



M&E protocol for the adaptation outcome

Food Security

Overview

Food insecurity, the lack of access to sufficient, safe and nutritious food to meet dietary needs and food preferences for an active and healthy life, is affecting a high percentage of Madagascar's population. Climate change, mainly by affecting crop production due to extreme weather events and long-term changes to temperature and precipitation, is exacerbating food insecurity in many places. Ecosystem-based adaptation (EbA), the protection, restoration and management of nature, can help people adapt to the negative impacts of climate change by helping achieve adaptation outcomes including food security (Donatti et al. 2020). The CARI method from the World Food Programme (2015) was selected to track the contribution of EbA for food security under climate change because it provides standardized information that combines several dimensions of food security. This document presents a protocol to monitor and evaluate the ability of EbA activities to achieve food security. Although Madagascar is used as a case study for preparing this protocol, the framework can be applied to other areas where EbA has been implemented to address food insecurity driven by climate change.

Table 1. M&E overview of the indicator that can be used to track food security

Indicator definition/unit	Data collection methods	Data sources/origin	Policies alignment
food security index	Household Surveys (WFP CARI method)	CI Madagascar survey	SDG 2.1.2 National Strategy to Face Climate Change in Agriculture-Livestock-Fishery for 2012-2025

1. Case study: Madagascar

Madagascar is one of the most vulnerable countries to climate change in the world. Climate threats include increasing temperature, drought, fluctuations in rainfall, and increased frequency of storms. Owing to their high dependence on agriculture for their livelihoods, chronic food insecurity, physical insolation, and the lack of access to formal safety nets, many smallholder farmers, especially female farmers, rely mainly on rice for their subsistence and are particularly vulnerable to shocks.

To increase the food security of smallholder farmers located near two protected areas (in the CAZ and COFAV corridors) and affected by climate change, the project will implement Ecosystem-based adaptation (EbA) activities including agroforestry and tree planting, conservation agriculture measures (mulching, no tillage, terracing, contour farming, row crops, anti-erosion systems, living hedges, ground cover), livelihood diversification (bee keeping, fishponds, handicrafts), and forest restoration. These conservation agriculture and tree planting activities will improve water flow regulation, soil conservation, and hazard protection, as well as increase product diversification. This leads to more resilient production of subsistence and cash crops to respond to droughts and extreme weather events, thereby increasing food security.

2. Theory of Change

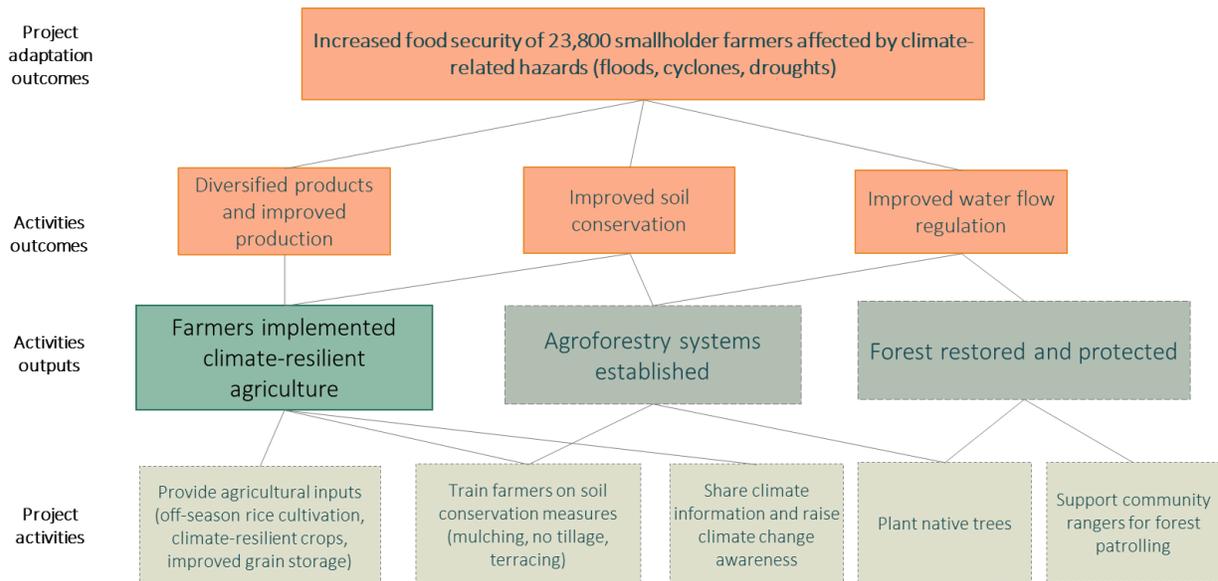


Figure 1: The Theory of Change (ToC) illustrates how the implementation of EbA and EbA-enabling activities will lead to the increased food security of 23,800 smallholder farmers. This ToC represents only one part of the overall GCF Madagascar project "Sustainable landscapes in Eastern Madagascar".

EbA activities form the physical foundation of the project and will improve water flow regulation and soil conservation, as well as diversify products and increase hazard protection. The EbA-enabling activities (sharing climate information and raising awareness on climate change) will also be implemented. Overall, these activities will target those who have not been classified as food secure by a certain year, allowing for more resilient production of subsistence and cash crops to respond to droughts and extreme weather events, which will result in the increased food security of 23,800 smallholder farmers. The activities target households that are members of local associations (VOI), women's associations, and groups of people affected by the creation of protected areas. These households are vulnerable to climate change and many are food insecure. Other farmers are assumed to be less affected by climate risks, less vulnerable, and to have already adopted sustainable agriculture techniques.

3. Indicator's rationale and definitions

For assessing food security, we used the food security index (FSI), the indicator selected to monitor and evaluate whether the project activities lead to food security of the households within the project area. We used the Consolidated Approach for Reporting Indicators of Food Security (CARI) method, designed by the World Food Programme (WFP). CARI combines a suite of three food security indicators (see more details in section 4.2) into a summary indicator. The Food Security Index represents the overall food security status of the population of interest. In this method, each individual household is categorized into 4 food security groups: 1) Food secure 2) Marginally food secure 3) Moderately food insecure 4) Severely food insecure (see definitions in section 3.2). This information is then combined to assess the food security of the target population. This indicator was selected because of its proven ability to track food security changes in a quantitative way at the household level. It has been used by WFP to track progress and effectiveness of food-related operations. A scientific comparative study of different food security indexes recommended the use of CARI when planning interventions related to long-term chronic food insecurity (Butaumocho and Chitiyo 2017).

3.1. Linkages with national policies and priorities related to adaptation

The adaptation outcome indicator chosen is directly aligned with the Sustainable Development Goal on Zero Hunger (SDG 2) and one of its indicators, *SDG: 2.1.2 Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale*. The chosen indicator covers agriculture, one of the priority sectors according to the National Climate Change Policy (2015) and aligns with Madagascar's concerns expressed in the Nationally Determined Contribution (NDC). This document notes that the destruction of agricultural crops and fields due to heavy irregular rains, floods, and stormy winds is causing food insecurity, especially in the southern and eastern parts of the country. The NDC calls for the development

of climate-resilient Agriculture Integrated Model pilot projects and programs to reduce the number of people affected by hunger, and to restore natural forests and habitat connectivity (35,000 ha). Maintaining food security in the face of disasters is also an objective of the National Disaster Risk Reduction Strategy 2016-2030 (activity R 3.3) and the National Strategy to Face Climate Change in Agriculture-Livestock-Fishery for 2012-2025 (Priority A.2), which aims to reduce the number of food insecure households and the period of time that households are annually food insecure (33% of households and 5 months in 2014).

3.2. Definitions

- **Food security:**

Food security exists when all people, always, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. The four pillars of food security are availability, access, utilization and stability. The nutritional dimension is integral to the concept of food security (FAO,2009 and WFP 2015).

- **Food Secure:** when a person or a group of people are able to meet essential food and non-food needs (e.g. electricity, transportation and medical expenses) without engaging in atypical coping strategies
- **Marginally Food Secure:** when a person or a group of people has minimally adequate food consumption without engaging in irreversible coping strategies; unable to afford some essential non-food expenditures
- **Moderately Insecure:** when a person or a group of people has significant food consumption gaps OR is marginally able to meet minimum food needs only with irreversible coping strategies
- **Severely Insecure:** when a person or group of people has extreme food consumption gaps OR has extreme loss of livelihood assets that lead to food consumption gaps or worse

- **Small-holder subsistence farmers:**

Farmers with less than 2 ha, often relying on household members for most of their labor and cultivating land primarily for subsistence, often living in poverty with chronic food security issues (IFAD 2009, OECD 2015). Around 70-80 % of farmers in Madagascar are smallholders, with a national average upland rice area per farmer of 1.28 ha.

- **Direct beneficiaries:**

People who are targeted by a project or activity as per project objective and receive adaptation support that is of high intensity/effort (e.g. farmers receiving agricultural inputs). Direct beneficiaries to be considered as such must be aware that this support for adaptation is being received and should be counted individually (and disaggregated by sex) (CI Adaptation Strategy 2021 and GCF 2021).

4. Methodology

4.1. Data sources and frequency

It is recommended that household surveys be conducted at least twice during the duration of the project to track changes in food security of smallholder farmers. This includes a baseline survey conducted before the implementation of the project activities followed by at least one additional set of interviews with the same households during the same month after the activities have been implemented. In Madagascar the household surveys were conducted in March-April, which are the months during which farmers are between harvests and often face the biggest food security challenges.

4.2. Data measurements/collection

The three food security indicators used to build the CARI food security index are the Food Consumption Score, the Food Expenditure Share, and the livelihood coping strategies categories. The specific questions used to assess each can be found in the annex. An algorithm is used to assign each surveyed household into one of the four food security groups (see analysis).

The household survey should randomly target a portion of the direct beneficiaries of the adaptation interventions, and the number of households to be interviewed should be at least a certain percent of the target beneficiaries to have statistical significance. In the case of the Madagascar project, 826 households have been selected and will be interviewed 4 times. Results will be disaggregated by area and gender of the head of the household. If time and resources allow, and if an impact evaluation can be carried out, households not receiving support from the project can also be interviewed (control group).

4.2.1. Food Consumption Score

The food consumption score (FCS) is an indicator on dietary consumption that includes both quantity and quality considerations. The quantity aspect of the indicator is calculated using the frequency of consumption (number of days) of eight food groups consumed by a household during the thirty days before the survey. The quality aspect of the indicator is calculated using the dietary diversity of the household that is assessed through the number of different food groups consumed over the last thirty days. The description of how this score is calculated can be found in the annex.

4.2.2. Food Expenditure Share

The food share of expenditure helps estimate how much of the household budget is used for food. The index is based on food expenditure shares, with the most food insecure households spending greater than 75% of their budget on food and food secure households spending less than 50%. The description of how this score is calculated can be found in the annex.

4.2.3. Livelihood coping strategy categories

The livelihood coping strategy categories are used to assess how households meet their basic food needs despite being affected by shocks. It is used to understand the frequency and severity of changes in food consumption when the household faces a shortage of food. Understanding household strategies used to adapt to recent shocks provides insight into how likely they will be to meet challenges in the future. The household head is asked whether any member in their household had to engage in any of the ten coping strategies because there was not enough food or money to buy food during the past 30 days. Four stress strategies, three crisis strategies, and three emergency strategies were determined based on the severity of the strategies. The strategies were selected following the CARI methodology and based on known strategies used in the region from previous household surveys. The higher the value of the index, the higher the degree of food insecurity. The description of how this score is calculated can be found in the annex.

4.2.4. Food Security Index

Table 5: Scorecard: Overview of the four categories in the CARI Food Security Index (1-4) that combine three sub-indexes of Food Consumption, Food Expenditure and Coping Strategies.

		Food Secure (1)	Marginally Food Secure (2)	Moderately Insecure(3)	Severely Insecure (4)
Current Status	Food consumption score	Acceptable		Borderline	Poor
Coping Capacity	Food Expenditure Share	< 50%	50% -- 65%	65% -- 75%	≥ 75%

	Livelihood coping strategy categories	No asset depletion	Stress Strategies (e.g. sell non-prod assets)	Crisis Strategies (e.g. sell prod assets)	Emergency Strategies (e.g. sell major prod assets – land)

We used the scores of the three indexes above to calculate the CARI composite indicator for food security. Following the CARI methodology, the FSI is calculated by averaging the score between food expenditure and coping strategies and then average again with food consumption (see aneex).

FSI	Food insecurity index	Share
0-1	Food secure (1)	% HH
1-2	Marginally food secure (2)	% HH
2-3	Moderately food insecure (3)	% HH
3-4	Severely food insecure (4)	% HH

Table 3: Example of Results using the CARI Console

4.3. Data analysis

Based on the answers to the household survey, the three sub-indexes that form the CARI Food Security Index were calculated (see Table 5). Analyses were performed using statistical software (SPSS, R, or STATA) or excel, as well as geospatial information tools (QGIS, ArcGIS). The percentage of households in each food security index at the baseline will be compared with the percentages after the project is implemented to assess the contribution of EbA in achieving food security.

4.4. Interpreting your results

The baseline surveys were conducted in 2018. Results show that households in the project areas suffer from food insecurity issues (see Figure 2). On average, households in both CAZ and COFAV project areas are moderately to severely food insecure. The households in COFAV have a statistically significant higher food insecurity compared to those in CAZ (t-test with weighted averages and standard errors clustered at VOI level). When an end line survey is conducted at the end of the project, i.e. when all benefits of the project activities are realized, we expect that

the project activities will lead to an increase in the number of households that are “food secure” (e.g. 80-100%).

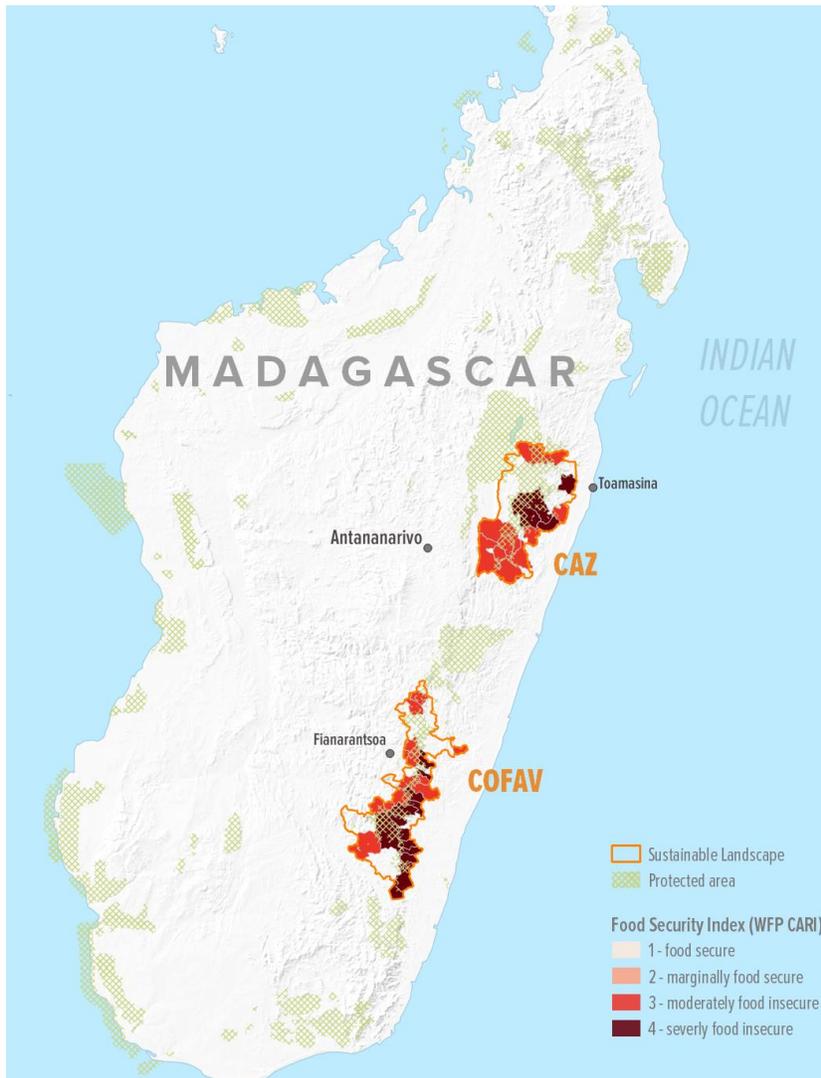


Figure 2. Map of CAZ and COFAV municipalities and average food security of households located in each during the baseline survey. Most of the municipalities have moderately or severely food insecure farmers.

4.5. Data reporting, quality, and limitations

Each data collection must pass through a data quality and control process. The first level is performed directly during the interviews to ensure that data collection proceeds smoothly. Staff conduct spot checks by going to the field and randomly checking questionnaires. The second level of control aims to check that the questionnaire is fully and accurately filled by the enumerators. Specifically, they check whether there are missing or unclear responses, and if

respondents' names are reported correctly. In a third level of control, the accuracy of the data included in the database is verified by comparing it with paper questionnaires. A final check can be done by performing summary analysis and cross-checking trends in answers. The process is the same for both digital and paper forms.

There are limitations to the CARI methodology. First, as is the case when multiple data from different dimensions are summarized into a single combined index, there is a simplification of information. A second caveat is related to the standardized nature of the indicator that can only partially cover locally specific information. A third caveat is the perception nature of several questions that rely on the memory of the household heads interviewed. To overcome these limitations, it is important to collect or compare the information with additional data beyond what is suggested here for the food security index (e.g. qualitative data with key informants or focus group discussions). However, if a sufficient sample size is used, the overall conclusion can be met with a high level of confidence.

4.6. Data repository and management

Household survey answers should be saved in an excel database and an encrypted excel with PII (personal identification information) only accessible in a separate file with a password, for example in Onedrive. Codified information from the excel file should then be entered in one single dataset that contains the information collected in the survey, except the PII. The M&E manager should oversee the update of the database with the household data and ensure that all involved parties use the same version of the database. All paper copies of surveys implemented, with the PII removed, should be scanned and saved in an external hard drive. Paper copies, with the PII removed, should be stored in the office.

At the project conclusion, the dataset with all information collected in all surveys (except personal identified information) should be stored in a cloud-based repository curated by a different institution for perpetuity of the data collected and for access by colleagues that were not involved in the project.

5. Literature

United Nations World Food Programme-Food security analysis (VAM). Consolidated Approach to Reporting Indicators of Food Security (CARI) Guidelines; United Nations World Food Programme, Food Security Analysis (VAM): Rome, Italy, 2015.

Butaumocho, B. and Chitiyo, P.T., 2017. A Comparative Analysis Of Household Food Security Measures In Rural Zimbabwe. *International Journal of Food and Agricultural Economics (IJFAEC)*, 5(1128-2018-067), p.41.

Isaura, E., Chen, Y.C. and Yang, S.H., 2018. The association of food consumption scores, body shape index, and hypertension in a seven-year follow-up among Indonesian adults: A longitudinal study. *International journal of environmental research and public health*, 15(1), p.175.

6. Data collection tool

Module F: Food Security Food consumption

[In this part of the interview we want to understand your household food consumption and how it has changed through time]

1.	How many days did the members of your household eat the following food items, prepared and/or consumed at home, <u>in the last 30 days</u>? <i>If hard to remember, check for the last 7 days and multiple by 4, if answer is 0 for the last 7 days, check for the whole month</i>	# of days eaten <i>(0 if not consumed)</i>
1	Cereals, grains, roots and tubers Rice, pasta, bread, sorghum, millet, maize, fonio, potato, yam, cassava, white sweet potato, breadfruit, cooked banana)	<input type="text"/>
2	Legumes / nuts : beans, cowpeas, peanuts, lentils, nut, soy, pigeon pea and / or other nuts	<input type="text"/>
3	Milk and other dairy products: fresh milk / sour, yogurt, cheese, other dairy products (Exclude margarine / butter or small amounts of milk for tea / coffee)	<input type="text"/>
4	Meat, fish and eggs: goat, beef, chicken, pork, blood, fish, including canned tuna, escargot, and / or other seafood, eggs (meat and fish consumed in large quantities and not as a condiment)	<input type="text"/> If 0 skip to Q5
4.1	Flesh meat: beef, pork, lamb, goat, rabbit, chicken, duck, other birds, insects, bush meat	<input type="text"/>
4.2	Organ meat: liver, kidney, heart and / or other organ meats	<input type="text"/>
4.3	Fish/shellfish: fish, including canned tuna, escargot, and / or other seafood (fish in large quantities and not as a condiment)	<input type="text"/>
4.4	Eggs	<input type="text"/>
5	Vegetables and leaves: spinach, onion, tomatoes, carrots, peppers, green beans, lettuce, etc	<input type="text"/> If 0 skip to Q6
5.1	Orange vegetables (vegetables rich in Vitamin A): carrot, red pepper, pumpkin, orange sweet potatoes,	<input type="text"/>
5.2	Green leafy vegetables: spinach, broccoli, amaranth and / or other dark green leaves, cassava leaves, sweet potato leaves, moringa levels, palm of the heart	<input type="text"/>
6	Fruits: banana, litchi, jackfruit, apple, lemon, mango, papaya, apricot, peach, etc	<input type="text"/> If 0 skip to Q7
6.1	Orange fruits (Fruits rich in Vitamin A): mango, papaya, apricot, peach	<input type="text"/>
7	Oil / fat / butter: vegetable oil, palm oil, shea butter, margarine, other fats / oil	<input type="text"/>

8	Sugar, or sweet: sugar, honey, jam, cakes, candy, cookies, pastries, cakes and other sweet (sugary drinks)	<input type="checkbox"/>
9	Condiments / Spices: tea, coffee / cocoa, salt, garlic, spices, yeast / baking powder, lanwin, tomato / sauce, meat or fish as a condiment, condiments including small amount of milk / tea coffee. Ve tsin	<input type="checkbox"/>

food expenditure

<p>2. Food items</p> <p>[enumerators will do most of the calculations. Please just check if the HH bought products, which ones, how many times, and prices (the prices should be checked with local market).</p>	<p>1. Did you purchase any of the following items during the <u>last 30 days</u> for domestic consumption?</p> <p>If 'no', enter '0' and proceed to next food-item. If 'yes', ask to estimate the total cash and credit expenditure.</p>	<p>2. During the <u>last 30 days</u> did your household consume the following foods without purchasing them?</p> <p>Check question 37 and for consumed items, ask to estimate the value of the non-purchased food items</p>		
	1. cash (local currency)	2. credit (local currency)	3. value (local currency)	
1.	Cereals (maize, rice, sorghum, wheat, bread)	<input type="text"/>	<input type="text"/>	<input type="text"/>
2.	Tubers (sweet potatoes, cassava)	<input type="text"/>	<input type="text"/>	<input type="text"/>
3.	Pulses (beans, peas, groundnuts)	<input type="text"/>	<input type="text"/>	<input type="text"/>
4.	Fruits & vegetables	<input type="text"/>	<input type="text"/>	<input type="text"/>
5.	Fish/Meat/Eggs/poultry	<input type="text"/>	<input type="text"/>	<input type="text"/>
6.	Oil, fat, butter	<input type="text"/>	<input type="text"/>	<input type="text"/>
7.	Milk, cheese, yogurt	<input type="text"/>	<input type="text"/>	<input type="text"/>
8.	Sugar/Salt	<input type="text"/>	<input type="text"/>	<input type="text"/>
9.	Tea/Coffee	<input type="text"/>	<input type="text"/>	<input type="text"/>
10.	Other meals/snacks consumed outside the home	<input type="text"/>	<input type="text"/>	<input type="text"/>

Household Expenditure

3.	<p>1. Did you purchase the following items during the <u>last 30 days</u> for domestic/own consumption?</p> <p><i>If none, write 0</i></p>	<p>[enumerators will do most of the calculations. Please just check if the HH bought products, which ones, how many times, and prices (the prices should be checked with local market)]</p>	<p>2. <u>In the last 6 months</u> how much money have you spent on each of the following items or service?</p> <p><i>If none, write 0.</i></p>	<p>[enumerators will do most of the calculations. Please just check if the HH bought products, which ones, how many times, and prices (the prices should be checked with local market)]</p>
----	--	---	--	---

		Estimated expenditure (local currency)		Estimated expenditure (local currency)	
1	Alcohol/Palma wine & Tobacco	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	9	Medical expenses, health care	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
2	Soap & HH items	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	10	Clothing, shoes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
3	Transport	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	11	Education, school fees, uniform,	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
4	Fuel (wood, paraffin, etc.)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	12	Debt repayment	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
5	Water	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	13	Celebrations / social events	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
6	Electricity/Lighting	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	14	Agricultural inputs	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
7	Communication (phone)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	15	Savings	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
8	Rent	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	16	Constructions/house repairs	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

Livelihood-based coping strategies

4. During the <u>past 30 days</u>, did your household engage in any following behaviors due to a lack of food or a lack of money to buy food?		0 = No, because I did not face a shortage of food 1 = No, because I already sold those assets or have engaged in this activity within the last 12 months and cannot continue to do it 2= Yes
1.1 stress	Spent savings or borrowed money, sold small assets for food or repairing	<input type="text"/>
1.2 stress	Reduced meals quantities/times or borrowed food or eaten elsewhere	<input type="text"/>
1.3 stress	Harvested wild food	<input type="text"/>
1.4 stress	Changed seed varieties, land management changes	<input type="text"/>
1.5 crisis	Withdrew children from school	<input type="text"/>
1.6 crisis	harvested immature crops (e.g. green maize) or eat seed for future planting	<input type="text"/>
1.7 crisis	Sold productive assets or drastically reduce their use (bicycle, machines, fertilizers)	<input type="text"/>
1.8 emergency	Sold or abandoned land or building	<input type="text"/>
1.9 emergency	Sold last female animal or last seeds reserves	<input type="text"/>
1.10 emergency	Begged	<input type="text"/>

7. Detailed data calculation

Food consumption calculations in the database:

Total days: $\text{SUM}(Q38.1-38.9*\text{coefficient})$

Coefficients:

Q38.1 (cereals) = 2

Q38.2 (legumes) = 3

Q38.3 (milk) = 4

Q38.4 (meat) = 4

Q38.5 (vegetables) = 1

Q38.6 (fruits) = 1

Q38.7 (oils) = 0.5

Q38.8 (sugar) = 0.5

Q38.9 (condiments) = 0

FC_tot: 0-84 days* = 4 (poor)
85-140 days = 3 (borderline)
141-max = 1 (acceptable)

* The categories have been slightly adapted from the original CARI method, which considered 1 week compared to 1 month. We multiplied the total days in the original CARI methodology by 4 (to convert to months).

Food expenditure calculations:

$\$_{\text{Food monthly}} = \text{SUM}(39.1, 39.2, 39.3)$

$\$_{\text{Non Food monthly}} = \text{SUM}(40.1) + \text{SUM}(40.2)/6$

Food expenditure share = $\$_{\text{Food monthly}} / (\$_{\text{Food monthly}} + \$_{\text{Non Food monthly}})$

FE_tot: 0-49.9 % = 1 (Food Secure)
50-64.9 % = 2 (Marginally Food secure)
65-74.9 % = 3 (Moderately Food Insecure)
75-100% = 4 (Severely Food insecure)

Coping strategies calculations:

Strategy_No depletion (1) = all other cases

Strategy_Stress (2) = $\text{IF}(\text{SUM}(41.1.1, 41.1.2, 41.1.3, 41.1.4) > 0, 1, 0)$

Strategy_Crisis (3) = $\text{IF}(\text{SUM}(41.1.5, 1.6, 1.7) > 0, 1, 0)$

Strategy_Emergency (4) = $\text{IF}(\text{SUM}(41.1.8, 1.9, 1.10) > 0, 1, 0)$

FS_tot: $\text{IFS}(\text{Strategy_Emergency} \geq 1, 4, \text{Strategy_Crisis} \geq 1, \text{Strategy_Stress} \geq 1, 2, 1)$

Food security index calculatons:

`Food_Security_index=ROUND(AVERAGE(FC_tot, AVERAGE(FE_tot,FS_tot)))`