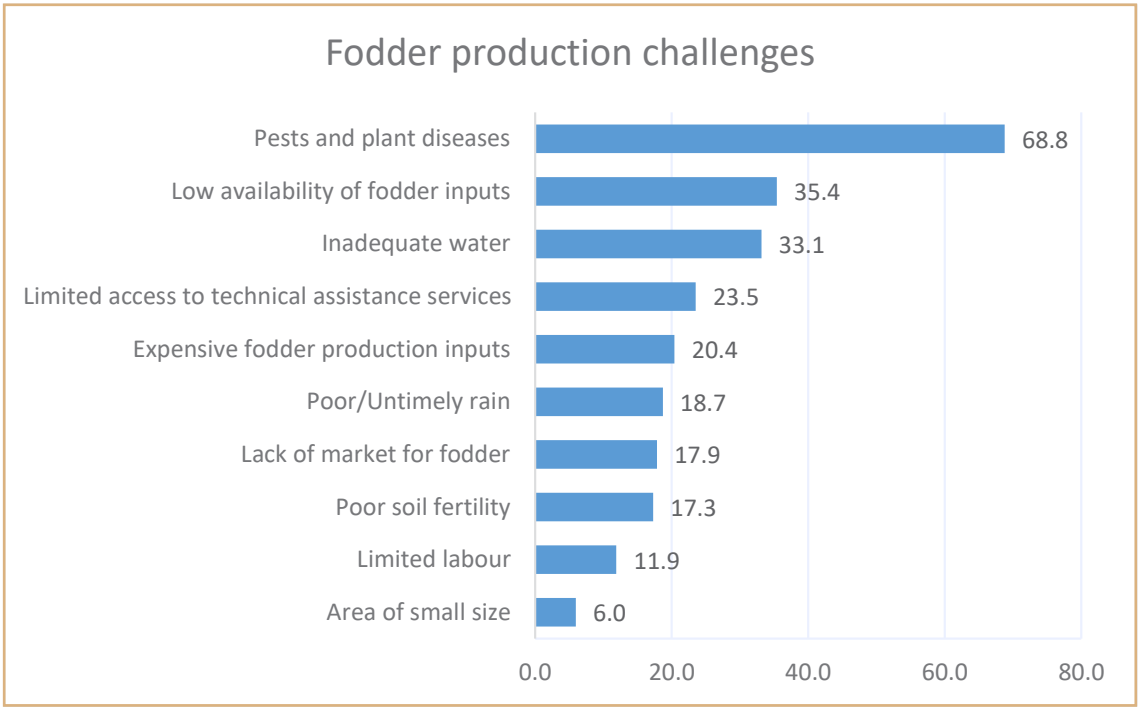
Table 7. Benefits of increased availability of fodder

Benefits of availability of feeds to the family	Baseline %	Endline %	Change %
Reduced distance of travel	25.0	53.7	28.7
More milk for the family	36.3	50.0	13.7
More income for the family	0.0	31.7	31.7
Spending more time with the family	0.0	19.5	19.5
Children's health improved because they drink milk	0.0	12.2	12.2
Reduced worry about enough feed	0.0	7.3	7.3
Nothing	50.0	14.6	-35.4

3.1.5 Fodder production challenges

Figure 8 presents challenges faced by households during fodder production. The three main challenges include pests and diseases, low availability of fodder inputs and inadequate water. These are the same key fodder production challenges mentioned at baseline.

Figure 8. Challenges in fodder production



3.1.6 Shocks and coping strategies

i) Relevant shocks reported by the household, as well as coping strategies to respond to, and overcome, reported shocks

Figure 9 presents a baseline and endline assessment of various shocks experienced by households. The four main shocks in the study area in the two rounds of surveys continue to be unusually high food prices, drought, reduced income and unusually high fuel prices. The most notable shift was in the category of unusually high food prices, which saw a substantial increase from 10 percent to 32 percent. The levels of reduced income of household member(s) saw marginal declines from 17 percent to 12 percent respectively during the baseline and endline periods.

There was a slight increase in the percentage of households experiencing drought/irregular rains or prolonged dry spells, unusually high prices of fuel/transport and other non-food prices, and reduced employment for household members. Despite these changes, most households still reported experiencing none of the mentioned shocks, although a slight decrease was reported from 46 percent to 39 percent.

Figure 9. Shocks experienced by the households in the last 12 months at baseline and endline

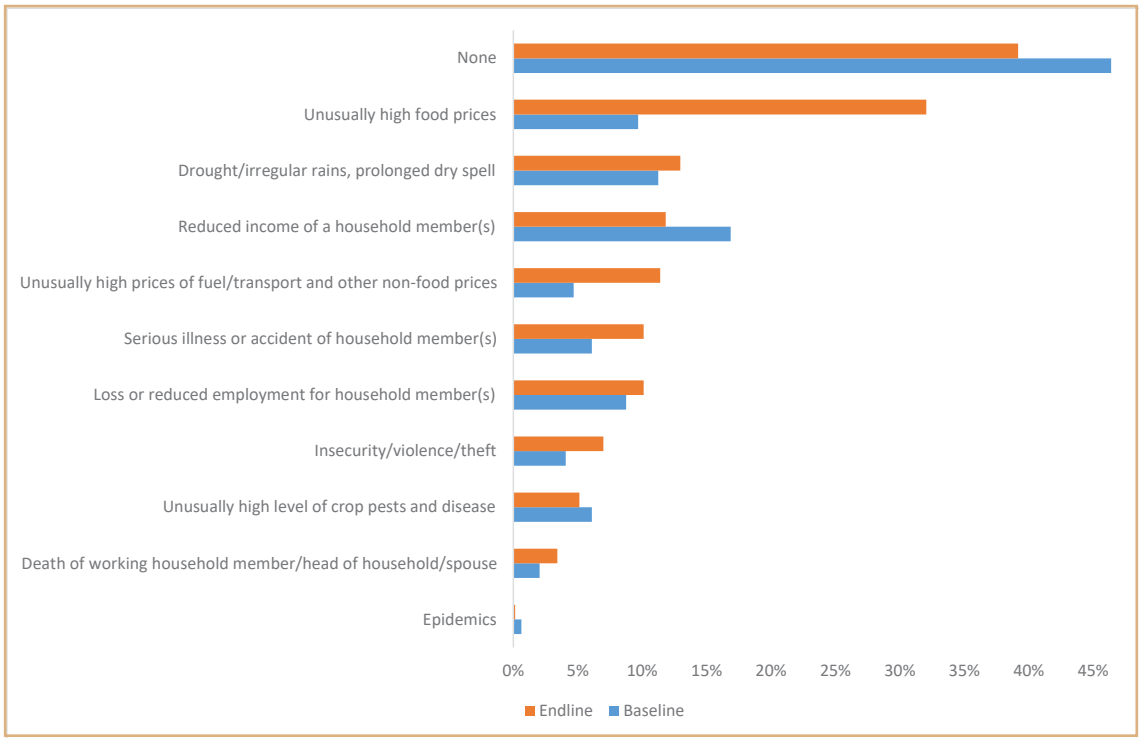
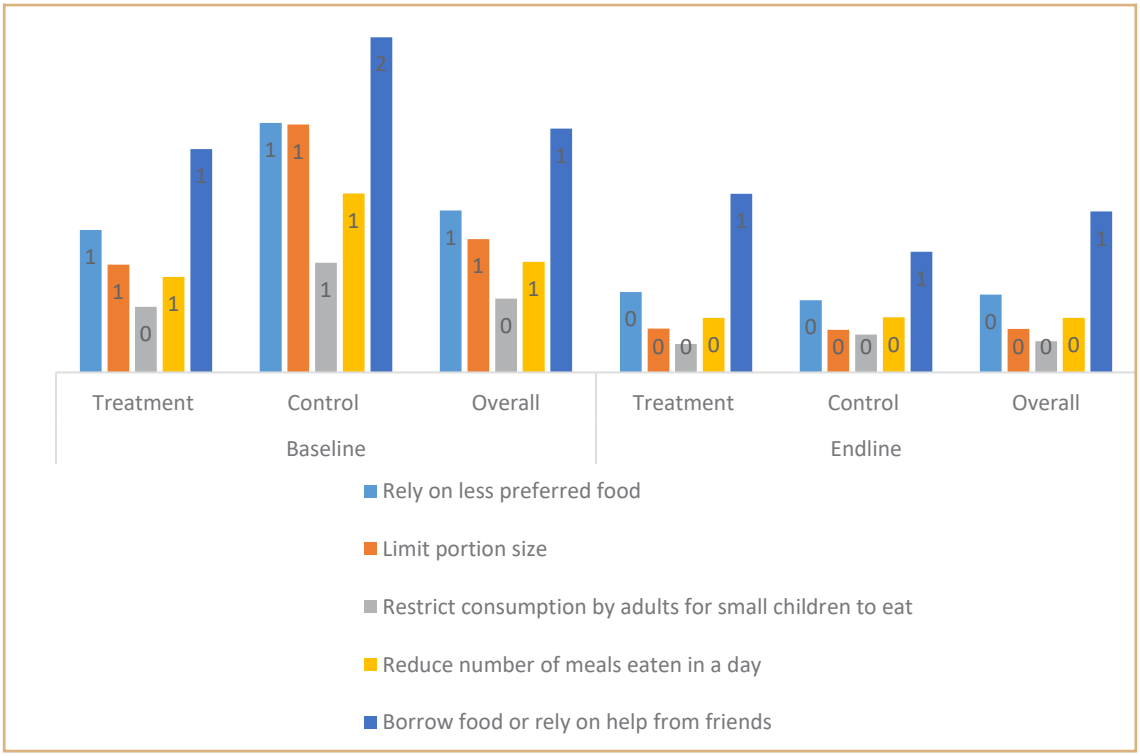


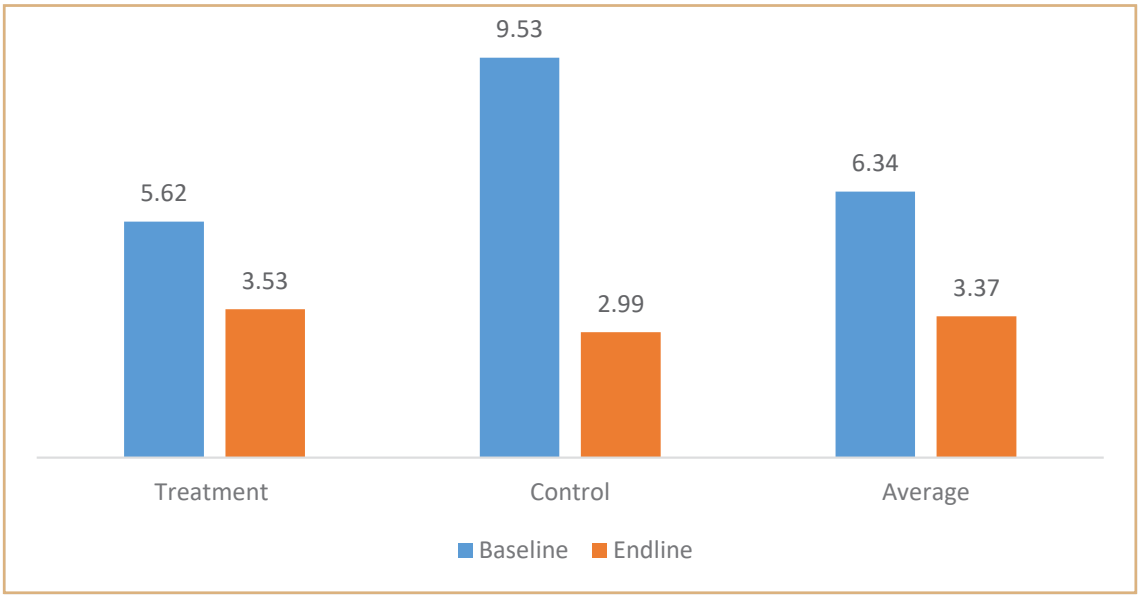
Figure 10 presents food consumption coping strategies undertaken by households in the last seven days preceding the survey, comparing baseline and endline data for treatment and control groups. There is a notable shift in the behaviour of borrowing food or relying on help from friends, with the treatment group experiencing a decrease from 1 to 0.

Figure 10. Number of days in the last seven days preceding the survey that households used a coping strategy



Overall, the combined reduced coping strategy index (rCSI) score for both groups decreased from 6.34 at baseline to 3.37 at the endpoint, as shown in figure 11, indicating an overall positive trend in coping strategies. The treatment group initially had an rCSI of 5.62, which decreased to 3.53, suggesting a reduction in reliance on coping strategies. Similarly, the control group showed a decrease from a higher baseline rCSI of 9.53 to 2.99 at the endpoint, indicating a substantial improvement in coping strategies. A lower rCSI score on a scale of 0 to 56 indicates better or more effective coping, while a higher score suggests a greater reliance on potentially detrimental coping strategies.

Figure 11. Reduced coping strategy index



Initially, 59 percent of both treatment and control groups received no assistance, but by the endline the percentage had decreased to 35 percent. The main forms of assistance received by the households 12 months before the endline include cash transfers which increased in both groups, rising from 16 percent to 35 percent in the treatment group and from 7 percent to 24 percent in the control group. Livestock vaccinations, agricultural inputs and training on crop production and management all experienced increases in the treatment group, with the control group showing minimal changes. The assistance received by the households is presented in Table 8.

Table 8. Assistance received in the last 12 months before baseline and endline

Assistance received	Baseline			Endline		
	Treatment (%)	Control (%)	Overall (%)	Treatment (%)	Control (%)	Overall (%)
None	59	61	59	28	50	35
Cash transfers	16	7	14	35	24	32
Livestock vaccinations	5	3	5	19	11	17
Agricultural inputs such as seeds, fertilizers, other farming inputs	2	3	2	20	8	16
Training on crop production and management	1	0	1	14	5	11
Livestock treatment	5	3	4	9	10	9
Free vaccination of children	10	2	9	7	14	9
Training on livestock production and management	0	0	0	10	4	8
Fodder seeds	1	1	1	10	1	7
Free health care	8	1	7	5	6	5
Free food ration	14	23	15	3	4	3
Live animals	1	0	1	3	1	2
Animal feeds such as mineral blocks, range cubes	0	0	0	2	1	2

3.1.7 Food security/Nutrition

i) Food consumption score

Food consumption score[3] (FCS) measures the variety, quality and quantity of food consumed by a household in a period of seven days. Table 9 shows the FCS scores and FCS categories for beneficiary and non-beneficiary households for baseline and endline. There is an increment in FCS for both groups.

[3] https://fscluster.org/sites/default/files/documents/WFP_BAN_FCS%20technical%20guideline_Bangladesh%20context_Jan09.pdf

Table 9. FCS scores and categories for beneficiary and non-beneficiary households for baseline and endline

	Baseline				Endline			
	FCS	Poor (%)	Borderline (%)	Acceptable (%)	FCS	Poor (%)	Borderline (%)	Acceptable (%)
Treatment	48.1	20	16	64	51.7	15	14	71
Control	43.5	31	18	51	50.1	14	19	67
Total	47.3	22	16	62	51.2	15	16	70

Among the treatment group, those in the Poor category decreased from 20 percent to 15 percent, while those in the Acceptable category increased from 64 percent to 71 percent. Similarly, for the control group, those in the Poor category decreased from 31 percent to 14 percent, while those in the Acceptable category increased from 51 percent to 67 percent. Those in the Borderline category did not seem to change in the two time points for the treatment and control groups.

Table 10 presents the number of days a food group was consumed in the seven days preceding the survey for both baseline and endline disaggregated by treatment and control. Oils and fats, cereals, vegetables and milk are frequently consumed in the households, at least four days in a week. Proteins from meat, eggs and pulses are least consumed by the households (on average, the households would go for seven days without consuming such products). Milk remains the main source of protein for both treatment and control groups in both the baseline and endline. Fruits are rarely consumed in the household within a period of seven days.

Table 10. Food groups consumed in the household in the last seven days

Food group	Baseline			Endline		
	Treatment	Control	Overall	Treatment	Control	Overall
Cereals	6.7	6.5	6.6	5.7	5.7	5.7
Roots	1.8	1.5	1.8	1.3	1.1	1.3
Pulses	0.5	0.2	0.5	0.8	0.7	0.8
Milk	4.3	3.4	4.1	5.2	4.9	5.1
Flesh meat	0.7	0.7	0.7	1.1	0.9	1.0
Eggs	0.3	0.3	0.3	0.4	0.3	0.4
Organ meat	0.4	0.2	0.3	0.6	0.5	0.5
Fish	0.1	0.2	0.1	0.2	0.2	0.2
Sweets	6.7	6.6	6.7	5.7	5.6	5.7
Fats	6.6	6.3	6.5	6.0	6.1	6.0
Spices	6.1	5.7	6.1	5.5	5.3	5.5
Vegetables	5.0	4.9	5.0	4.9	4.9	4.9
Fruits	0.4	0.6	0.4	0.4	0.6	0.5

ii) Household dietary diversity score

Household dietary diversity score[4] (HDDS) measures the diversity of foods consumed in a household. The consumption data is collected for a recall period of 24 hours. The average HDDS for the households in the survey area is 6. On average, a household in the survey area consumed six different kinds of food out of the 12 food groups for both treatment and control and in baseline and endline (Table 11).

[4] http://www.fao.org/nutrition/assessment/tools/household-dietary-diversity/en/#:~:text=Household%20dietary%20diversity%20Score%20(HDDS)%20is%20a%20qualitative%20measure%20of,dietary%20diversity%20at%20individual%20level.

Table 12 presents the proportion of households that consumed food groups in the last 24 hours preceding the survey disaggregated by treatment/control and baseline and endline. There was a high consumption of cereals, vegetables, oils and sugar in the survey area during baseline and endline. The main sources of protein are milk and meat. Very few households are consuming other protein-rich foods; fewer than 20 percent consumed pulses, fish and eggs. However, there was a slight improvement in the consumption of eggs from baseline (5 percent) to endline (10 percent). Fewer than 10 percent of the households consumed fruits in the past 24 hours.

Table 11. HDDS for the households in the survey area

	Baseline				Endline			
	HDDS	Poor (%)	Medium (%)	High (%)	HDDS	Poor (%)	Medium (%)	High (%)
Treatment	6.1	10	51	39	6.2	17	40	43
Control	6.0	14	56	31	6.0	18	50	33
Overall	6.1	11	52	37	6.2	17	43	40

Table 12. Proportion of households that consumed food groups in the last 24 hours preceding the survey

	Baseline			Endline		
	Treatment (%)	Control (%)	Total (%)	Treatment (%)	Control (%)	Total (%)
Cereals	97	98	97	88	86	87
Roots and tubers	37	34	36	28	26	27
Vegetables	80	83	80	80	78	79
Fruits	6	11	7	13	18	15
Meat	29	21	27	38	32	36
Eggs	5	5	5	12	5	10
Fish	4	8	5	7	9	8
Pulses	12	5	11	19	17	19
Milk	68	59	66	81	76	79
Fats	95	93	95	91	89	90
Sugar	96	96	96	83	83	83
Condiments	85	85	85	84	79	83

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3.2 IMPACT ANALYSIS OF KEY INDICATORS

In this section, the average effect of the FNS-REPRO programme on the treated households is presented. The RCI and its associated pillars are analysed, as are food security and livestock holding indicators. Each analysis consists of three steps: (i) a balance test; (ii) the statistical attribution analysis (if it is possible to statistically attribute the impact to the programme); and (iii) the evaluation of the size of the effect on the indicator. Two samples can be considered balanced when they do not significantly differ from each other, in other words, when there are no observable and unobservable differences that may influence the experiment's outcomes. When this is the case, a simple difference-in-difference (DiD) estimator can be adopted; otherwise, a matching technique (typically propensity score matching [PSM]) needs to be employed as regressor. In this study some imbalances were identified (see Table 20 in Annex 2), hence PSM was preferred. The matching was obtained using a set of covariates (household size, gender of household head, education level of the household head and the district) selected through a Probit regression. The idea is to find a sufficient number of variables that could create a propensity score which is able to pair the observations in the two subsamples of the population (for example between non-beneficiaries and beneficiaries).

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

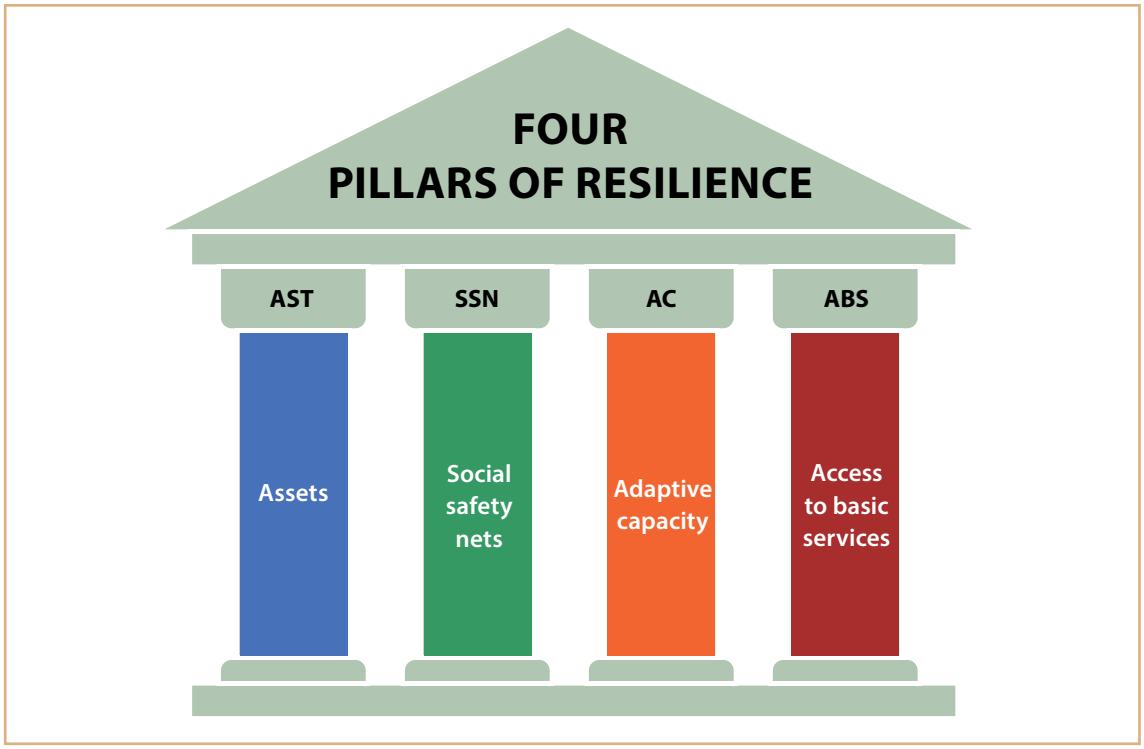
Finally, the statistical meaning of the analysis needs to be completed by the economic meaning and linkage with the theory of change for the FNS-REPRO programme.

3.2.1 Treatment effects on overall sample

(a) Resilience capacity

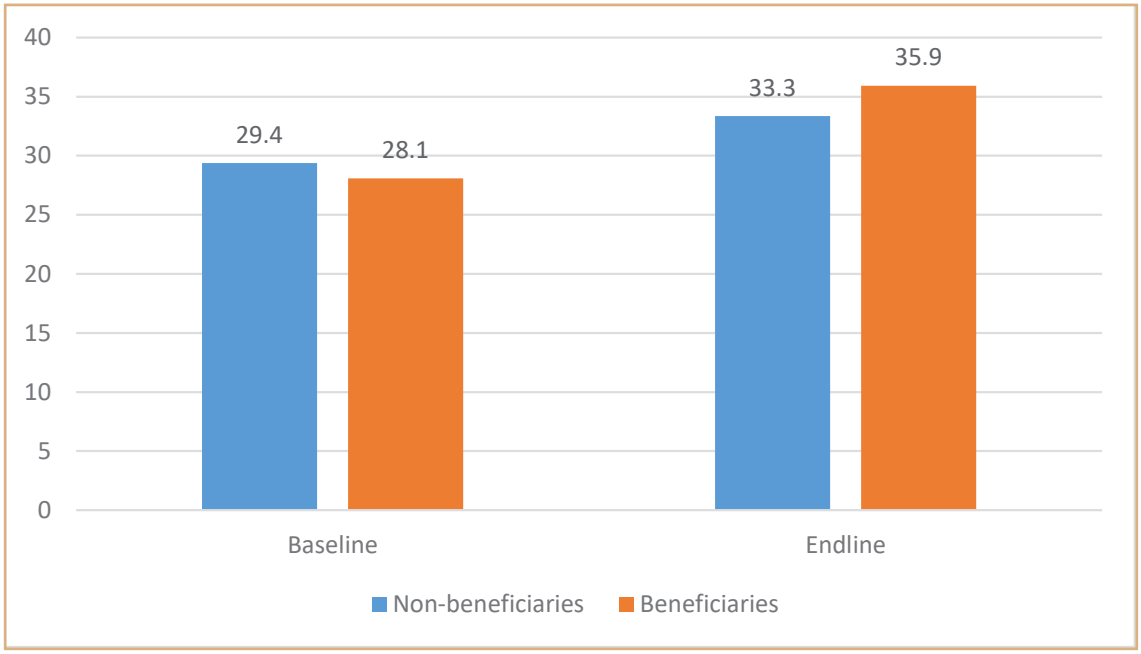
This section presents an analysis of both the resilience capacity and resilience structure of the households surveyed. It uses RIMA methodology developed by FAO, which systematically explores the relationship between a core set of context-specific variables of resilience to construct the RCI based on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

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



The resilience capacity index was estimated for the pooled data. Figure 12 presents the estimated RCI values for both beneficiaries (treatment) and non-beneficiaries (control) at baseline and endline. Among the non-beneficiary households, the RCI increased by 4 points, while for the beneficiary group, the RCI increased by 7.9 points.

Figure 12. Estimated RCI values for control and treatment at baseline and endline



The RCI is a composite index that captures the four diverse pillars. A single programme or project might not impact fully on all four pillars. This analysis aimed to evaluate the impact of the FNS-REPRO project on the RCI as well as the individual pillars. A PSM estimator has been employed for the RCI and each of the pillars and the output is shown Table 13.

The overall RCI reported a significant positive impact, with a change of 1.9 points. Looking at the individual pillars, the AC pillar reported the most significant and positive impact, with a change of 3.9 points. The AST and SSN pillars also reported positive change, albeit not significant at 0.4 and 1.8 points respectively. The ABS pillar showed a significant negative change of 3.1.

The AC pillar is made up of the number of income sources in which the household is participating, crop diversification, inverted dependency ratio, capacity building and training, household head education level and ability to write. The AST pillar is made up of the wealth index, agricultural assets holdings, land holding and livestock holding (TLU). The ABS pillar is made up of distance to basic services, access to improved toilet facilities and access to improved water. The SSN pillar is made up of access to formal and informal transfers, and number of associations/groups that household members belong to.

The economic significance of this finding is that the effect of the interventions of the FNS-REPRO programme led to an increase in resilience capacity as shown through the positive impact on RCI. From the theory of change of the programme as presented in the project document, a strong change was expected in the adaptive capacity pillar and assets pillar. The project theory of change had little intervention on the ABS pillar.

Table 13. PSM estimator output

ATE	Coef.	Std. Err.	z	P-value
RCI	1.935	0.909	1.72	0.09
ABS	-3.123	1.513	-2.060	0.039
AST	0.396	0.953	0.420	0.678
SSN	1.818	1.423	1.280	0.201
AC	3.939	0.716	5.500	0.000

(b) Food security

Table 14 presents PSM estimator results for the FCS and HDDS. The project was reported to have a positive impact on both FCS and HDDS, however, only the impact on FCS was significant. The FNS-REPRO programme in Somaliland was aimed at increasing food security in two ways. First, by increasing fodder production for livestock and general natural resource management, which in turn leads to healthy livestock, more milk and higher income, which can be used to purchase food. Secondly, by improving household-level nutritional activities such as kitchen garden and nutrition education.

Table 14. PSM estimator results for the food consumption score and household dietary diversity core

ATE	Coef.	Std. Err.	z	P-value
Food consumption score (FCS)	2.962	1.365	2.170	0.030
Household dietary diversity score (HDDS)	0.110	0.150	0.730	0.464

(c) Livestock holding

Table 15 presents PSM estimator results for household livestock holding captured through TLU and number of livestock kept by the household. The project's significant and positive impact on TLU, involvement in fodder production and goats, sheep, cattle and camel holding was reported. FNS-REPRO in Somaliland was aimed at increasing fodder production for livestock and general natural resource management. This was intended to provide livestock feed throughout the year and reduce reliance on natural vegetation. This result confirms that the interventions of the FNS-REPRO programme were relevant in improving livestock productivity.

Table 15. PSM estimator results for household livestock holding

ATE	Coef.	Std. Err.	z	P-value
TLU holding	2.347	0.380	6.18	0.000
Proportion growing fodder	0.296	0.036	8.31	0.000
Goats holding	3.214	1.151	2.79	0.005
Sheep holding	7.861	1.153	6.82	0.000
Cattle holding	0.639	0.163	3.92	0.000
Camel holding	0.691	0.199	3.47	0.001

(d) Income

Table 16 presents PSM estimator results for the various income sources, in particular overall income, income from crop production and income from livestock production. Positive and significant impacts of the project on both overall income and income from livestock were reported. Overall income and income from livestock production increased by USD 38 and USD 86 respectively. A negative but insignificant impact on income from crop production was reported. FNS-REPRO in Somaliland aimed to increase income diversification and income generation in the project areas.

Table 16. PSM estimator results for the various income sources

ATE	Coef.	Std. Err.	Z	P-value
Overall income	38.162	22.794	1.67	0.094
Income from livestock production	85.836	26.203	3.28	0.001
Income from crop production	-24.501	32.821	-0.75	0.455

3.2.2 Treatment effects by gender subgroups

In this section, the analysis examines the impact of the FNS-REPRO project on several indicators of interest by gender of the household head. Table 17 shows the breakdown of the impact assessment on the overall income, income from livestock, RCI, FCS, HDDS and TLU by the gender of the household head. Although insignificant, there is a positive impact on RCI for female-headed households, which is not observed for male-headed households. There is a significant and positive impact on income from livestock production and TLU for both male-headed and female-headed households. A positive and significant impact on HDDS is observed in female-headed households. This shows that the programme's targeting along livestock production is successful for both male-headed and female-headed households. The impact of the project on food security is more clearly observed among female-headed beneficiaries.

Table 17. Impact of the FNS-REPRO project by gender of the household head

Gender	ATE	Coef.	Std. Err.	z	P-value
Male	RCI	-0.215	1.131	-0.190	0.849
	Total income	43.714	34.215	1.280	0.201
	Income from livestock	99.711	32.014	3.110	0.002
	FCS	1.874	1.709	1.100	0.273
	HDDS	0.084	0.181	-0.470	0.640
	TLU	3.212	0.497	6.470	0.000
Female	RCI	1.882	1.482	1.270	0.204
	Total income	-21.766	45.719	-0.480	0.634
	Income from livestock	64.849	36.723	1.770	0.077
	FCS	3.379	2.646	1.280	0.202
	HDDS	0.565	0.224	2.530	0.012
	TLU	2.029	0.485	4.180	0.000

3.3 Summary of log-frame indicators

Table 18 presents a summary of baseline and endline values of selected log-frame indicators that can be derived from the household survey. The values are presented for baseline and endline[5].

Table 18. Summary of key log-frame indicators

Indicator	Baseline value	Endline value
RCI (rescaled for baseline and endline)	28.1	35.9 (28% increase)
Mean annual income (USD)	279	454
Percentage of households who reported increased income	0%	68.4%
Percentage of households who reported increased fodder production	0%	14%
Percentage of households who reported increased livestock production	0%	58.5%

[5] It is important to note that some of the areas that were sampled in the baseline could not be reached in endline because of conflict. Therefore, the analysis used samples for the areas that were reached in both baseline and endline. Also, the RCI values reported for both baseline and endline are reported based on pooled data for the two rounds, hence the RCI value in the baseline is rescaled in this process and would not be the same as the baseline value but will have similar magnitude in comparison with the endline.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4. CONCLUSION

This chapter presents the implications for future programming as elucidated from the findings of the report. It is important to note that the Horn of Africa has continued to be affected by the number and intensity of shocks, both natural and human induced. Some of the shocks cover the entire Horn of Africa, while others are country specific. Topping the list of shocks are conflict, climate extremes (drought) and economic shocks. These shocks were recurrent during the period when the FNS-REPRO was being implemented. COVID-19 and its after-effects also weighed in on many households during the FNS-REPRO implementation period. Several episodes of conflict were reported in the Sool and Sanaag areas. The combination of these shocks has had a severe impact on the resilience of the households by raising the levels of inflation, unemployment, disruption in livestock and crop markets, loss of livestock, inaccessibility of inputs and increase in prices of inputs.

The FNS-REPRO is aimed at providing solutions that lessen the impact of these shocks through the fodder value chain. While fodder production provides an avenue for diversification of income sources, it also directly impacts livestock productivity and reduces overreliance on natural vegetation that has been identified to lead to conflict over natural resources. The project aims to improve the management of natural resources, income diversification and enhancement of the knowledge, skills and capacity of local communities to participate effectively in various livelihood options.

In this study, a rigorous impact evaluation of the FNS-REPRO was undertaken, focusing on support for households through the provision of investments in the fodder value chain and natural resource management. The design of the study compared similar beneficiary and non-beneficiary households before and after the start of the programme to extract the causal impact of receiving support on increasing livestock production, enhancing food security and increasing income diversification.

Against this backdrop, the project was successful in reaching the target households, providing timely support and realizing both short-term and long-term positive impact on resilience, food security and improved livelihoods. Specifically, the project increased the overall resilience capacity index of the households, which, in the absence of the intervention, would have been worse off given the various shocks that are affecting the Horn of Africa. The Adaptive Capacity pillar of resilience received the highest positive impact from the project. This result responds to learning question 1(LQ1): *To what extent are households better able to withstand and recover from shocks and stressors as a result of REPRO?* This showed that the beneficiaries of the FNS-REPRO coped better with the shocks and stressors than the non-beneficiaries, and hence their resilience capacity was less eroded.

Overall, there is a 22 percent increment in households involved in fodder production between baseline and endline studies. This has a ripple effect on the increase in livestock holdings, increase in income, increase in milk production (for home consumption and sale) and income diversification. Reduced distance in search of fodder and more milk for the family are the top benefits reported at 53.7 percent and 50 percent respectively by households involved in fodder production, a 28.7 percent and 13.7 percent increase compared with baseline. As reported by 31.7 percent of households, increased availability of fodder has provided more income for the family. Due to the increased accessibility and availability of

fodder, better livestock body condition have been observed, leading to better sale prices. Furthermore, increased milk production has provided enough milk for the family, with the surplus being sold to earn the household more income. The positive changes in livestock body condition and milk production showcase a direct link to improved nutritional outcomes and economic well-being for the households.

The contribution of the FNS-REPRO in improving the food security of households in the target community is notable. The project reported a positive impact on both FCS and HDDS. However, only the FCS impact was significant. FNS-REPRO projected increased food security of households in the target areas in two ways. First, by increasing fodder production for livestock and general natural resource management which in turn lead to healthy livestock, more livestock holding, more milk (which can be consumed directly to boost protein consumption) and more income, which can be used to purchase food. Secondly, by improving household-level nutritional activities such as kitchen garden and nutrition education. This finding provides evidence for learning question LQ I4: *To what extent is there improved food and income security as a result of REPRO?*

The contribution of the FNS-REPRO in reducing gender disparity can be observed from the results of the impact evaluation for the two gender subgroups. The project supported a positive impact on income from livestock production for both male-headed and female-headed households. This could be linked to the fact that in the fodder and livestock value chains, both genders have different roles to play in the production, sale and use of fodder. The significant positive impact of the FNS-REPRO is observed in the food security indicators for female-headed households. This result is aligned to learning question LQ O3.3: *What role does REPRO play in reducing gender disparities?*

Recommendations

1. An improvement was observed in the resilience capacity of the households in the FNS-REPRO target areas. This improvement was especially felt in the Adaptive Capacity pillar, with minimal impact on the Access to Basic Services pillar, Social Safety Net pillar and Assets pillar. This highlights the need to design a bigger and more encompassing package of interventions that could cover at least three of the pillars at once to provide more effective change in the resilience capacity of target households.
2. Investment in fodder and feed value chains is important in enhancing livestock productivity and the food and nutrition security of households. The results indicated that from the support of FNS-REPRO, households that were involved in fodder production reported a reduction in distance covered in search of fodder and an increase in milk production for both home consumption and sale. However, it is important for the intervention to go at scale to ensure that these benefits are enjoyed by a larger group of the communities. The increase in scale is more likely to reduce overreliance on natural vegetation for feed in a significant area and hence reduce resource-based conflict.
3. The findings showed a positive and good uptake of fodder production albeit the target areas being more reliant on pastoral livelihood and not riverine livelihood. Although there has been an increase in the availability of fodder, the commercialization of fodder is still very low. Most households are mainly using the fodder to feed their livestock and store surplus for future use. There is a need for more sensitization on fodder commercialization and creating linkages between the producers and market actors.
4. The fodder value production provides an avenue for building resilience for both male-headed and female-headed households within the livestock value chain. Future investments along this value chain will provide an opportunity to reduce gender disparity in the study area and similar locations where livestock is the main value chain.

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Annexures

Annexure 1: Resilience measurement approach

RIMA-II methodology (FAO, 2016a) was used to measure resilience in this study (Figure 13). The methodology estimates the Resilience Capacity Index (RCI) based on a two-stage procedure.

First, the resilience pillars are estimated from observed variables through factor analysis. The definition of each pillar of resilience and the related variables are reported in Table 19.

Second, the RCI is estimated from the pillars, considering the indicators of food security using the Multiple Indicators Multiple Causes (MIMIC) model. The food security indicators are considered outcomes of resilience.

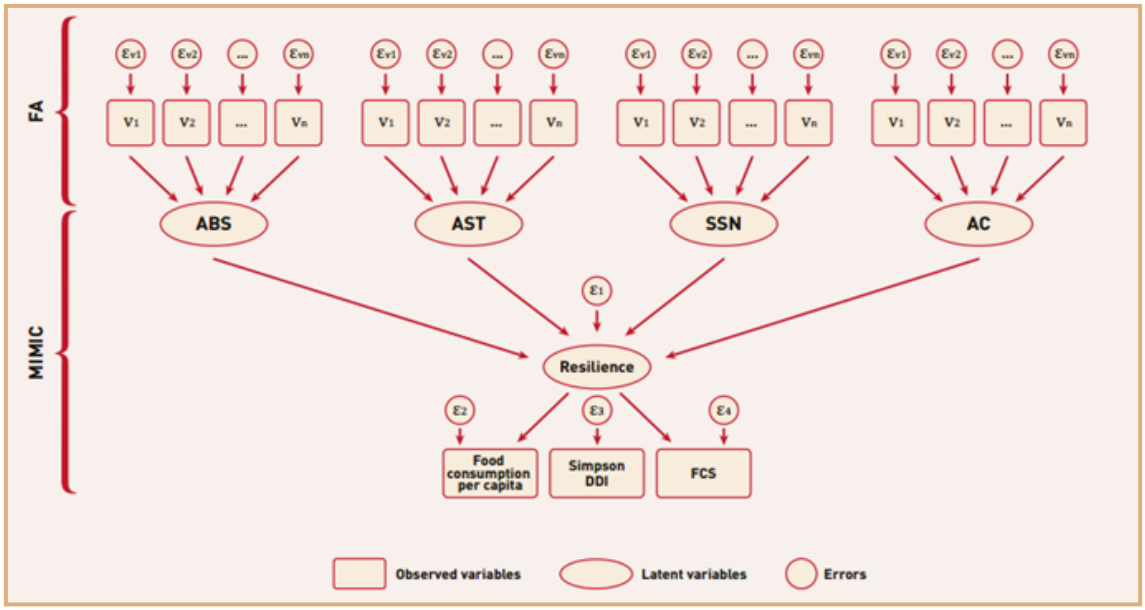
After estimating the pillars, the RCI is jointly estimated through its pillars and by considering the food security indicators. After estimating the RCI, a min-max scaling is used to transform the RCI value into a standardized index, ranging between 0 and 100, with higher values indicating higher resilience capacity.

Table 19. Definition of variables used in each pillar for RCI estimation

Pillars of resilience	Definition	Variables
ABS	Access to basic services shows the ability of a household to meet basic needs by accessing and effectively using basic services, such as sending children to school; accessing water, electricity and sanitation; and accessing markets for selling and buying goods.	Access to safe water; access to safe toilet; access to soap for handwashing, improved cooking energy, improved lighting energy; closeness to services such as school, health facilities, hospitals; markets, financial services and public transport.
AST	Assets, both productive and non-productive, are the key elements of a livelihood as they enable households to produce and consume goods. Examples of productive assets include land and agricultural index (e.g. agricultural equipment), while non-agricultural assets consider the monetary value of the house where the household is located, and its appliances.	Household asset index; ownership of productive tools and equipment, cultivated land area; tropical livestock units (TLU) per capita.
SSN	Social safety nets proxy the ability of the household to access formal and informal assistance from institutions, as well as from relatives and friends.	Access to credit; access to formal transfers; access to informal transfers; access to credit from financial institutions; having a bank account; participation in social networks such as market associations, cooperatives, women and youth networks.

AC	Adaptive capacity is the ability to adapt to a new situation and develop new livelihood strategies. For instance, proxies of the AC are the average years of education of household members and the household perception of the decision-making process of their community.	Average education of the household head and whether they can read and write in any language; number of income sources; and dependency ratio (active/non-active members).

Figure 13. RIMA II model structure



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Annexure 2: Balance test at baseline

Table 20. Balance test at baseline

	Non-beneficiary		Beneficiary			
var	mean1	N1	mean2	N2	mean diff	pvalue
Household size	7.45	117	7.64	523	-0.19	0.536
Household head can read & write	0.60	117	0.60	523	-0.01	0.906
Average education for household head	0.97	117	0.85	523	0.11	0.368
Household head age	39.45	117	43.11	523	-3.66	0.006
Cultivated land	0.12	117	0.18	523	-0.05	0.295
Experienced drought	0.10	117	0.11	523	-0.01	0.707
Experienced conflict	0.13	117	0.02	523	0.11	0.000
Dependency ratio	168.99	117	164.55	523	4.44	0.653
Safe water	0.54	117	0.59	523	-0.06	0.266
Safe toilet	0.33	117	0.14	523	0.20	0.000
Improved cooking energy	0.06	117	0.06	523	0.00	0.895
Distance index	0.11	117	-0.06	523	0.17	0.000
Wealth index	0.21	117	0.19	523	0.02	0.037
Agricultural assets index	0.08	117	0.05	523	0.03	0.023
Total land	0.26	117	0.32	523	-0.06	0.507
Tropical Livestock Units	3.24	117	5.55	523	-2.31	0.000
Access to credit	0.56	117	0.64	523	-0.09	0.073
Access to informal transfers	0.39	117	0.41	523	-0.02	0.666
Access to formal transfers	0.06	117	0.08	523	-0.02	0.452
Number of associations	0.38	117	0.28	523	0.10	0.060

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

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

Ministry of Foreign Affairs

Contact:

FAO Representation in Somalia
FAO-SO@fao.org
Nairobi, Kenya

Resilience Team for Eastern Africa
SFE-RTEA@fao.org
Nairobi, Kenya

Office of Emergencies and Resilience
OER-Director@fao.org

Food and Agriculture Organization of the United Nations
Rome, Italy

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