Integrated Natural Resource Management (INRM)

HEARTH Monitoring and Evaluation Toolkit

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Authors:	Samantha Cheng, Mike Duthie, Daniel Evans, Aaron Ferguson, Andres Gomez, Scott Miller, Christina Seybolt, and Meredith Wiggins
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Submitted by:
Robin Martino, Chief of Party
Integrated Natural Resource Management
DAI
7600 Wisconsin Ave, Suite 200
Bethesda, MD, 20814, USA
Telephone: 301.771.7600
Fax: 301.771.7777
www.dai.com

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Contents

Tables and Figures

Acronyms

AFOLU	Agriculture, Forestry, and other Land Use
ARSSI	Ability to Recover from Shocks and Stresses Index
ATR	Ability to Recover
A-WEAI	Abbreviated - Women's Empowerment in Agriculture
AWI	Absolute Wealth Index
CCP	Conservation and Communities Project
CE	Conservation Enterprise
CHW	Community Health Worker
CIFOR	Center for International Forestry Research
CPI	Consumer Price Index
CWI	Comparative Wealth Index
DDL	Development Data Library
DHS	Demographic and Health Surveys
DNA	Deoxyribonucleic Acid
EBV	Essential Biodiversity Variables
ENRM	Environmental and Natural Resource Management
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization
FFP	Food for Peace
FIES	Food Insecurity Experience Scale
FTF	Feed the Future
GCC	Global Climate Change
GESI	Gender Equity and Social Inclusion
GFW	Global Forest Watch
GhG	Greenhouse Gas
GIS	Geographic Information System
GLAD	Global Land Analysis and Discovery
GPS	Global Positioning System
HAZ	Height for Age Z Score
HEARTH	Health, Ecosystems, and Agriculture for Resilient Thriving Societies
IIED	International Institute of Environment and Development
IM	Instrument Measurement
INRM	Integrated Natural Resource Management
IP	Implementing Partner
IRB	Institutional Review Board
IWI	International Wealth Index
KAP	Knowledge, Attitude and Practices
LandPKS	Land Potential Knowledge System
LCC	Land Capability Classification
LCU	Local Currency Units

LMIC	Low-to-Middle-Income-Countries
LSMS	Living Standards Measurement Studies
MCV	Measles Containing Vaccination
MDD-W	Minimum Dietary Diversity of Women
MERL	Monitoring, Evaluation, Research, and Learning
MII	Method Information Index
NGO	Non-Government Organization
NTFP	Non-Timber Forest Products
OFDA	Office of Foreign Disaster Assistance
ORS	Oral Rehydration Solution
PBSs	Population-Based Survey
PEN	Poverty Environment Network
PII	Personally Identifiable Information
PIRS	Performance Indicator Reference Sheet
PMA	Performance Monitoring for Action
PPI	Poverty Probability Index
PPP	Purchasing Power Parity
PSE	Private Sector Engagement
RAND	Research and Development
TP	Total Production
SAGE	Site-Level Assessment of Governance and Equity
SDG	Sustainable Development Goals
SEI	Shock Exposure Index
SES	Socioeconomic Status
SWPER	Survey-Based Women's Empowerment Index
UP	Units of Production
USAID	United States Agency for International Development
USD	United States Dollar
USG	United States Government

Overview

Background

The United States Agency for International Development (USAID) has long recognized the importance of cross-sectoral programming to advance sustainable development. Integration is key to both the Biodiversity Policy and the Environmental and Natural Resource Management (ENRM) Framework, and to operationalizing a One Health approach to development. Yet, monitoring, evaluation, research, and learning (MERL) can be a challenge for integrated activities because practitioners need to assess performance across multiple sectors and technical elements. USAID's Health, Ecosystems, and Agriculture for Resilient Thriving Societies (HEARTH) program is working with the Integrated Natural Resource Management (INRM)[1] team to help USAID Missions meet this challenge.

Developing a cross-sectoral package of Monitoring, Evaluation, Research, and Learning tools

The HEARTH program fosters public-private partnerships to advance integrated investments in conservation, agriculture, health, governance, and other sectors. HEARTH aims to promote the conservation of threatened ecosystems and the well-being and prosperity of communities that depend on them. While USAID Missions co-design, fund, and manage integrated activities in the field, a cross-bureau HEARTH team in Washington supports the design process and MERL across the program.

Together, HEARTH and INRM have created a suite of indicators and guidance that will help USAID Missions monitor HEARTH progress and aggregate common metrics from across HEARTH sites to build the evidence base around the effectiveness of integrated strategic approaches. Using common indicators to monitor metrics common to multiple HEARTH sites will facilitate comparison across similar components of different HEARTH activities. This toolkit packages these tools as customizable modules for different sectors—including biodiversity and climate change, food security, health, governance, and economic growth—so that individual HEARTH activities can apply the modules most relevant to their work. The modules draw on global best practices in each sector to allow robust and consistent measurement of a broad range of outcomes for integrated programs.

[1] INRM is a five-year Task Order that provides on-demand support services and technical assistance for USAID Missions, Bureaus, and Independent Offices, managed by the Center for Environment, Energy, and Infrastructure (EEI) in the Bureau for Development, Democracy, and Innovation (DDI). The activity is designed to help USAID Operating Units (OUs) achieve higher impact environment programming and to support the uptake of principles and approaches outlined in the Agency's ENRM Framework.

How can Missions and implementing partners use this toolkit to measure environmental and development outcomes?

This toolkit was designed as a "one stop shop" for key indicators across the multiple sectors represented in HEARTH. The toolkit indicators were selected based on an extensive technical review by sector experts at INRM and USAID/Washington, with a focus on robust, credible metrics that are widely used in each sector. Not all indicators will be relevant to each HEARTH activity, nor do they replace adaptive management indicators that measure progress toward intermediate results. Rather, the toolkit indicators should compliment activity-specific context and adaptive management indicators that are rooted in the local context. HEARTHs can select the modules and indicators relevant to their theory of change and include them in data collection tools, which may include household surveys and approaches to biophysical measurement, as relevant.

Alignment with the Triple Bottom Line and Sustainable Development Goals

The goals of the cross-sectoral HEARTH MERL system align with the "Triple Bottom Line" framework focusing on the "3 Ps" – People, Planet, and Profit/Prosperity. This framework aims to measure the social, environmental, and financial impacts of activities, and is at the core of HEARTH's model of private sector engagement (PSE). "People" and "Planet" are at the center of the human well-being and biophysical indicators respectively, and align with goals of improving health, education, food security, and ensuring healthy environments, while protecting the planet from degradation and other threats. "Prosperity" includes poverty reduction, conservation enterprise development, and profitability for the private sector partners engaged in HEARTH activities.

The Sustainable Development Goals expand this framework to include Peace and Partnerships. "Peace" is integrated across the HEARTH activities, many of which aim to improve governance of natural resources and thereby reduce conflict and displacement. "Partnerships" between the public and private sector are at the base of the HEARTH model, and many HEARTH activities additionally focus on increased participation and inclusion of marginalized groups. The HEARTH MERL indicator modules are organized using this People, Planet, Prosperity, Peace, and Partnerships framework, which highlights the interconnected and cross-sectoral nature of HEARTH's intended outcomes (see **Figure 1** below).

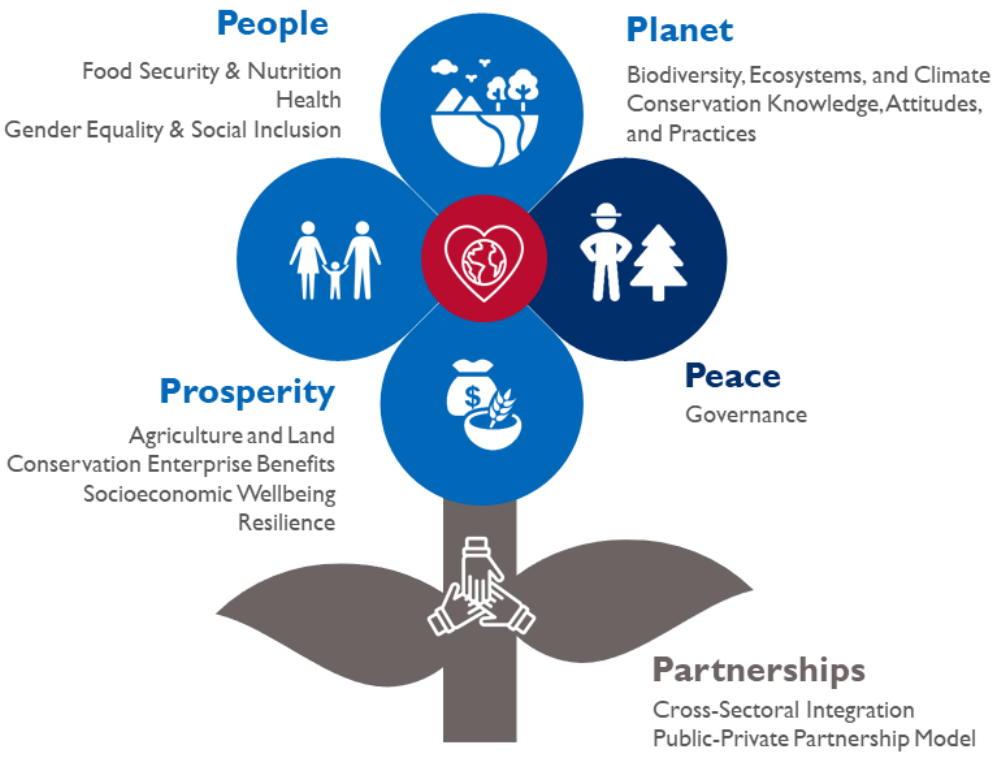


Figure 1: *HEARTH MERL Framework: People, Planet, Prosperity, Peace, and Partnerships*

Toolkit Development and Key Outcomes of Interest

INRM reviewed situation models, results chains, and technical approach documents for a set of HEARTH activities to identify a common set of outcomes and indicators across the HEARTH portfolio. Based on a preliminary review, a set of outcome sectors were identified that most closely linked to the HEARTH activities' theories of change in line with the 5-Ps Framework. Outcomes shared among three or more activities were prioritized to help ensure that findings can be aggregated across HEARTH activities. For the full list of key outcomes of interest and the HEARTH portfolio indicators by sector (see **Table 1** below).

Indicator Guidance and Core Household Questionnaire

This document contains guidance for defining and collecting data for each of these indicators for Missions and implementing partners (IPs), including Performance Indicator Reference Sheets throughout. This guidance draws heavily on established best practices, such as the Demographic and Health Surveys

and Feed the Future programs for "People" indicators. In addition to this guidance, INRM developed a core questionnaire to provide a basis for household surveys to facilitate ease of take-up. It should be emphasized that it is important for Missions and IPs to adapt the questionnaire to their local country context – which might include adding/removing answer choice options, updating question text or translations, etc. Areas where edits for local context are typically required are identified in the tool and following guidance.

While most indicators will be collected through household surveys, some rely on other data collection approaches – in particular, the Site-Level Assessment of Governance and Equity (SAGE) tool for measuring aspects of governance, administrative data from private sector partners on employment or agricultural prices, and biophysical measurements from geospatial and other data sources. This guidance includes discussions on sampling for household data collection as well as other data collection approaches, as relevant.

Table 1: *Overview of Outcomes and Recommended Indicators by Sector*

Food Security & Nutrition

Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
People	Increased dietary diversity	• Percent of women of reproductive age consuming a diet of minimum diversity (MDD-W)
	Improved household food security	• Percent of households experiencing moderate and severe food insecurity, based on the Food Insecurity Experience Scale (FIES)
	Improved children's dietary intake	• Percent of children 6-23 months receiving a minimum acceptable diet (MAD)
	Reduction of potential exposure to zoonotic diseases	• Percent of households consuming high-risk wild meat in the past year

Gender Equality & Social Inclusion

Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
People	Increased women's role in decision-making	• Percent of women achieving high empowerment on the survey-based women's empowerment index (SWPER)
	Reduced acceptance of gender-based violence	
	Change in women's time use	• Percent of women spending 11 or more hours per day on non-paid work

Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
	Greater awareness of the importance of gender equality and women's empowerment in men and boys	• Percent of households with gender parity on decision-making • Percent of men that do not justify violence against women

Health

Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
People	Increased use of family planning services	• Percent of women/men of reproductive age who are using a contraceptive method • Percent of women given information on contraception methods (Method Information Index)
	Increased access to maternal health services	• Percent of pregnant women who have attended at least two comprehensive antenatal clinics • Percent of pregnant women who deliver assisted by a skilled attendant at birth • Percent of pregnant women who deliver at a health facility
	Increased health expenditures to seek treatment for sick family members	• Average amount of health expenditures per sick family member
	Increased access to healthcare services	• Average number of outpatient consultations per sick family member
	Increased access to treatment for common childhood illnesses	• Average number of visits for community-based treatment per sick child five and under • Percent of children 0-35 months of age who received their first dose of measles-containing vaccine by 12-months of age
	Improved access, reliability, and affordability of safe household drinking water	• Number of people gaining access to basic drinking water services • Number of people gaining access to safely managed drinking water services • Number of people receiving improved service quality from an existing basic or safely managed drinking water service • Percent of children under five with diarrhea in the past two weeks

Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
		• Percent of children under five with diarrhea in the past two weeks treated with ORS

Biophysical

Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
Planet	Population status of target species maintained or improved	• Change in presence/absence of target species(s) across target area over a set time interval • Change in abundance of target species(s) across target area over a set time interval
	Improved or maintained condition of natural ecosystems	• Change in presence/absence of target species(s) across target area over a set time interval* • Change in abundance of target species(s) across target area over a set time interval* • Change in total area of one or more classes of vegetation, e.g., forest class, across the defined spatial unit(s) • Change in Land Capability Classification (LCC) * *Target areas selected here should reflect areas that indicate change to ecosystem condition, e.g., areas important for wildlife movement.*
	Reduce loss of habitats for biodiversity	• Change in total area of one or more classes of vegetation, e.g., forest class, across the defined spatial unit(s)
	Pollution of water sources reduced	• Turbidity of natural aquatic environments (surface, freshwater sources) near agricultural activity sites • pH of natural aquatic environments (surface, freshwater sources) near agricultural activity sites • Presence / absence of E. coli bacteria in drinking water sources (freshwater, surface) around agricultural activities sites • Change in concentration of nitrites and nitrates in natural aquatic environments (surface,

Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
		freshwater sources) near agricultural activity sites
	Reduced greenhouse gas (GhG) emissions from focal enterprise activities	• GhG emissions, estimated in metric tons of CO2 equivalent, reduce sequestered, or avoided in full or in part by USG assistance • Number of hectares under improved management expected to reduce greenhouse gas emissions as a result of USG assistance

Conservation Knowledge, Attitudes, and Practices

Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
Planet	Improved knowledge and attitudes towards conservation and natural resource management (NRM)	• Average score measuring the perceived importance of protecting nature and the environment
	Reduced unsustainable use of resources	• Percent of households who engaged in unsustainable use of ecosystem resources in the past year • Percent of households that cleared land for cultivation in the past year

Agriculture and Land

Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
	Increased agricultural productivity	• Average crop production, by targeted crop • Average crop yield, by targeted crop • Percent of households participating in farmer groups
Prosperity	Increased use of sustainable/regenerative practices	• Percent of households using HEARTH promoted technologies/practices • Number of hectares under improved management practices or technologies
	Increased land tenure and security	• Percent of households with legally recognized land tenure/rights • Percent of households with perceived tenure security

Conservation Enterprise Benefits

Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
Prosperity	Increased benefits from conservation enterprises	• Average household income from environment products • Percent of households that used or benefitted from any community services provided by the project • Number of full-time equivalent jobs created

Resilience

Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
Prosperity	Increased household resilience	• Average score on the ability to recover from shocks and stresses index (ARSSI)
	Use of natural resources to reduce effects of shocks and stresses	• Average score measuring the extent that households rely on natural resources during times of stress
	Increased use of renewable and clean energy sources	• Percent of households using renewable fuel sources or grid-connected electricity

Socio-Economic Well-being

Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
Prosperity	Increased socio-economic well-being	• Percent of households below the comparative threshold for the poorest quintile of the Asset-Based Comparative Wealth Index (CWI)
	Increased financial inclusion	• Percent of households participating in micro-finance, lending programs and/or banking

Governance

Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
Peace	• Increased community participation in resource governance • Increased rights and/or security	• Average score across Site-Level Assessment of Governance and Equity (SAGE) outcome areas

Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
	• Strengthened resolution mechanisms • Improved monitoring and enforcement	

Private Sector Engagement

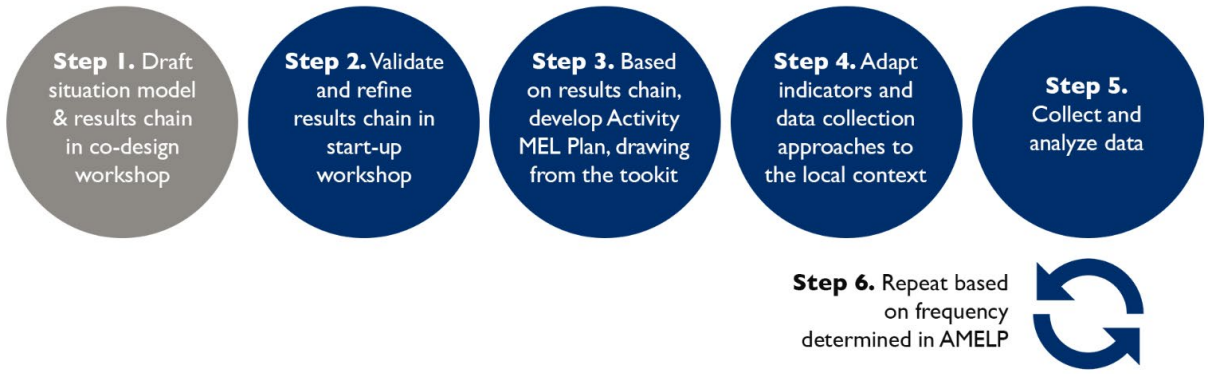
Link to 5 Ps	Outcomes	HEARTH Portfolio Indicators
Partnerships	Increased private sector engagement	• Number of USG engagements jointly undertaken with the private sector • Number of private sector enterprises that engaged with the USG • Investment leveraged from private sector engagements with the USG to support U.S. Foreign Assistance objectives (in United States Dollar (USD))

How To Use This Toolkit

This toolkit presents a **menu of options** for outcomes and recommended indicators across the HEARTH activities. Before using this toolkit, activities should have developed a robust theory of change – through first drafting their situation model and results chains during the co-design workshops, many of which have been completed already, and then validating and refining those results chains during start-up workshops.

Based on the activity theory of change, HEARTHs should develop their Activity MERL Plan, which should draw directly from the toolkit. It is not expected that all outcomes or indicators will be relevant for all activities, but that activities should select those in line with their results chains and activity theory of change. Additionally, there might be activity-specific outcomes not included in this toolkit because they were not generally applicable across the HEARTH portfolio, and Missions and IPs should therefore include additional indicators in their MERL plans, as relevant.

When developing activity MERL plans, the indicators in this toolkit are intended to be used both to **standardize reporting for monitoring data, as well as a basis for evaluation data collection**. While monitoring trends in these indicators over time may be important for some activities, USAID anticipates that Missions and IPs will also identify important questions about the causal impact of their activities during the start-up activities, best answered using evaluation approaches. Which indicators will be part of monitoring systems, and which will be used to answer evaluation questions, will affect how the toolkit is operationalized. In addition, it is expected that MERL plans will likely include **qualitative data sources**, important to further explaining monitoring and evaluation results and exploring learning questions in more depth, in addition to the quantitative data collected using the approaches from the toolkit.



Household Sampling and Data Collection Guidance

While most indicators will be collected through household surveys, some rely on other data collection approaches. In particular, the SAGE tool for measuring aspects of governance, administrative data from private sector partners on employment or agricultural prices, and biophysical measurements from geospatial and other data sources. For indicators measured using surveys, HEARTHs should consider from whom to collect data. It is typically not possible or necessary to collect data from all targeted beneficiaries, so most surveys utilize a sample. This section discusses sampling for household data collection, and sampling for other indicators that rely on non-household survey approaches will be discussed in their relevant Performance Indicator Reference Sheet (PIRS).

Participant-Based Survey and Population-Based Survey Sampling Approaches[2]

Participant-Based Surveys (PaBSs) are conducted among a sample of the population that participates in a project's interventions. PaBSs are typically used in the context of project monitoring and are recommended in cases where the target population is expected to be different from the overall population. This is typically the case on USAID projects, including when individuals, farmers, households (or other groups) are targeted for specific characteristics they share or when they self-select or choose to participate. PaBSs can be used for performance or impact evaluations using baseline, interim, and endline surveys, especially when project outcomes and impacts are not expected to accrue at the population-level, but rather be more concentrated among direct participants. One possible challenge with PaBSs is that sometimes activities do not have a confident identification of participants at the time of a baseline, particularly for new activities or those with rolling implementation. An alternative approach is population-based surveys (PBSs), which are conducted among a sample of the entire population living within a project's area of coverage. Typically, PBSs are recommended when program effects are expected broadly across the full population within a geographic area.

Depending on the HEARTH activity, data to measure indicators can be collected either through a project's routine monitoring systems or through periodic PaBSs. PaBSs are generally recommended over PBSs for HEARTH, largely because HEARTHs are anticipated to have specifically targeted beneficiaries. For more information comparing routine monitoring and PaBSs (when appropriate), sampling frame guidance, and data collection approaches, please see the *Participant-Based Survey Sampling Guide for Feed*

[2] This section is summarized from the Purpose and Background section of the Participant-Based Survey Sampling Guide for Feed the Future Annual Monitoring Indicators: Stukel, Diana Maria. "Participant-Based Survey Sampling Guide for Feed the Future Annual Monitoring Indicators." Feed The Future. USAID, September 2018. https://pdf.usaid.gov/pdf_docs/PA00TBMK.pdf.

the Future Annual Monitoring Indicators[3] which is broadly applicable for the HEARTH context. Depending on whether data are collected through monitoring systems or PaBSs, data may be reported through routine reporting systems, or annual (or baseline/interim/endline) survey reports, respectively.

Data Collection Administration and Frequency

While implementing partners will likely be collecting data for many monitoring indicators on a routine basis and often through their administrative or management systems, data on outcome indicators, such as those covered in this guidance, is typically collected less frequently – often at just a few points during the project and occasionally just at baseline and endline. These indicators tend to change much more slowly and are usually more expensive to collect so more frequent measurement is typically not necessary.

In addition, decisions will need to be made regarding whether to collect cross-sectional or panel data. A cross-sectional approach involves surveying different activity participants at each point in time, whereas a panel approach involves surveying the same participants at each point in time. Panel approaches have the benefit of being able to measure whether outcomes for a *specific household* have changed over time, while cross-sectional surveys reflect general changes for the *sample population* over time. In general, panel surveys allow for more precise measurement of change, but they are more challenging and costly to implement, as there are additional costs to track the same households over time. HEARTH activities should consider the benefits and drawbacks of each approach, and determine which best fits given their data needs and resource constraints.

Data Management

All HEARTH activities should include data management plans as part of their Activity MERL Plans, which should cover the entire lifecycle of both primary and secondary data. Primary data are any data that is collected/generated directly by the activity or evaluation team, using methods such as surveys or interviews. Secondary data, which has been collected by someone else but made available for use to others, such as administrative data from private sector partners, satellite data, etc., should also be included in data management plans. Data management plans should be sure to cover both quantitative as well as any qualitative data used for monitoring and/or evaluation purposes. Data management plans should cover data access, privacy, security, and general management across the lifetime of an activity: data collection, transfer, storage, analysis, and dissemination/sharing (including USAID Development Data Library [DDL] submission, as relevant).

Privacy, Confidentiality, and Ethics

Data privacy governs how data are collected, shared, and used. This is of particular concern when data contains personally identifying information (PII). Teams should start thinking about privacy prior to data

[3] ibid

collection, and whether it is even necessary to collect PII (names, addresses, Global Positioning System [GPS] coordinates, etc.). Privacy and confidentiality should also be of paramount concern if activities are collecting any information which might result in risk for respondents, including data about illegal activities such as deforestation or poaching.

It is important that prior to conducting any data collection, all respondents consent to participate in the survey or interview. This should include a consent script or text, which should outline for respondents the potential risks and benefits to participating, as well as how their information will be used. For example, if activities plan on publishing de-identified data to the DDL, that must be made clear to respondents in the consent script.

In addition, data collection protocols may require review by an institutional review board (IRB). IRBs are independent committees established to review and approve research involving human subjects, to ensure that all human subject research be conducted in accordance with all federal, institutional, and ethical guidelines.[4] While data collection for project monitoring or performance evaluations typically do not meet the definition of "research" to require an IRB review, it is best practice to err on the side of caution for large scale data collection, particularly whenever potentially sensitive topics are discussed. Moreover, impact evaluations most often do meet the criteria for "research" as they typically seek to develop *generalizable knowledge*, and therefore typically require IRB review. Additionally, some countries have country-specific ethical review requirements that should be fully explored well in advance of data collection. Some IRB or ethical review committees do not meet regularly, so approvals can sometimes take months, and teams should plan accordingly.

The remainder of this document includes sections for each outcome sector, with a high-level summary of pathways through which HEARTH activities might impact each outcome, the recommended indicators, and detailed PIRS for each.

[4] This is in line with U.S. federal "Common Rule" regulations governing ethical research and composition/activities of IRBs. Research is defined as a systematic investigation, including research development, testing, and evaluation, designed to develop or contribute to generalizable knowledge. Human subjects are defined as a living individual about whom an investigator conducting research: (i) obtains information or biospecimens through intervention or interaction with the individual, and uses studies, or analyzes the information or biospecimens; or (ii) obtains, uses, studies, analyzes, or generates identifiable private information or identifiable biospecimens. For more details, please see 22 CFR 225 Research falling under Foreign Relations regs: Agency for International Development. Protection of Human Subjects 56. FR 28012ed. Vol. 56. 42 U.S.C. 300v-1(b). gov.info, April 2012. https://www.govinfo.gov/app/details/CFR-2012-title22-vol1/CFR-2012-title22-vol1-part225/summary

Toolkit Modules

Household Roster & Respondent Identification

Household Rosters

A household is defined as a person or group of persons that usually live and eat together.[5] Household rosters provide a variety of information important for both constructing indicators and disaggregations. In addition to calculating **household size** (which is important for any per capita indicators) household rosters provide important information on (1) **sex**, which is integral for sex-disaggregation for many indicators, and (2) **age**, which the construction of many food security/nutrition and health indicators relies on (e.g., percent of stunted (Height for Age Z Score (HAZ) < -2) children under five (0-59 months); percent of women/men of reproductive age who are using a contraceptive method). Rosters can also include information on **education** – including literacy, highest-level of education, and enrollment for school-aged household members – which activities might both want to track changes in trends over time, as well as analyze program impacts for households with different education levels.

Consideration should be given **whether to collect names** of household members. Benefits of doing so include facilitating identifying household members for subsequent rounds of data collection (if activities have chosen a panel design, whereby the same household is interviewing at multiple time periods), and in helping with the flow of the survey (e.g., by referencing children by name in later health modules, instead of "Child 1"). The core questionnaire includes household member names for this reason. However, if there are concerns over maintaining confidentiality of respondents, or if subsequent rounds of data collection are not planned for the same households, then collecting names might not be necessary.

The core questionnaire, based on the Feed the Future household survey, includes example questions on the following per household member, which should be adapted by activities as relevant based on their monitoring and evaluation needs and local context:

- Relationship to primary household decision-maker
- Sex and age

[5] This definition is taken from the FTF Indicator Handbook: Feed the Future. "Feed the Future Indicator Handbook." US Government's Global Hunger and Food Security Imitative, September 2019. https://fr.fsnnetwork.org/sites/default/files/ftf_agriculture_guide_0.pdf.

- Residence – Usual household member, spent last night at the house, time since spent the night in the house
- Education – Ever attended school, currently attending school, highest level of school attended/completed

Respondent Identification

Depending on how Missions and IPs choose to implement their surveys, it might be helpful to include a few questions after the household roster to **identify which household member is the intended respondent** for each subsequent module, to help facilitate data collection by not jumping between different respondents. While for many modules, the intended respondent will be the primary household decision-maker, others are targeted to the primary female household decision-maker (who may or may not be the same person), or other qualifier. For example, if activities include the Food Consumption Score indicator, the intended respondent for this set of questions is the primary adult decision-maker responsible for meal planning and/or food preparation from households, regardless of gender. Each subsequent PIRS includes a section on identifying the intended respondent to help facilitate.

Food Security and Nutrition

Pathways to Change

There are several pathways through which HEARTH activities might impact food security, diets, and nutrition. To achieve impact, HEARTH activities must be intentional in designing strategies and interventions and in measuring outcomes to improve diets and nutrition. For example, nutrient adequacy and caloric availability might be increased due to increased incomes used to buy more healthy food varieties, as well as increased agricultural productivity, used to grow a greater variety of healthy foods. Changes in food sources (i.e., cultivated, bought, or wild caught/gathered) may also impact the varieties of food consumed and overall access to food. It is recommended that both food security and changes in diets are measured as both types of information are necessary to understand impact. While collecting dietary data can be expensive and time-consuming, USAID is supportive of methods such as the Diet Quality Questionnaire that reduce the burdens of data collection.[6] Access to food, as well as increases in variety and quality of food consumed are expected to ultimately reduce women and children's exposure to inadequate diet and poor health/malnutrition in both the short and long term. Ideally, HEARTH activities should measure both food security and diet outcomes.

Recommended Outcomes and Indicators

Outcome	Description	Recommended Indicator & Duration
Increased dietary diversity	The minimum dietary diversity of women (MDD-W) is a validated proxy indicator for the quality of the diet for women of reproductive age (15 - 49 years). Dietary diversity is a key characteristic of a high-quality diet with adequate micronutrient content and is thus important to ensuring the health and nutrition of both women and their children. Research has validated that women of reproductive age that consume foods from five or more of the 10 food groups in the MDD-W indicator are more likely to consume a diet higher in micronutrient adequacy than women consuming foods from fewer than five of these food groups.[7]	**Indicator:** Percent of women of reproductive age consuming a diet of minimum diversity (MDD-W) **Source:** FTF Indicator EG.3.3-10 [IM-level] Percent of female participants of USG nutrition-sensitive agriculture activities

[6] Herforth, A., Martínez-Steele, E., Calixto, G., Sattamini, I., Olarte, D., Ballard, T., and Monteiro, C. (2019). Development of a diet quality questionnaire for improved measurement of dietary diversity and other diet quality indicators (P13-018-19). Current Developments in Nutrition, 3(Supplement_1). https://doi.org/10.1093/cdn/nzz036.p13-018-19

[7] "Introducing the Minimum Dietary Diversity – Women (MDD-W) Global Dietary Diversity Indicator for Women." fao.org. Food and Agriculture Organization of the United Nations, July 2014. http://www.fao.org/nutrition/assessment/tools/minimum-dietary-diversity-women/zh/.

Outcome	Description	Recommended Indicator & Duration
	Women's dietary diversity (based on the response of one woman of reproductive age in the household) is recommended rather than household dietary diversity (1) to maintain consistency with FTF data collection, (2) to increase accuracy (by having one woman report on the food she ate, rather than asking a respondent about household members generally, or extrapolating from one individual to the household), and (3) because research indicates that MDD-W is more appropriate than household dietary diversity for measuring nutrient adequacy.[8]	consuming a diet of minimum diversity; HL 9.1-d [Zone of Influence (ZOI)-level] Percent of women of reproductive age consuming a diet of minimum diversity[9] **Duration:** 5-10 minutes
Improved household food security	The Food Insecurity Experience Scale (FIES)[10] was developed by the Food and Agriculture Organization of the United Nations (FAO) and estimates the probability that a household is either moderately or severely food insecure. It captures lack of access due to money and other resources. Most existing food insecurity indicators focus on potential consequences of food insecurity (e.g., nutrition outcomes), adequacy of diet (food consumption scores, dietary diversity), or physical experience and behavior (e.g., household hunger scale). The food insecurity prevalence based on FIES measures the access dimension of food security based on households' psychological and behavioral experience with accessing food in the desired quantity, quality, and continuity. The FIES was developed to complement existing food and nutrition indicators; hence, when used in combination with other existing indicators, it will offer a more comprehensive understanding of causes and consequences of food insecurity. The analytic treatment of the data through the Rasch model based on	**Indicator:** Percent of households experiencing moderate and severe food insecurity, based on the FIES **Source:** FTF Indicator EG-e [ZOI-level] Prevalence of moderate and severe food insecurity in the household based on the FIES[11] **Duration:** 3 minutes

[8] Tufts University, Boston, MA. "Household Dietary Diversity Score (HDDS)." Data4Diets: Building Blocks for Diet-related Food Security Analysis | INDDEX Project. International Dietary Data Expansion Project, 2018. https://inddex.nutrition.tufts.edu/data4diets/indicator/household-dietary-diversity-score-hdds.

[9] MacCartee, Julie, and Katie West. "Feed the Future Indicator Handbook." Agrilinks. Feed the Future, March 23, 2018. https://agrilinks.org/post/feed-future-indicator-handbook.

[10] Food and Agriculture Organization of the United Nations (FAO). "Food Insecurity Experience Scale (FIES)". Policy Support and Governance Gateway. 2018. https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/1236494/.

[11] MacCartee, Julie, and Katie West. "Feed the Future Indicator Handbook." Agrilinks. Feed the Future, March 23, 2018. https://agrilinks.org/post/feed-future-indicator-handbook.

Outcome	Description	Recommended Indicator & Duration
	sound statistical methods allows for testing the quality of the data with respect to their validity and reliability and ensures that the indicator estimates are comparable across cultural and socio-economic contexts. Although this guidance provides detailed instructions and additional resources to simplify calculation of FIES, because of the statistical methods used, it does require a slightly higher level of experience or training to calculate relative to other food security indicators.	
Improved children's dietary intake	WHO guiding principles on feeding the breastfed child and the nonbreastfed child recommend that children aged 6–23 months be fed meals at an appropriate frequency and in a sufficient variety to ensure, respectively, that energy and nutrient needs are met.[12] This indicator combines information on minimum dietary diversity and minimum meal frequency, with the extra requirement that non-breastfed children should have received milk at least twice on the previous day. Thus, it provides a useful way to track progress at simultaneously improving the key quality and quantity dimensions of children's diets.	**Indicator:** Percent of children 6 - 23 months receiving a minimum acceptable diet (MAD) **Source:** FTF Indicator HL.91-a [ZOI-level] Percent of children 6-23 months receiving a minimum acceptable diet [13] **Duration:** 5 minutes per child under two years
Reduction of potential exposure to zoonotic diseases	Given the COVID-19 global zoonotic pandemic, USAID is interested in measuring whether HEARTH programs reduce pressure on, and consumption of, endangered or high-risk wildlife, especially wildlife that could harbor zoonotic diseases. Respondents will be asked if anyone in their household has eaten wild meat from a select list of species over the past year, with follow-up questions on the frequency of consumption and source. The list of animals would be adapted for each country's context, and a subset	**Indicator:** Percent of households consuming high-risk wild meat in the past year week **Source:** N/A **Duration:** 1 minute

[12] World Health Organization and the United Nations Children's Fund (UNICEF). "Indicators for assessing infant and young child feeding practices: definitions and measurement methods." 2021. https://data.unicef.org/resources/indicators-for-assessing-infant-and-young-child-feeding-practices/.

[13] MacCartee, Julie, and Katie West. "Feed the Future Indicator Handbook." Agrilinks. Feed the Future, March 23, 2018. https://agrilinks.org/post/feed-future-indicator-handbook.

Outcome	Description	Recommended Indicator & Duration
	of wild animals would be identified as high-risk by the HEARTH activity.	

Performance Indicator Reference Sheets

INDICATOR TITLE: Percent of women of reproductive age consuming a diet of MDD-W

APPLICABILITY:

This indicator is applicable for HEARTH activities that have explicit consumption, diet quality, or other nutrition-related objectives and/or outcomes. Use of this indicator is encouraged for activities that are inherently nutrition-sensitive (e.g., resulting in improved women's empowerment, control over income, etc.) but that do not necessarily have explicit objectives related to consumption.

The MDD-W is a prevalence indicator, which reflects the percent of a population of interest that is above or below a defined threshold (in this case, women who are consuming a diet of minimum diversity). Prevalence indicators are intuitive and understandable to a broad audience of stakeholders, and MDD-W will be useful for reporting and describing progress toward improved nutrition for women.

DEFINITION:

A woman of reproductive age is defined as a woman 15 - 49 years of age, consistent with FTF and FAO guidance. However, the age range of responding women can be broadened if a HEARTH intervention targets a different age group.

This indicator captures the percent of women of reproductive age who are consuming a diet of minimum diversity. A woman of reproductive age is considered to consume a diet of minimum diversity if she consumed at least five of 10 specific food groups during the previous day and night.[14] The 10 food groups included in the MDD-W indicator are:

1. Grains, white roots and tubers, and plantains
2. Pulses (beans, peas, and lentils)
3. Nuts and seeds[15] (including groundnuts)
4. Dairy
5. Meat, poultry, and fish
6. Eggs

[14] For additional detail on collecting and analyzing the minimum dietary diversity indicator, please see the 2021 update to FAO's Minimum Dietary Diversity for Women guide. (FAO. "Minimum Dietary Diversity for Women: An Updated Guide to Measurement from Collection to Action." 2021. Rome. https://doi.org/10.4060/cb3434en.)

[15] "Seeds" in the botanical sense includes a very broad range of items, including grains and pulses. However, seeds are used here in a culinary sense to refer to a limited number of seeds, excluding grains or pulses, which are typically high in fat content and are consumed as a substantial ingredient in local dishes or eaten as a substantial snack or side dish. Examples include squash/melon/gourd seeds used as a main ingredient in West African stews and sesame seed paste (tahini) in some dishes in Middle Eastern cuisines.

INDICATOR TITLE: Percent of women of reproductive age consuming a diet of MDD-W

7. Dark leafy green vegetables
8. Other vitamin A-rich fruits and vegetables
9. Other vegetables
10. Other fruits

It is a food group diversity indicator that reflects one key dimension of diet quality – micronutrient adequacy – summarized across 11 micronutrients: vitamin A, thiamine, riboflavin, niacin, vitamin B-6, folate, vitamin B-12, vitamin C, calcium, iron and zinc.

Assuming that data for this indicator are collected through a participant-based sample survey, the numerator is the sample-weighted number of women 15 - 49 years of age who consumed 5 out of 10 food groups during the previous day and night. The denominator is the sample-weighted number of women 15 - 49 years of age with food group data.

Note: Using the data collected for this indicator, activities may wish to create an additional indicator measuring the average number of food groups consumed by women of reproductive age. This will allow managers to better understand progress made under this indicator and would be especially useful in situations where dietary diversity is very low at baseline.

DATA COLLECTION:

Data on women's dietary diversity should be collected by asking the respondent to recall all foods and drinks that she consumed yesterday (during the day and/or night), whether she consumed these items at home or anywhere else. All foods and drinks, snacks, or small meals, should be included as well as main meals. HEARTH recommends an open-recall method, whereby the respondent should be prompted to think about what she ate/drank when she first woke up, later in the morning, mid-day, during the afternoon, in the evening, and before going to bed or during the night.

As the respondent recalls foods, the enumerator should select the food groups, as relevant. A list of 23 food groups is provided in the core questionnaire, along with space to write any other foods eaten (to be classified later). If the respondent mentions mixed dishes like a porridge, sauce, or stew, she should be probed for the ingredients. If foods are used in small amounts for seasoning or as a condiment, they should be included under the condiment food group. For any food groups not mentioned, the enumerator should probe and confirm that no food from that food group was consumed yesterday.

Data should be collected annually at the same time of year since the indicator will likely display considerable seasonal variability. If possible, data should be collected at the time of year when diversity is likely to be the lowest to best capture improvements in year-round consumption of a diverse diet. However, HEARTH recognizes that data for this indicator may be collected in the postharvest/sale period when data for other indicators, such as crop yields, are collected. In this

INDICATOR TITLE: Percent of women of reproductive age consuming a diet of MDD-W

case, the indicator value may reflect a best-case scenario in terms of access to a quality and diverse diet by female participants.

In addition to the standard MDD-W indicator questions, follow-up questions have been added regarding the food source for food groups likely to be wild caught or gathered; fish, leafy greens, fruit, roots/tubers, or grubs/insects. Note that wild animal meat/organs are already measured separately from domestic animal meat/organs, so no follow-up questions related to food source are required. These questions will help determine the extent to which wild caught or gathered foods contribute to MDD-W.

Although the standard MDD-W module is recommended, HEARTHs may consider using the Diet Quality Questionnaire (DQ-Q)[16] as an alternative data collection approach when dietary diversity is a less central outcome or there is not enough survey time to complete the full MDD-W module. The DQ-Q is a list-based survey module that can be used to rapidly collect dietary data. The tool includes binary yes/no questions about consumption of 29 unique food groups, including both healthy foods and less healthy foods. The DQ-Q takes about five minutes to administer and does not require implementers to have nutrition expertise or specialized training. Population-level data obtained from the DQ-Q tool can be used to calculate numerous diet quality indicators, including MDD-W.[17]

ADAPTATION:

Ensure country-specific food items are added to the existing food groups. The food groups themselves should not be edited, but the specific items within each food group should be adapted to the local conditions. The FAO MDD-W Guide to Measurement[18] has details for adapting the food groups, and HEARTH activities may seek input from a nutrition specialist as needed to properly allocate country-specific food items to their respective food groups. If activities would like to collect data about target foods, these items may be disaggregated and asked about in a new question that is independent from, but adjacent to, the food group it would otherwise belong to. For example: QEx1: Foods made from soy or soy products; QEx2: Foods made from other kinds of beans, peas, or lentils [add any local names]?

[16] Herforth et al., 2019. "Development of a Diet Quality Questionnaire for Improved Measurement of Dietary Diversity and Other Diet Quality Indicators." Current Developments in Nutrition, Volume 3, Issue Supplement_1.

[17] Vogliano, Chris. "Measuring Healthy Diets to Advance Nutrition Globally Using the Diet Quality Questionnaire." AgriLinks. Feed the Future, Nov 02, 2021. https://agrilinks.org/post/measuring-healthy-diets-advance-nutrition-globally-using-diet-quality-questionnaire.

[18] FAO. "Minimum Dietary Diversity for Women: An Updated Guide to Measurement from Collection to Action." 2021. Rome. https://doi.org/10.4060/cb3434en.

INDICATOR TITLE: Percent of women of reproductive age consuming a diet of MDD-W	
Additional food groups that might be of specific interest to HEARTH activities include insects and small protein foods, and wild foods and neglected and underutilized species (for a full list, please see the FAO MDD-W Guide to Measurement).	
UNIT: Percent	
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Women of reproductive age from sample households. This should ideally be the primary adult female decision-maker in the household (to streamline data collection), but if this person is not of reproductive age, another adult female in the household of reproductive age may be used for reporting. In that case, ideally the respondent would be randomly selected among eligible women in the household.
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the nutrition-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

INDICATOR TITLE: Percent of households experiencing moderate and severe food insecurity, based on the Food Insecurity Experience Scale (FIES)

DEFINITION:

The indicator measures the percentage of households that experienced food insecurity at moderate and severe levels during the 12 months prior to data collection. The severity of the experience of food insecurity is defined as a measurable latent trait (a characteristic that is not directly observable, but can be measured indirectly, for example by taking into account behavioral and psychological experiences, in this case around food insecurity). It is measured through the FIES, a measurement scale established by FAO. The indicator is based on an estimation of the probability that each household belongs to a specific category of food insecurity severity (moderate and severe), as determined by the household's position on the scale.[19]

The inability to access food results in a series of experiences and conditions that are common across cultures and socio-economic contexts. These experiences range from being concerned about the possibility of obtaining enough food, to the need to compromise on the quality or the diversity of food consumed, to being forced to reduce the intake of food by reducing portion sizes or skipping meals, to the extreme condition of feeling hungry and not having the means (money or other resources) to access food. The new FIES global indicator for measuring food insecurity (access) is calculated from answers to a set of eight questions that covers a range of severity of food insecurity.[20] The questions refer to difficulty in accessing food due to lack of money or other resources and reflect the food-related behavior and experiences of the household. The questions are as follows:

1. During the past 12 months, was there a time when you or others in your household were worried you would not have enough food to eat because of a lack of money or other resources?
2. During the past 12 months, was there a time when you or others in your household were unable to eat healthy and nutritious food because of a lack of money or other resources?
3. During the past 12 months, was there a time when you or others in your household ate only a few kinds of foods because of lack of money or other resources?
4. During the past 12 months, was there a time when you or others in your household had to skip a meal because there was not enough money or other resources to get food?
5. During the past 12 months, was there a time when you or others in your household ate less than you thought you should because of a lack of money or other resources?

[19] Technical resources, including the datasets and the FIES statistical program, are available at the FAO's Voices of the Hungry website (http://www.fao.org/in-action/voices-of-the-hungry/fies/en/). An e-learning course that provides guidance on the collection and analysis of data, and on how the information provided by the FIES can be used to inform and guide policy, is also available: "SDG Indicator 2.1.2 - Using the Food Insecurity Experience Scale (FIES)." FAO Elearning Academy. Food and Agriculture Organization of The United States, 2020. https://elearning.fao.org/course/view.php?id=360.

[20] For detailed definition and background, refer to FAO's Voices of the Hungry paper, Methods for Estimating Comparable Prevalence Rates of Food Insecurity Experienced by Adults throughout the World: Rep. Voices of the Hungry Technical Report. Food and Agriculture Organization of The United States, August 2016. https://www.fao.org/3/i4830e/i4830e.pdf.

INDICATOR TITLE: Percent of households experiencing moderate and severe food insecurity, based on the Food Insecurity Experience Scale (FIES)

6. During the past 12 months, was there a time when your household did not have food because of a lack of money or other resources?
7. During the past 12 months, was there a time when you or others in your household were hungry but did not eat because there was not enough money or other resources for food?
8. During the past 12 months, was there a time when you or others in your household went without eating for a whole day because of a lack of money or other resources?

The response categories for each of the questions include 'Yes (1),' 'No (0),' and 'Refused.' Cases with 'Refused' are excluded from the analysis.

The prevalence of food insecurity is calculated using the one-parameter logistic model, also known as the Rasch model, which is the simplest formulation for an Item Response Theory-based model.[21] The Rasch model assumes that households' responses to each of the eight binary questions (0/1) are conditionally independent (meaning that the only statistical link between them is the fact that all of them contribute to measure only one and the same food insecurity latent trait), and that each question has the same discrimination power with respect to food insecurity severity. Based on these assumptions, the model uses conditional maximum likelihood procedures to generate estimates of both the questions' and households' severity parameters.[22] Provided the data are consistent with the Rasch model assumption, the estimated household severity parameters are defined on a continuous, interval-level scale of the severity of food insecurity (latent trait). An interval scale is one where the difference between points on the scale is measurable and consistent.

Households are assigned to categories of severity after statistically determining appropriate thresholds that define the categories. Based on the application of the FIES in more than 140 countries in 2014 - 2016, FAO has suggested cross-nationally comparable thresholds that correspond to the severity level of the 5th question "Ate less than should" (to separate "mild" from "moderate" levels of severity) and of the 8th question "Did not eat for a whole day" (to separate "moderate" from "severe" levels) for global monitoring purposes. Adopting these thresholds (after adjusting the country's metric to make the country-specific scale's severity parameters comparable to the global standard scale and thus to other Feed the Future target countries), households with a sample-weighted sum of the probabilities of being between the severity level of the 5th item on the FIES global reference scale (adjusted on the country's metric) and the 7th item, are assigned to the "moderate" category of food insecurity. Households with a

[21] For details about item response theory in the context of food security measurement, refer to Introduction to Item Response Theory Applied to Food Security Measurement: "Introduction to Item Response Theory Applied to Food Security Measurement - Basic Concepts, Parameters and Statistics." Voices of the Hungry. Food and Agriculture Organization of The United States, 2014. https://www.fao.org/3/i3946e/i3946e.pdf.

[22] ibid

INDICATOR TITLE: Percent of households experiencing moderate and severe food insecurity, based on the Food Insecurity Experience Scale (FIES)	
sample-weighted sum of the probabilities of being greater than or equal to the severity level of the 8th item on the FIES global reference scale (adjusted on the country's metric) are assigned to the "severe" food insecurity category.[23] Note: The documentation referenced here provides detailed instructions and templates for calculation of the FIES. However, the calculation does require at least a moderate degree of familiarity with statistical data analysis and at least a basic familiarity with the R statistical programming language (or more advanced understanding of other software, although the guidance and templates are provided in R).	
ADAPTATION: N/A	
UNIT: Percent	DISAGGREGATE BY: Level of Severity: Moderate, Severe
TYPE: Impact	DIRECTION OF CHANGE: Lower is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary adult decision-maker responsible for meal planning and/or food preparation from sample households.
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the nutrition-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

[23] The 5th item refers to the question, "In the past 12 months, did you eat less than you thought you should?", and the 8th item refers to the question "In the past 12 months, did you go a whole day without eating?" on the global reference scale developed by FAO's Voices of the Hungry project. Note: The severity threshold for moderate to severe food insecurity has been recently updated from the 4th to the 5th item by FAO. The key resource document from the FAO, titled "The Food Insecurity Experience Scale-Development of a Global Standard for Monitoring Hunger Worldwide", has not been revised yet.

INDICATOR TITLE: Percent of children 6-23 months receiving a minimum acceptable diet (MAD)

DEFINITION:

This indicator measures the percent of children 6-23 months of age who receive a minimum acceptable diet (MAD). The "minimum acceptable diet" indicator measures both the minimum feeding frequency and minimum dietary diversity, as appropriate for various age groups. If children meet the minimum feeding frequency and minimum dietary diversity for their respective age group and breastfeeding status (i.e., there is an extra requirement that non-breastfed children should have received milk at least twice on the previous day) then they are considered to receive a minimum acceptable diet.

Tabulation of the indicator requires that data on breastfeeding, dietary diversity, number of semi-solid/solid feeds, and number of milk feeds be collected for children 6-23 months the day and night preceding the survey. The indicator is calculated as follows:

Numerator: children 6–23 months of age who consumed a minimum acceptable diet during the previous day. The minimum acceptable diet is defined as:

- Breastfed children: receiving at least the minimum dietary diversity and minimum meal frequency for their age during the previous day;
- Non-breastfed children: receiving at least the minimum dietary diversity and minimum meal frequency for their age during the previous day as well as at least two milk feeds.

Denominator: children 6–23 months of age.

Minimum dietary diversity for children 6-23 months is defined as five or more food groups out of the following 8 food groups (refer to the WHO IYCF operational guidance document cited below):

1) Breast milk
2) Grains, roots, tubers, and plantains
3) Pulses (beans, peas, lentils), nuts, and seeds
4) Dairy products (milk, infant formula, yogurt, cheese)
5) Flesh foods (meat, fish, poultry, and liver/organ meats)
6) Eggs
7) Vitamin-A rich fruits and vegetables
8) Other fruits and vegetables

Minimum meal frequency for breastfed children is defined as two or more feedings of solid, semi-solid, or soft food for children 6-8 months and three or more feedings of solid, semi-solid or soft food for children 9-23 months.

INDICATOR TITLE: Percent of children 6-23 months receiving a minimum acceptable diet (MAD)

Minimum meal frequency for non-breastfed children is defined as four or more feedings of solid, semi-solid, soft food, or milk feeds for children 6-23 months. For non-breastfed children to receive a minimum adequate diet, at least one of the four feeds must be a solid, semi-solid, or soft feed.

For more detailed guidance on how to collect and tabulate this indicator, refer to the WHO document: Indicators for assessing infant and young child feeding practices.[24]

DATA COLLECTION:

For all children under two, a question is first asked whether the child was breastfed yesterday during the day or at night (including a follow-up question if at first the answer is no, to clarify other ways that babies might be fed breast milk, including by spoon or bottle, or by another woman). Babies are counted as being breastfed if the answer to either question is yes.

Additional questions include asking about consuming infant formula, other milk (e.g., tinned, powdered, or fresh animal milk), yogurt, or thin porridge yesterday during the day or at night.

Finally, caregivers are asked to recall all other foods and drinks that each child consumed yesterday during the day or night. This should include all foods and drinks, any snacks, or small meals, as well as any main meals. The following table from the WHO guidance[25] has the categorization of each type of food into the main food groups used to construct the dietary diversity component of the indicator:

Food Group	Variables
Breast milk	Q4: Was [NAME] breastfed yesterday during the day or at night? (Asked separately, not as part of open recall or list-based recall)
Grains, roots, and tubers	Q7B: Porridge, bread, rice, noodles, pasta or [insert other commonly consumed grains, including foods made from grains like rice dishes, noodle dishes, etc.]

[24] World Health Organization and the United Nations Children's Fund (UNICEF). "Indicators for assessing infant and young child feeding practices: definitions and measurement methods." 2021. https://data.unicef.org/resources/indicators-for-assessing-infant-and-young-child-feeding-practices/.

[25] ibid

INDICATOR TITLE: Percent of children 6-23 months receiving a minimum acceptable diet (MAD)

	Q7D: Plantains, white potatoes, white yams, manioc, cassava, or [insert other commonly consumed starchy tubers or starchy tuberous roots that are white or pale inside]
Legumes and nuts	Q7N: Beans, peas, lentils, nuts or [insert commonly consumed foods made from beans, peas, lentils, nuts, or seeds]
Dairy products	Q6B: Infant formula such as[insert local names of common formula] Q6C: Milk from animals such as fresh, tinned or powdered milk Q6D: Yogurt drinks such as [insert local names of common types of yogurt drinks] Q7A: Yogurt, other than yogurt drinks Q7O: Hard or soft cheese such as [insert commonly consumed types of cheese]
Flesh foods	Q7I: Liver, kidney, heart or [insert other commonly consumed organ meats] Q7J: Sausages, hot dogs, ham, bacon, salami, canned meat or [insert other commonly consumed processed meats] Q7K: Any other meat such as beef, pork, lamb, goat, chicken, duck or [insert other commonly consumed meat] Q7M: Fresh or dried fish or shellfish
Eggs	Q7L: Eggs
Vitamin A-rich fruits and vegetables	Q7C: Pumpkin, carrots, sweet red peppers, squash or sweet potatoes that are yellow or orange inside? [any additions to this list should meet "Criteria for defining foods and liquids as 'sources' of vitamin A"] Q7E: Dark green leafy vegetables such as [insert commonly consumed vitamin A-rich dark green leafy vegetables] Q7G: Ripe mangoes, ripe papayas or [insert other commonly consumed vitamin A-rich fruits]

INDICATOR TITLE: Percent of children 6-23 months receiving a minimum acceptable diet (MAD)	
Other fruits and vegetables	Q7H: Any other fruits such as [insert commonly consumed fruits] Q7F: Any other vegetables such as [insert commonly consumed vegetables]

To calculate meal frequency, first the number of total milk feeds must be calculated (which is the sum of the number of times yesterday that the child consumed any formula, milk, or yogurt). Then, to calculate the total number of feeds (milk + food), the number of soft, solid, or semi-solid food feeds yesterday should be added.

For more details on this indicator construction and data collection, please see the WHO guidelines.[26]

ADAPTATION:

Country-specific adaptation may be relevant for the food groups as part of the minimum dietary diversity component.

UNIT:	DISAGGREGATE BY:
Percent	Sex: Male, Female Age: 6-8 months; 9-23 months
TYPE:	DIRECTION OF CHANGE:
Outcome	Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Dietary information should be collected from the primary caregiver of each child under two from sample households.

[26] ibid

INDICATOR TITLE: Percent of children 6-23 months receiving a minimum acceptable diet (MAD)
REPORTING NOTES
In addition to reporting the percent value, the total number of children under two from participant households and the total number of participant households of the nutrition-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).

INDICATOR TITLE: Percent of households consuming high-risk wild meat in the past year

APPLICABILITY:

Consumption of wild meat has been an increasing focus in development programming because of its important role in food security and nutrition, but also because of its intersection with both conservation and zoonosis. For these reasons, we recommend this indicator be tracked by all HEARTHs, not just those that specifically target wild meat consumption.

DEFINITION:

Wild meat is defined by the FAO as *terrestrial animal wildlife used for food*. This excludes both marine and freshwater animals (although these can be included by HEARTHs if specific marine or freshwater species are identified as important) and livestock. It includes wild meat that is purchased, received as a gift, or directly collected (hunted, trapped, etc.).

DATA COLLECTION:

Respondents will be asked if anyone in their household has eaten wild meat from a list of species over the past year (Q1). Species included should be those at high-risk for transmission of zoonotic disease, which may include bats, primates, rodents, and/or ungulates as appropriate for the local context. In addition, HEARTH activities may choose to include species that are of particular interest for conservation and/or illegal poaching. Households will be counted in this indicator if they report consuming any of the targeted high-risk wild meats over the last year (consumption of species of conservation importance can be reported separately).

For each species that respondents select, follow-up questions will be asked regarding how frequently they consume wild meat from that species (Q2), and from which sources (Q3). Frequency of consumption should include the following answer choices: daily; weekly; every other week; monthly; every other month; every 3-4 months; every 5-6 months; yearly. Sources should be adapted to the local context but should include the following: purchased – cooked/cured; purchased – raw; wild caught; traded goods/services/barter; borrowed; gift. Differentiating between meat purchased already cooked/cured compared to raw will help determine additional exposure related to handling (rather than just consumption).

In some contexts, wild meat consumption may be illegal or considered taboo, so respondents may be likely to under-report. If this is a particular concern for a HEARTH activity, and especially if that activity has a focus on wild meat, we recommend considering one of a handful of approaches that seek to generate more accurate estimates of illicit behavior through anonymization techniques. These include randomized response and unmatched count/lists. In these approaches, the response of the individual is masked/hidden, but the prevalence of the population can be estimated. There is a growing literature on these approaches, including on when they are most

INDICATOR TITLE: Percent of households consuming high-risk wild meat in the past year	
useful. A good starting point is Harriet Ibbett, Julia P.G. Jones, and Freya A.V. St John "Asking sensitive questions in conservation using Randomised Response Techniques" (2021).[27]	
ADAPTATION: HEARTHs should identify the list of important species to ask about. While this should include species of importance from either a conservation or a zoonosis perspective, only species with zoonotic importance should be counted in this indicator as high-risk (consumption of species of conservation importance can be reported in a separate indicator). In addition, HEARTHs should adapt the list of wild food sources as appropriate for their local context. Finally, HEARTHs should determine if more detailed questions on wild meat consumption are required.	
UNIT: Percent	DISAGGREGATE BY: N/A
TYPE: Impact	DIRECTION OF CHANGE: Lower is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary adult decision-maker responsible for meal planning and/or food preparation from sample households.
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the HEARTH activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

[27] Ibbett, H., Jones, J. P. G., and St John, F. A. V. (2021). Asking sensitive questions in conservation using randomised response techniques. Biological Conservation, 260, 109191. https://doi.org/10.1016/j.biocon.2021.109191

Gender Equality & Social Inclusion (GESI)

Pathways to Change

Through inclusion as participants in HEARTH activities, it is expected that women will have increased roles in household-level (agriculture, borrowing, productive assets) and community-level decision-making. Specifically, for conservation enterprise activities targeted for women participants (e.g., traditional crafts, agriculture, etc.), it is expected that women will change the allocation of time between productive/income-generating activities, unpaid household work, and leisure time.

Additionally, activities targeted towards changing gender norms may reduce the acceptance of gender-based violence. As an indirect result of the HEARTH activities increasing women's role in decision-making, it is also expected that men may be more aware of the importance of gender equality and women's empowerment. However, it is important to note that changes in household decision-making or income between spouses can sometimes have adverse effects and may result in increases in gender-based violence – underscoring the importance of measuring changes in this indicator.

In addition to gender equality, HEARTH activities should also have a focus on social inclusion for other marginalized populations (such as youth, LGBTQIA+, Indigenous Peoples, people with disabilities, etc.). HEARTH implementing partners are encouraged to collect disaggregated data and information for the relevant groups to inform their participation in the activities (see USAID's Inclusive Development Analysis).[28] The inclusion of these groups should also be considered in the sampling strategy (e.g., activities may choose to oversample households from these groups to ensure representation) and evaluation design (e.g., specific evaluation questions related to the program impacts for these groups may be included). HEARTH implementing partners and USAID Operating Units are encouraged to reach out to the Bureau of Development, Democracy, and Innovation's Inclusive Development Hub for support in engaging with these marginalized populations.

[28] Cotton, Anthony, Aline Magnoni, Derek Simon, and Brett Tolman. "Suggested Approaches for Integrating Inclusive Development Across the Program Cycle and in Mission Operations." (2018). https://usaidlearninglab.org/sites/default/files/resource/files/additional_help_for_ads_201_inclusive_development_180726_final_r.pdf.

Recommended Gender Outcomes and Indicators

General Note: The recommended options imply data collection from both an adult male and adult female, which increases the complexity of the survey, but will be required to cover all of these outcomes. If questions can only be asked of an adult male or adult female, then some of the indicators will not be able to be reported.

Outcome	Description	Recommended Indicator & Duration
Women's increased role in decision-making	The Survey-Based Women's Empowerment Index (SWPER) was developed by analyzing responses to DHS questions among partnered women in 34 African countries (Ewerling et al., 2017),[29] and was more recently adapted into a version designed to be applicable in all low- and middle-income countries (LMIC)s (Ewerling et al., 2020).[30] SWPER includes 14 questions that represent three dimensions of empowerment: attitudes toward violence, social independence, and decision-making. The questions were chosen because of their strong correlation with gender gaps in health and education, which are hypothesized to be caused or affected by women's agency. The premise behind the measure is that women's agency narrows these gender gaps, or when these gaps narrow, women acquire more agency. With the recommended DHS questions, this index can be	**Indicator:** Percent of women achieving high empowerment on the SWPER **Source:** DHS Women's Module[32] **Duration:** 8 minutes
Reduction in acceptance of gender-based violence[33]		

[29] Ewerling, Fernanda, John W Lynch, Cesar G Victora, Anouka van Eerdewijk, Marcelo Tyszler, and Aluisio J Barros. "The SWPER Index for Women's Empowerment in Africa: Development and Validation of an Index Based on Survey Data." The Lancet Global Health 5, no. 9 (2017). https://doi.org/10.1016/s2214-109x(17)30292-9.

[30] Ewerling, Fernanda, Anita Raj, Cesar G Victora, Franciele Hellwig, Carolina VN Coll, and Aluisio JD Barros. "SWPER Global: A Survey-Based Women's Empowerment Index Expanded from Africa to All Low- and Middle-Income Countries." Journal of Global Health 10, no. 2 (2020). https://doi.org/10.7189/jogh.10.020434.

[32] "Demographic and Health Survey Module Woman's Questionnaire." Demographic and Health Survey. United States Agency for International Development, June 19, 2020. https://www.dhsprogram.com/pubs/pdf/DHSQ8/DHS8_Womans_QRE_EN_19Jun2020_DHSQ8.pdf.

[33] It is not recommended to ask about experience of violence, given that this is not expected to be a direct outcome of HEARTH activities, and because asking about experience of violence increases potential for psychological trauma from interviewing.

Outcome	Description	Recommended Indicator & Duration
	constructed to compare across HEARTHs in addition to comparing responses to individual questions.[31]	
Change in women's time use	Detailed time use surveys (e.g., asking for primary and secondary activities broken down into 15-minute increments) are commonly seen as the most rigorous approach to measuring time use. However, these approaches are time consuming to implement. It is therefore recommended to ask a set of stylized questions about time spent on a limited set of tasks to measure this outcome. For more detailed discussion on measuring time use, please see Annex I. Alternatives such as A-WEAI[34] or the World Bank Living Standards Measurement Survey,[35] which include diary and recall approaches, may be considered for activities for which changes in women's time use are a primary outcome of interest.	**Indicator:** Percent of women spending 11 or more hours per day on non-paid work **Source**: N/A **Duration:** 5 minutes
Greater awareness of the importance of gender equality and women's empowerment in men and boys	It is recommended to ask the same set of questions for the decision-making and attitudes towards violence dimensions of SWPER to both women and men, allowing for comparison. To construct the indicator for decision-making parity, each respondent (male and female) should be categorized as adequate if they make any decisions	**Indicator:** Percent of households with gender parity on decision-making **Source:** DHS Men's Module[36] **Duration**: 4 minutes

[31] It should be noted that this DHS question set is similar to A-WEAI Module 6.2: "Feed the Future Zone of Influence Survey Methods - Questionnaire." Feed the Future, 2020. https://docs.google.com/spreadsheets/d/18drihQ1qe39L1Qj9qXSA0M3Yf7E4MXrR/edit#gid=1928718979.

[34] Abbreviated Women's Empowerment in Agriculture Index (A-WEAI) – Section 6.6a Time Allocation (Hourly Diary): "Feed the Future Zone of Influence Survey Methods - Questionnaire." Feed the Future, 2020. https://docs.google.com/spreadsheets/d/18drihQ1qe39L1Qj9qXSA0M3Yf7E4MXrR/edit#gid=1928718979.

[35] Living Standards Measurement Study (LSMS) example: "Socioeconomic Survey 2018-2019." Ethiopia - Socioeconomic Survey 2018-2019. World Bank, February 24, 2021. https://microdata.worldbank.org/index.php/catalog/3823/related-materials.

[36] "Demographic and Health Surveys Man's Module Questionnaire." Demographic Health Surveys, May 17, 2020. https://dhsprogram.com/pubs/pdf/DHSQ8/DHS8_Mans_QRE_EN_11Jun2020_DHSQ8.pdf.

Outcome	Description	Recommended Indicator & Duration
	jointly or alone. Then, household gender parity is scored as one if the adequacy score for the male and female are equal, otherwise zero. To construct the indicator for attitudes towards violence, a score is calculated with an overall negative value indicating that violence is more accepted, and an overall positive value indicating that violence is less accepted. Other options which were considered to measure this outcome tend to be much longer, broader, and less commonly used (e.g., Horizons and Promundo, Gender-Equitable Men (GEM) Scale; Promundo, International Men and Gender Equality Survey (IMAGES)).	**Indicator:** Percent of men that do not justify violence against women **Source:** DHS Men's Module[37] **Duration**: 2 minutes

[37] "Demographic and Health Surveys Man's Module Questionnaire." Demographic Health Surveys, May 17, 2020. https://dhsprogram.com/pubs/pdf/DHSQ8/DHS8_Mans_QRE_EN_11Jun2020_DHSQ8.pdf.

Performance Indicator Reference Sheets

INDICATOR TITLE: Percent of women achieving high empowerment on the SWPER

DEFINITION:

The SWPER Global is a suitable common measure of women's empowerment for LMICs, addressing the need for a single consistent survey-based indicator of women's empowerment that allows for tracking of progress over time and across countries at the individual and country levels (Ewerling et al., 2020).[38] SWPER includes 14 questions that represent three dimensions of empowerment: attitudes toward violence, social independence, and decision-making. The following table includes the 14 questions used to construct each dimension of the index:

Question	Answer Choice Code
Attitude to violence	
1. Beating justified if wife goes out without telling husband	Yes = -1 No = 1 Don't Know = 0
2. Beating justified if wife neglects the children	Same as above
3. Beating justified if wife argues with the husband	Same as above
4. Beating justified if wife refuses to have sex with the husband	Same as above
5. Beating justified if wife burns the food	Same as above
Social Independence	
6. Frequency of reading newspaper or magazine	Not at all = 0 <once a week=1 ≥once a week=2

[38] Ewerling, Fernanda, Anita Raj, Cesar G Victora, Franciele Hellwig, Carolina VN Coll, and Aluisio JD Barros. "SWPER Global: A Survey-Based Women's Empowerment Index Expanded from Africa to All Low- and Middle-Income Countries." Journal of Global Health 10, no. 2 (2020). https://doi.org/10.7189/jogh.10.020434.

INDICATOR TITLE: Percent of women achieving high empowerment on the SWPER

7. Woman education	Years
8. Age of respondent at cohabitation	Years
9. Age of respondent at first birth	Years
10. Age difference: woman's minus husband's age	Years
11. Education difference: woman's minus husband's years of schooling	Years
Decision-making	
12. Who usually decides on respondent's health care	Husband or other alone = -1 Joint decision or respondent alone = 1
13. Who usually decides on large household purchases	Same as above
14. Who usually decides on visits to family or relatives	Same as above

For detailed information on how to calculate SWPER for a specific survey, please see the Online Supplementary Document.[39] In general, the steps are:

1) Recode the items as shown in the table above
2) Imputation of woman's age at first birth. The authors use single hotdeck imputation to impute the age at first birth for nulliparous women, clustering women according to their age at first cohabitation. In many countries the number of women that had the first cohabitation later in life was very small, so they generate a new variable of age at first cohabitation to use in the imputation where the maximum age was set at 33+ years.
3) Calculate individual scores using the equations below:

[39] Ewerling, Fernanda, Anita Raj, Cesar G. Victora, Franciele Hellwig, Carolina V. Coll, and Aluisio Barros. "A Survey-Based Women's Empowerment Index for Low- and Middle-Income Countries: The SWPER Goes Global." SSRN Electronic Journal, 2019. https://doi.org/10.2139/ssrn.3466986.

INDICATOR TITLE: Percent of women achieving high empowerment on the SWPER

$$Score_{\,Attitude\ to\ violence_i} = (-1.202) + \sum_{v=1}^{14}(\lambda_{v1}x_{vi})$$

$$Score_{\,Social\ independence_i} = (-5.661) + \sum_{v=1}^{14}(\lambda_{v2}x_{vi})$$

$$Score_{\,Decision-making_i} = (-0.168) + \sum_{v=1}^{14}(\lambda_{v3}x_{vi})$$

Where x_{vi} is the value of items v for each individual i and $\lambda_{v1} - \lambda_{v3}$ are the item weights, that can be found in **Table 2** below.

4) Standardize the calculated SWPER scores by subtracting the global mean and dividing the result by the respective standard deviation (values provided in **Table 3** below).

$$Std\ Score_{\,Attitude\ to\ violence_i} = \frac{(Score_{\,Attitude\ to\ violence_i}) - (mean)}{standard\ deviation}$$

$$Std\ Score_{\,Social\ independence_i} = \frac{(Score_{\,Social\ independence_i}) - (mean)}{standard\ deviation}$$

$$Std\ Score_{\,Decision-making_i} = \frac{(Score_{\,Decision-making_i}) - (mean)}{standard\ deviation}$$

Table 2: *Item Weights Used in the Equations for Estimating Individual Scores for each Domain of the SWPER Index*

Item (v)		λ_{v1} Attitude to violence	λ_{v2} Social independence	λ_{v3} Decision-making
1.	Beating not justified if wife goes out without telling husband	0.508	-0.012	-0.003
2.	Beating not justified if wife neglects the children	0.508	-0.026	-0.040
3.	Beating not justified if wife argues with husband	0.526	0.001	0.007
4.	Beating not justified if wife refuses to have sex with husband	0.538	0.001	0.028
5.	Beating not justified if wife burns the food	0.588	-0.015	-0.020
6.	Frequency of reading newspaper or magazine	0.083	0.422	0.121
7.	Woman education	0.016	0.081	0.022
8.	Age of respondent at cohabitation	-0.006	0.133	-0.012
9.	Age of respondent at first birth	-0.010	0.139	-0.016
10.	Age difference: woman's minus husband's age	0.001	0.031	0.013
11.	Education difference: woman's minus husband's years of schooling	0.002	0.054	0.001
12.	Who usually decides on respondent's health care	0.001	-0.004	0.599
13.	Who usually decides on large household purchases	-0.017	-0.022	0.601
14.	Who usually decides on visits to family or relatives	0.002	-0.034	0.619

INDICATOR TITLE: Percent of women achieving high empowerment on the SWPER

Table 3: *Mean and Standard Deviation for the Standardization of the SWPER Scores*

	Attitude to violence		Social Independence		Decision-making	
Region	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
South Asia	-0.138	1.804	-0.121	1.452	-0.097	1.546
East Asia & Pacific	0.238	1.563	0.757	1.550	0.792	0.950
Europe and Central Asia	0.256	1.701	1.286	1.169	0.619	1.296
Middle East & North Africa	-0.167	1.923	0.371	1.549	0.014	1.449
West & Central Africa	-0.601	2.030	-0.683	1.346	-0.913	1.562
Eastern & Southern Africa	0.094	1.745	-0.142	1.350	0.246	1.283
Latin America & Caribbean	1.084	0.852	0.460	1.546	0.674	1.049
SWPER Global	0.000	1.811	0.000	1.526	0.000	1.502

5) Once scores have been standardized, they should be categorized into low, medium, or high empowerment based on the cutoffs in **Table 4** below.

Table 4: *Cut-offs Used to Categorize the SWPER Domains into Low, Medium, and High Empowerment Levels*

	Attitude to violence	Social independence	Decision-making
Low empowerment	≤-0.700	≤-0.559	≤-1.000
Medium empowerment	>-0.700 ≤0.400	>-0.559 ≤0.293	>-1.000 ≤0.600
High empowerment	>0.400	>0.293	>0.600

The Online Supplementary Document includes a link to a Stata do-file with all procedures required for the calculation of the SWPER Index score.

These questions should be asked to the female respondent (ideally, the primary female household decision-maker) in private and by a female enumerator given the potentially sensitive nature of the questions related to violence.

ADAPTATION:

It is not recommended that these questions be adapted.

Note that this indicator includes 3 questions related to the decision-making from the DHS. However, activities may decide to include the full set of 6 decision-making questions from DHS women's module, which includes the following related to earnings:

- Who usually decides how the money you earn will be used: you, your (husband/partner), or you and your (husband/partner) jointly?
- Would you say that the money that you earn is more than what your (husband/partner) earns, less than what he earns, or about the same?
- Who usually decides how your (husband's/partner's) earnings will be used: you, your (husband/partner), or you and your (husband/partner) jointly?

INDICATOR TITLE: Percent of women achieving high empowerment on the SWPER	
These questions are not part of the index because they are dependent on women having earnings, but nonetheless may provide important insights for activities related to women's empowerment in decision-making. Other aspects of decision-making that HEARTH activities may want to ask about include who makes decisions regarding children's healthcare or education. However, these additional questions should not be analyzed as part of the index.	
UNIT: Percent	DISAGGREGATE BY: Index Dimension: Decision-making; Social independence; Attitudes towards violence Age groups: <5; 5-14; 15-18; 19-49, 50+
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary female decision-makers from sample households. If this household member is not available, another adult female household member may respond.
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the gender-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

INDICATOR TITLE: Percent of women spending 11 or more hours per day on non-paid work

DEFINITION:

It is expected that women participating in HEARTH activities will change their allocation of time between income-generating activities, non-paid work, and leisure time.

To measure this, respondents will be asked a set of questions about the average amount of time per day they spent on these three groups of activities over the past week, with the following response options: (1) one hour or less; (2) between 1 and 3 hours; (3) between 3 and 5 hours; (4) between 5 and 7 hours; (5) between 7 and 9 hours; (6) between 9 and 11 hours; (7) 11 more hours. Below is a list of illustrative activities that might fall into these groups, adapted from the Feed the Future time use diary list of activities:

Income-Generating Activities	Non-Paid Work Activities	Leisure Activities
Work (employed or own business)	Shopping/getting services (including healthcare)	Watching TV/listening to the radio/reading
Farming (food or cash crop), livestock raising, and fishing or fishpond culture	Domestic work (including fetching water and collecting fuel)	Social activities and hobbies (including exercise)
	Cooking	Religious activities
	Weaving/sewing/textile care	
	Caring for children or adults (sick, elderly)	

The indicator is constructed as the percent of women spending 11 or more hours per day on non-paid work activities. The additional response buckets will allow analysis of smaller changes in time allocation that might be of interest and including income-generating and leisure activities will provide important information on what else women are spending their time on.

ADAPTATION:

HEARTH activities should provide a list of activities adapted to the local context, to appropriately probe respondents.

Additionally, activities may consider further adapting the questionnaire to collect more detailed information – for example, by asking respondents to estimate hours as an integer rather than in buckets, or by asking respondents about the disaggregated activity types (e.g., work, farming,

INDICATOR TITLE: Percent of women spending 11 or more hours per day on non-paid work	
domestic work, etc.) rather than the three higher-level groups. However, these adaptations will add significant length to the survey, and results will be more sensitive to recall bias.	
UNIT: Percent	DISAGGREGATE BY: Age groups: <5; 5-14; 15-18; 19-49, 50+
TYPE: Outcome	DIRECTION OF CHANGE: Lower is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary female decision-makers from sample households. If this household member is not available, another adult female household member may respond.
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the gender-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

INDICATOR TITLE: Percent of households with gender parity on decision-making

DEFINITION:

The SWPER Global is a suitable common measure of women's empowerment for LMICs, addressing the need for a single consistent survey-based indicator of women's empowerment that allows for tracking of progress over time and across countries at the individual and country levels (Ewerling et al., 2020).[40] SWPER includes 14 questions that represent three dimensions of empowerment: attitudes toward violence, social independence, and decision-making. While this index was constructed for women, it is recommended for HEARTH activities to include the same questions for men regarding decision-making (as in the DHS Men's Questionnaire).

Prior to calculation, each item should be recoded as shown in the table below:

Question	Answer Choice Code
Decision-making	
12. Who usually decides on respondent's health care	Spouse or other alone = -1 Joint decision or respondent alone = 1
13. Who usually decides on large household purchases	Same as above
14. Who usually decides on visits to family or relatives	Same as above

To construct the indicator for decision-making parity, each respondent (male and female) should be categorized as adequate if they make any decisions jointly or alone (response to any question = 1), or inadequate if they have no control over any of these decisions (response to all questions = -1). Then, household gender parity is scored as one if the adequacy score for the male and female are equal, otherwise zero. This indicator is then reported as the percent of households achieving gender parity across the sample.

It should be noted that reporting for this indicator is limited to households with both male and female respondents.

[40] ibid

INDICATOR TITLE: Percent of households with gender parity on decision-making

ADAPTATION:

It is not recommended that these questions be adapted.

Note that this indicator includes 3 questions related to the decision-making from the DHS. However, activities may decide to include the full set of 4 decision-making questions from DHS men's module, which includes the following related to earnings:

- Who usually decides how the money you earn will be used: you, your (wife/partner), or you and your (wife/partner) jointly?

There are also 2 additional questions from the DHS women's module which it may be of interest to adapt for men:

- Would you say that the money that you earn is more than what your (husband/partner) earns, less than what he earns, or about the same?
- Who usually decides how your (husband's/partner's) earnings will be used: you, your (husband/partner), or you and your (husband/partner) jointly?

UNIT:	DISAGGREGATE BY:
Percent	Dimension: Decision-making; Attitudes towards violence Age groups: <5; 5-14; 15-18; 19-49, 50+
TYPE:	DIRECTION OF CHANGE:
Outcome	Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary male decision-makers from sample households. If this household member is not available, another adult male household member may respond.
REPORTING NOTES	

In addition to reporting the percent value, the number of participant households of the gender-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).

INDICATOR TITLE: Percent of men that do not justify violence against women

DEFINITION:

The SWPER Global is a suitable common measure of women's empowerment for LMICs, addressing the need for a single consistent survey-based indicator of women's empowerment that allows for tracking of progress over time and across countries at the individual and country levels (Ewerling et al., 2020).[41] SWPER includes 14 questions that represent three dimensions of empowerment: attitudes toward violence, social independence, and decision-making. While this index was constructed for women, it is recommended for HEARTH activities to include the same questions for men regarding attitudes towards violence (as in the DHS Men's Questionnaire).

Prior to calculation, each item should be recoded as shown in the table below:

Question	Answer Choice Code
Attitude to violence	
1. Beating justified if wife goes out without telling husband	Yes = -1 No = 1 Don't Know = 0
2. Beating justified if wife neglects the children	Same as above
3. Beating justified if wife argues with the husband	Same as above
4. Beating justified if wife refuses to have sex with the husband	Same as above
5. Beating justified if wife burns the food	Same as above

To construct the indicator for attitudes towards violence, the answer choices should be added together for all 5 questions, with an overall negative value indicating that violence is more accepted, and an overall positive value indicating that violence is less accepted. This indicator is then reported as the percent of men with a positive score. Men who answer "don't know" to all five questions are not included in the calculation.

[41] ibid

INDICATOR TITLE: Percent of men that do not justify violence against women	
ADAPTATION: It is not recommended that these questions be adapted.	
UNIT: Percent	DISAGGREGATE BY: Dimension: Decision-making; Attitudes towards violence Age groups: <5; 5-14; 15-18; 19-49, 50+
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary male decision-makers from sample households. If this household member is not available, another adult male household member may respond.
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the gender-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

Health

Pathways to Change

Access and use of healthcare services, including family planning services and maternal health services, might increase either due to direct HEARTH activities (e.g., constructing or otherwise providing financial/technical support for a health clinic, or provision of health information and services through community health workers), as a result of increased incomes, or increased knowledge/awareness of services available and their benefits. The same is true for access/use of treatment for children, which might increase due to activities directly supporting the health sector, thus increasing the availability of services, or through increased incomes. The number of children receiving treatment might also increase through greater awareness (of both availability of services, and the benefits of using them – especially vaccines). Healthier individuals and households may be more likely to engage in environmental conservation and sustainable agricultural and other income generating activities.

Due to increased access to healthcare services and/or increased incomes, it is expected that health expenditures would increase as households are able to get treatment for sick family members that previously they might not have had access to or been able to afford. At the same time, health expenditures overall might decrease, as overall health improves. In particular, healthcare seeking costs will decrease as more/better health information services become more available and convenient to access.

Similar to above, improved drinking water might be a result of direct HEARTH activities (e.g., digging new or repairing existing boreholes), or increased incomes (which households can use to invest in improvements in their water supply/systems). Additionally, greater awareness of the health benefits of clean drinking water might increase demand.

Recommended Outcomes and Indicators

Outcome	Description	Recommended Indicator & Duration
Increased use of family planning services	Contraceptive prevalence rate is the percent of women/men of reproductive age who are using a contraceptive method at a particular point in time, almost always reported for women/men married or in a sexual union. Additional questions would be asked regarding the method of contraception and who primarily chose to use contraception in the partnership. This indicator would be reported for both men and women respondents, disaggregated by sex, age, and contraception method.	**Indicator:** Percent of women/men of reproductive age who are using a contraceptive method **Source:** Adapted from DHS Women's Module[42] Duration: 2 minutes
	The Method Information Index[43] measures the extent to which women were given specific information when they received family planning services. The indicator provides a summary measure of the adequacy of information being provided to women by service providers at the time when they chose the contraception method currently being used. It is calculated by looking at the number of women who respond "yes" to a set of 3 questions, divided by the number of women of reproductive age currently using a contraceptive method.	**Indicator:** Percent of women given information on contraception methods (Method Information Index) **Source:** Performance Monitoring for Action (PMA) 2020 [44] Duration: 2 minutes
Increased access to maternal health services	This module is a set of 6 questions regarding whether the respondent sought any antenatal care, who she saw, where she received the treatment, how many weeks/months pregnant she was when she first received antenatal care, how many times she received antenatal care during the pregnancy, and type of care provided. A woman will thus be counted in the numerator of this indicator if she (1) received antenatal care 2 or more	**Indicator:** Percent of pregnant women who have attended at least two comprehensive antenatal clinics **Source:** Adapted from USAID OFDA Health

[42] ibid

[43] Chang, Karen T., Mulenga Mukanu, Ben Bellows, Waqas Hameed, Amanda M. Kalamar, Karen A. Grépin, Xaher Gul, and Nirali M. Chakraborty. "Evaluating Quality of Contraceptive Counseling: An Analysis of the Method Information Index." Studies in Family Planning 50, no. 1 (January 21, 2019): 25–42. https://doi.org/10.1111/sifp.12081.

[44] Johns Hopkins Bloomberg School of Public Health. "Data and Study Designs." Survey Methodology | PMA Data. Performance Monitoring for Action, 2021. https://www.pmadata.org/data/survey-methodology.

Outcome	Description	Recommended Indicator & Duration
	times during her pregnancy, AND (2) that care included at least 4 of the 7 comprehensive care components listed in the core questionnaire. It should be noted that it will likely be challenging to measure impacts for this indicator without a very large sample size (given that it is limited to households with women who have been pregnant in a specified time frame).	PIRS,[45] measured using DHS Women's Module[46] **Duration**: 6 minutes
	This indicator measures whether women had a delivery assisted by a skilled (not traditional) attendant at birth. Similar considerations regarding measurement and sample size as for antenatal care apply to delivery assistance.	**Indicator:** Percent of pregnant women who deliver assisted by a skilled attendant at birth **Source:** Adapted from USAID OFDA Health PIRS,[47] measured using DHS Women's Module[48] **Duration**: 1 minute
	This indicator measures whether women had a delivery at home or at a medical facility. To reduce maternal and infant mortality, the optimal long-term objective is that all births take place in (or very near to) health facilities in which obstetric complications can be treated when they arise. This indicator is considered a key process measure for assessing country progress in reducing maternal	**Indicator:** Percent of pregnant women who deliver at a health facility **Source:** Adapted from USAID Standard

[45] "Health PIRS." USAID/OFDA Proposal Guidelines. United States Agency for International Development, February 2018. https://www.usaid.gov/sites/default/files/documents/1866/USAID-OFDA_Health_PIRS_Feb_2018.pdf.

[46] "Demographic and Health Survey Module Woman's Questionnaire." Demographic and Health Survey. United States Agency for International Development, June 19, 2020. https://www.dhsprogram.com/pubs/pdf/DHSQ8/DHS8_Womans_QRE_EN_19Jun2020_DHSQ8.pdf.

[47] "Health PIRS." USAID/OFDA Proposal Guidelines. United States Agency for International Development, February 2018. https://www.usaid.gov/sites/default/files/documents/1866/USAID-OFDA_Health_PIRS_Feb_2018.pdf.

[48] "Demographic and Health Survey Module Woman's Questionnaire." Demographic and Health Survey. United States Agency for International Development, June 19, 2020. https://www.dhsprogram.com/pubs/pdf/DHSQ8/DHS8_Womans_QRE_EN_19Jun2020_DHSQ8.pdf.

Outcome	Description	Recommended Indicator & Duration
	mortality.[49] Similar considerations regarding measurement and sample size as for antenatal care apply to location of delivery.	**Indicator:** HL.6.2-2,[50] measured using DHS Women's Module[51] **Duration**: 1 minute
Increased health expenditures to seek treatment for sick family members	This indicator will be constructed as the total household expenditure on medical costs over the past three months, divided by the number of sick household members. Asking about medical costs per sick household member will provide additional information about expenditures across sex and age groups, as well as facilitate better recall. While asking by health expenditure type (e.g., outpatient costs, medication, etc.) may similarly result in more accurate recall, this would add more time to the survey, and therefore is not recommended. This indicator is divided by the number of sick household members, given that health may improve overall because of HEARTH activities, which would decrease average household level health expenditures (as fewer people get sick at the extensive margin). However, this does not fully account for household members experiencing less severe illness, which might reduce per household member health expenses. This indicator should be analyzed alongside other health indicators for a complete picture of health-related outcomes.	**Indicator:** Average amount of health expenditures per sick family member **Source:** Adapted from Research and Development (RAND) Indonesia Family Life Survey[52] **Duration:** 1-2 minutes (depending on the number of sick household members)

[49] See USAID Standard Health Indicator HL.6.2-2: "Health Indicator Reference Sheets." IRS_Category3. U.S. Department of State, n.d. https://www.state.gov/wp-content/uploads/2020/09/IRS_Category3_Health_Public.508.xlsx.

[50] "Health Indicator Reference Sheets." IRS_Category3. U.S. Department of State, n.d. https://www.state.gov/wp-content/uploads/2020/09/IRS_Category3_Health_Public.508.xlsx.

[51] "Demographic and Health Survey Module Woman's Questionnaire." Demographic and Health Survey. United States Agency for International Development, June 19, 2020. https://www.dhsprogram.com/pubs/pdf/DHSQ8/DHS8_Womans_QRE_EN_19Jun2020_DHSQ8.pdf.

[52] Strauss, John, Firman Witoelar, and Bondan Sikoki. "Household Survey Questionnaire for the Indonesia Family Life Survey, Wave 5." RAND Corporation WR-1143/3-NIA/NICHD (2016). https://doi.org/10.7249/wr1143.3.

Outcome	Description	Recommended Indicator & Duration
Increased coverage of healthcare services	This indicator will be constructed as the total number of outpatient consultations over the past three months, divided by the number of sick household members. Outpatient consultations should be to seek curative treatment for illness and excludes preventive care visits like vaccination and antenatal care. It is recommended to disaggregate by source of consultation (e.g., community health center, traditional healer, government hospital). While this indicator is measuring the receipt of outpatient consultations, this can be used as a proxy for access.	**Indicator:** Average number of outpatient consultations per sick family member **Source:** Adapted from USAID Office of Foreign Disaster Assistance (OFDA) Health PIRS[53] **Duration:** 2 minutes
Increased coverage of treatment for common childhood illnesses	This indicator will be constructed as the total number of visits by children for community-based treatment of illness over the past three months, divided by the number of sick children (5 years of age and under). It is recommended to ask this across a range of common childhood illnesses, which should be adapted for each HEARTH, rather than by specific illness to increase the potential sample size (i.e., to increase the likelihood that a household had at least one child with the illness in question over the last three months).	**Indicator:** Average number of visits for community-based treatment per sick child 5 and under **Source:** Adapted from USAID OFDA Health PIRS[54] **Duration:** 2 minutes
	This indicator is adapted from the USAID Standard Indicator for the number of children who received their first dose of measles-containing vaccine by 12 months of age. Measles vaccination is an important contributor to USAID's initiative to prevent child deaths. Unvaccinated children are at highest risk of measles and its complications, including death. In 2017, approximately 100,000 children died from measles, and the number of measles outbreaks have increased in recent years following anti-vaccination efforts combined with poor	**Indicator:** Percent of children 0-35 months of age who received their first dose of measles-containing vaccine by 12-months of age **Source:** Adapted from USAID Standard Indicator HL.6.4-62,[56]

[53] "Health PIRS." USAID/OFDA Proposal Guidelines. United States Agency for International Development, February 2018. https://www.usaid.gov/sites/default/files/documents/1866/USAID-OFDA_Health_PIRS_Feb_2018.pdf.

[54] ibid

[56] "Health Indicator Reference Sheets." IRS_Category3. U.S. Department of State, n.d. https://www.state.gov/wp-content/uploads/2020/09/IRS_Category3_Health_Public.508.xlsx.

Outcome	Description	Recommended Indicator & Duration
	health systems. Measles outbreaks can be particularly deadly in countries experiencing or recovering from a natural disaster or conflict.[55] HEARTH activities should only include this indicator if vaccination is directly relevant to program activities (i.e., if the activity is building/providing support for health facilities that might be providing vaccines, conducting vaccine awareness/information campaigns, etc.). Additionally, it should be noted that it will likely be challenging to measure impacts for this indicator without a very large sample size (given that it is limited to households with children under 3).	measured using DHS Women's Module[57] **Duration**: 5 minutes
Improved access, reliability, and affordability of safe household drinking water	These indicators are the number of households gaining access to a water source categorized as limited, basic, or safely managed as a result of USG assistance. These water source categories reflect a combination of whether the water source is improved, its accessibility, and reliability. Improved water sources include piped water into the dwelling, piped water into the yard, a public tap or standpipe, a tube well or borehole, a protected dug well, a protected spring, and rainwater. Improved water sources may also include tanker truck, cart with small tank, or bottled water, depending on the country.[58] In addition to asking about the main drinking water source, recommended follow-up questions are added about perceptions of changes in availability and quality.	**Indicator:** Number of people gaining access to basic drinking water services as a result of USG assistance **Indicator:** Number of people gaining access to safely managed drinking water services as a result of USG assistance **Source:** Joint Monitoring Program core questions for drinking water household survey.[59] Adapted from USAID Standard

[55] ibid

[57] "Demographic and Health Survey Module Woman's Questionnaire." Demographic and Health Survey. United States Agency for International Development, June 19, 2020. https://www.dhsprogram.com/pubs/pdf/DHSQ8/DHS8_Womans_QRE_EN_19Jun2020_DHSQ8.pdf.

[58] Definition based on Feed the Future Guide to Statistics.

[59] WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene. "Core questions on water, sanitation and hygiene for household surveys." 2018. https://washdata.org/monitoring/methods/core-questions.

Outcome	Description	Recommended Indicator & Duration
		Indicators HL.8.1-1 and HL.8.1-2.[60] **Duration**: 5 minutes
	Providing "access" does not necessarily guarantee beneficiary "use" of a basic or safely managed drinking water service, and thus potential health benefits are not certain to be realized from simply providing "access." This indicator captures additional dimensions of a water service's reliability or affordability--two other important factors that influence the likelihood that those defined as having access will actually use the service.	**Indicator:** Number of people receiving improved service quality from an existing basic or safely managed drinking water service as a result of USG assistance **Source:** Joint Monitoring Program core questions for drinking water household survey.[61] Adapted from USAID Standard Indicators HL.8.1-3.[62] **Duration**: 3 minutes
	Diarrheal disease is a leading cause of death in children under-five in USAID's priority Maternal & Child Health countries, as well as a substantial contributor to child malnutrition. This indicator will be measured by asking the primary caregiver whether each child under 5 has had diarrhea in the last two weeks. The term(s) used for diarrhea should encompass the expressions used for all	**Indicator:** Percent of children under five with diarrhea in the past two weeks **Source:** Adapted from DHS Women's Module[63]

[60] USAID. "Water and Development Indicator Handbook." 2021. https://www.globalwaters.org/resources/assets/water-and-development-indicator-handbook.

[61] WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene. "Core questions on water, sanitation and hygiene for household surveys." 2018. https://washdata.org/monitoring/methods/core-questions.

[62] USAID. "Water and Development Indicator Handbook." 2021. https://www.globalwaters.org/resources/assets/water-and-development-indicator-handbook.

[63] "Demographic and Health Survey Module Woman's Questionnaire." Demographic and Health Survey. United States Agency for International Development, June 19, 2020.

Outcome	Description	Recommended Indicator & Duration
	forms of diarrhea, including bloody stools (consistent with dysentery), watery stools, etc.	**Duration**: 1 minute
	ORS is an effective, low-cost prevention and management intervention for diarrhea. This indicator is therefore measured as the percent of children under 5 with diarrhea in the past two weeks who were treated with ORS, divided by the total number of children under 5 with diarrhea in the past two weeks.	**Indicator:** Percent of children under five with diarrhea in the past two weeks treated with ORS **Source:** Adapted from USAID Standard Indicator HL.6.6-1,[64] measured using DHS Women's Module[65] **Duration**: 1 minute

[64] "Health Indicator Reference Sheets." IRS_Category3. U.S. Department of State, n.d. https://www.state.gov/wp-content/uploads/2020/09/IRS_Category3_Health_Public.508.xlsx.

[65] "Demographic and Health Survey Module Woman's Questionnaire." Demographic and Health Survey. United States Agency for International Development, June 19, 2020.

Performance Indicator Reference Sheets

INDICATOR TITLE: Percent of women/men of reproductive age who are using a contraceptive method

DEFINITION:

Contraceptive prevalence rate is the percent of women/men of reproductive age who are using a contraceptive method at a particular point in time.

An illustrative list of contraceptive methods may include:

- Female/male sterilization
- IUD
- Injectables
- Implants
- Pill
- Female/male condom
- Emergency contraception
- Diaphragm
- Foam/jelly
- Standard days method/cycle beads
- Lactation amenorrhea method
- Rhythm method
- Withdrawal

Additional questions should be asked regarding the method of contraception and who primarily chose to use contraception in the partnership. This indicator would be reported for both men and women respondents, disaggregated by sex, age, and contraception method.

ADAPTATION:

The list of contraceptive methods and their locally understood names should be adjusted for different countries/regions.

UNIT:	DISAGGREGATE BY:
Percent	Sex: Male, Female Age: 15-19, 20-29, 30-39 Contraception method
TYPE:	DIRECTION OF CHANGE:

INDICATOR TITLE: Percent of women/men of reproductive age who are using a contraceptive method	
Outcome	Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Women and men of reproductive age (15-49)
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the health-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

INDICATOR TITLE: Percent of women given information on contraception methods (Method Information Index)	
DEFINITION: The Method Information Index (MII) is a relatively new tool in the suite of indicators focused on family planning quality. The MII is a way to assess the information given to clients during family planning health visits. Assessments of counseling have traditionally relied on direct observation, exit interview, or retrospective reporting by the person seeking family planning. In the absence of direct observation, asking women about the information they received is used as a proxy indicator of the quality of the services provided.[66] This indicator measures the extent to which women were given specific information when they received family planning services. The indicator provides a summary measure of the adequacy of information being provided to women by service providers at the time when they chose the contraception method currently being used. Data for this indicator is collected by asking women a set of 3 questions: whether they were informed about other methods aside from their current method, told about possible side effects from their current method, and advised what to do if they experienced side effects. The reported index score is the percent of women who responded "yes" to all three questions.[67] The percentage of women given information on contraception methods is then calculated by dividing the number of women who respond "yes" to all three items by the number of women of reproductive age currently using a contraceptive method.	
ADAPTATION: N/A	
UNIT: Percent	DISAGGREGATE BY: Age: 15-19, 20-29, 30-39
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Women of reproductive age (15-49)

[66] Chang, Karen T., Mulenga Mukanu, Ben Bellows, Waqas Hameed, Amanda M. Kalamar, Karen A. Grépin, Xaher Gul, and Nirali M. Chakraborty. "Evaluating Quality of Contraceptive Counseling: An Analysis of the Method Information Index." Studies in Family Planning 50, no. 1 (January 21, 2019): 25–42. https://doi.org/10.1111/sifp.12081.

[67] ibid

INDICATOR TITLE: Percent of women given information on contraception methods (Method Information Index)
REPORTING NOTES
In addition to reporting the percent value, the number of participant households of the health-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).

INDICATOR TITLE: Percent of pregnant women who have attended at least two comprehensive antenatal clinics

DEFINITION:

Attended is defined as having presented to a health service delivery point and received services required for antenatal visits. Comprehensive antenatal clinics include the complete package of antenatal services as prescribed by Ministry of Health policy and delivered by a trained health care worker. WHO guidelines on the content of antenatal care visits include the following components: Clinical examination; Blood testing to detect syphilis and severe anemia (and HIV, malaria, etc. according to the epidemiological context); Gestational age estimation; Uterine height; Blood pressure; Maternal weight and height; Test for sexually transmitted infections (STIs); Urine test; Request blood type and Rh; Tetanus toxoid administration; Iron/folic acid supplementation; recommendations for emergencies.[68]

To construct this indicator, the number of pregnant women in attendance for two or more comprehensive antenatal clinics is calculated, and then divided by the total number of women who gave birth.

This module is a set of 6 questions regarding (Q1) whether the respondent sought any antenatal care, (Q2) who she saw, (Q3) where she received the treatment, (Q4) how many weeks/months pregnant she was when she first received antenatal care, (Q5) how many times she received antenatal care during the pregnancy, and (Q6) type of care provided. A woman will thus be counted in the numerator of this indicator if she (1) received antenatal care 2 or more times during her pregnancy, AND (2) that care included at least 4 of the 7 comprehensive care components listed in the core questionnaire.

DATA COLLECTION:

It is recommended first to include a question for all women of reproductive age (15-49 years of age, consistent with FTF and FAO guidance) in the household roster regarding whether they have ever been pregnant, and if yes, the result of the pregnancy (live birth, still birth, abortion/miscarriage). This module should be asked to the woman in the household with the most recent live or still birth within the specified time frame (see below in Adaptation regarding the appropriate time frame). Then in this module, a question should be asked regarding whether (Q1) the respondent saw anyone for antenatal care for her most recent pregnancy (that resulted in a live or still birth).

If yes, follow-up questions will be asked regarding (Q2) whom she saw (health personnel [doctor, nurse/midwife, auxiliary midwife], other person [traditional birth attendant, community health worker/field worker], or other) and (Q3) where she received antenatal care (home [her home, other home], public sector [government hospital, government health center, government health

[68] Definitions taken from the OFDA Health PIRS: "Health PIRS." USAID/OFDA Proposal Guidelines. United States Agency for International Development, February 2018. https://www.usaid.gov/sites/default/files/documents/1866/USAID-OFDA_Health_PIRS_Feb_2018.pdf.

INDICATOR TITLE: Percent of pregnant women who have attended at least two comprehensive antenatal clinics

post, other public], private medical sector [private hospital, private clinic, other private medical], NGO medical sector [NGO hospital, NGO clinic, other NGO medical], or other).

These questions should be followed by (Q4) how many weeks or months pregnant were you when you first received antenatal care for this pregnancy, and (Q5) how many times did you receive antenatal care during this pregnancy?

Finally, a question is asked: (Q6) As part of your antenatal care during this pregnancy, did a healthcare provider do any of the following at least once: measure your blood pressure, take a urine sample, take a blood sample, listen to the baby's heartbeat, talk with you about which foods you should eat, talk with you about breastfeeding, and/or ask if you had vaginal bleeding?

ADAPTATION:

The timeframe over which these questions should be asked will depend on the frequency of data collection. If activities are conducting a baseline and endline survey, it is recommended that this set of questions be asked to all women whose pregnancy resulted in a live or still birth in the last 5 years at both points in time. However, if surveys are conducted annually, activities should adapt the time frame accordingly to ask all women whose pregnancy resulted in a live or still birth in the past year.

The list of providers and location of care may be adapted for local contexts, but it is recommended that they are aggregated for reporting into the same high-level categories (see below in Disaggregate By). Additionally, it is not recommended to adapt the list of comprehensive care components for comparison across the HEARTH portfolio. However, if there are specific aspects of antenatal care which are not included in this list, HEARTH activities may add extra care components – but these should not be included in the calculation of this indicator.

Finally, while it is recommended to ask this set of questions to the woman in the household with the most recent live or still birth within the specified time frame, activities may choose to ask these questions to ALL women in the household with the most recent live or still birth within the specified time frame, especially if there is concern about smaller sample sizes. However, this is not recommended given the length of time that this would require adding to the survey, as well as additional logistical challenges due to increasing the total number of survey respondents.

UNIT:	DISAGGREGATE BY:
Percent	Type of provider: Health personnel; Other person Location of care: Home, Public sector; Private medical sector; NGO Medical Sector

INDICATOR TITLE: Percent of pregnant women who have attended at least two comprehensive antenatal clinics	
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	This module should be asked to the woman in the household with the most recent live or still birth within the specified time frame (see above in Adaptation regarding the appropriate time frame).
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the health-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

INDICATOR TITLE: Percent of pregnant women who deliver assisted by a skilled attendant at birth

DEFINITION:

Assisted by is defined as present and presiding over labor and delivery for a pregnant woman and being trained/available to perform assessment and the seven signal functions of basic emergency obstetric and newborn care, including management of complications or recommending referral, as needed. Skilled (not traditional) attendant at birth is defined as an accredited health professional who possesses the knowledge and a defined set of cognitive and practical skills that enable the individual to provide safe and effective health care during childbirth to women and their infants in the home, health center, and hospital settings. Skilled attendants include midwives, doctors, and nurses with midwifery and life-saving skills. This definition excludes traditional birth attendants whether trained or not.[69]

To construct this indicator, the number of pregnant women who delivered while assisted by a skilled attendant is calculated, and then divided by the total number of women who gave birth.

This information is collected by asking a single question: For your most recent birth, who assisted with the delivery? The answer choices are Health personnel (doctor, nurse/midwife, auxiliary midwife), other person (traditional birth attendant, community health worker/field worker), or other. A woman will thus be counted in the numerator of this indicator if she answers any of the three types of health personnel.

DATA COLLECTION:

It is recommended first to include a question for all women of reproductive age (15-49 years of age, consistent with FTF and FAO guidance) in the household roster regarding whether they have ever been pregnant, and if yes, the result of the pregnancy (live birth, still birth, abortion/miscarriage). This question should be asked to the woman in the household with the most recent live or still birth within the specified time frame (see below in Adaptation regarding the appropriate time frame).

ADAPTATION:

The timeframe over which these questions should be asked will depend on the frequency of data collection. If activities are conducting a baseline and end line survey, it is recommended that this set of questions be asked to all women whose pregnancy resulted in a live or still birth in the last 5 years at both points in time. However, if surveys are conducted annually, activities should adapt the time frame accordingly to ask all women whose pregnancy resulted in a live or still birth in the past year.

[69] Definitions taken from the OFDA Health PIRS: "Health PIRS." USAID/OFDA Proposal Guidelines. United States Agency for International Development, February 2018. https://www.usaid.gov/sites/default/files/documents/1866/USAID-OFDA_Health_PIRS_Feb_2018.pdf.

INDICATOR TITLE: Percent of pregnant women who deliver assisted by a skilled attendant at birth	
The list of birth attendants may be adapted for local contexts, but it is recommended that they are aggregated for reporting into the same high-level categories (see below in Disaggregate By). Finally, while it is recommended to ask this set of questions to the woman in the household with the most recent live or still birth within the specified time frame, activities may choose to ask these questions to ALL women in the household with the most recent live or still birth within the specified time frame, especially if there is concern about smaller sample sizes. However, this is not recommended given the length of time that this would require adding to the survey, as well as additional logistical challenges due to increasing the total number of survey respondents.	
UNIT: Percent	DISAGGREGATE BY: N/A
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	This module should be asked to the woman in the household with the most recent live or still birth within the specified time frame (see above in Adaptation regarding the appropriate time frame).
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the health-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

INDICATOR TITLE: Percent of pregnant women who deliver at a health facility

DEFINITION:

Health facility: A place that provides health care; a dispensary, health post, health center, health clinic (fixed or mobile), or hospital.

To construct this indicator, the number of pregnant women who delivered at a health facility is calculated, and then divided by the total number of women who gave birth.

This information is collected by asking a single question: For your most recent birth, where did you give birth? The answer choices are Home (her home, other home), Public sector (government hospital, government health center, government health post, other public), Private medical sector (private hospital, private clinic, other private medical), NGO medical sector (NGO hospital, NGO clinic, other NGO medical), or other. A woman will thus be counted in the numerator of this indicator if she answers any of the public, private, or NGO medical sector facilities (i.e., anything except for home or other).

DATA COLLECTION: It is recommended first to include a question for all women of reproductive age (15-49 years of age, consistent with FTF and FAO guidance) in the household roster regarding whether they have ever been pregnant, and if yes, the result of the pregnancy (live birth, still birth, abortion/miscarriage). This question should be asked to the woman in the household with the most recent live or still birth within the specified time frame (see below in Adaptation regarding the appropriate time frame).

ADAPTATION:

The timeframe over which these questions should be asked will depend on the frequency of data collection. If activities are conducting a baseline and end line survey, it is recommended that this set of questions be asked to all women whose pregnancy resulted in a live or still birth in the last 5 years at both points in time. However, if surveys are conducted annually, activities should adapt the time frame accordingly to ask all women whose pregnancy resulted in a live or still birth in the past year.

The location of delivery may be adapted for local contexts, but it is recommended that they are aggregated for reporting into the same high-level categories (see below in Disaggregate By).

Finally, while it is recommended to ask this set of questions to the woman in the household with the most recent live or still birth within the specified time frame, activities may choose to ask these questions to ALL women in the household with the most recent live or still birth within the specified time frame, especially if there is concern about smaller sample sizes. However, this is not recommended given the length of time that this would require adding to the survey, as well as additional logistical challenges due to increasing the total number of survey respondents.

INDICATOR TITLE: Percent of pregnant women who deliver at a health facility	
UNIT: Percent	DISAGGREGATE BY: N/A
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	This module should be asked to the woman in the household with the most recent live or still birth within the specified time frame (see above in Adaptation regarding the appropriate time frame).
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the health-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

INDICATOR TITLE: Average amount of health expenditures per sick family member

DEFINITION: To measure the average amount of health expenditures per sick family member, this indicator will first identify all individuals within a household who experienced any ailment(s) over the past three months – regardless of whether they sought treatment. Then, a follow-up question will be asked for each household member who was sick regarding the total amount spent on medical costs over the past three months. Medical costs include hospitalization costs, clinic charges, physician's fees, traditional healer's fees, medicines, and the like.

To construct this indicator, the total amount of medical costs for all household members over the past 3 months will be calculated, and then divided by the total number of sick household members.

Expenditures should be reported by respondents in the appropriate local currency and converted into USD for comparison across the HEARTH portfolio.[70] To convert local currency units (LCU) for the survey year (t) into 2020 USD, HEARTH activities should first adjust for inflation from 2020 to the year and month of the survey. In all cases, the official source for the Consumer Price Index (CPI) should be used. Then, the inflation adjusted LCU should be converted into 2020 USD using the 2020 purchasing power parity (PPP) conversion factor of private consumption based on the International Comparison Program.[71] The PPP 2020 conversion factors can be obtained from the World Development Indicator database.[72] The formula for this calculation is as follows, and reporting should include the CPI and PPP used in the calculation for full transparency.

$$USD_{2020} = LCU_t \times (\frac{CPI_{2020}}{CPI_t}) \times (PPP_{2020})$$

Note that unbundling medical expenditures by individual household member leads to improvements in the accuracy and reliability of the measure by the interviewee. This method simultaneously allows for the calculation of the total household medical expenditure as well as the average per sick member.

ADAPTATION:

HEARTH activities should adapt the question to include local medical treatments, practices, and traditional health methodology as a part of treatment costs. Consideration for payment/expense

[70] For additional details on calculating interest rates and other conversions, please see the Feed the Future Survey Implementation Document: Guide to FTF Statistics section on guidelines for constructing poverty indicators.

[71] The International Comparison Program conducts comprehensive market surveys that are used to compute global PPP and real expenditures: "International Comparison Program (ICP)." World Bank, 2021. https://www.worldbank.org/en/programs/icp.

[72] "World Development Indicators." Data Bank. World Bank, 2021. https://databank.worldbank.org/source/world-development-indicators.

INDICATOR TITLE: Average amount of health expenditures per sick family member	
in in-kind, through bartering and trading, should also be taken if relevant. Finally, questionnaires should allow reporting in local currencies. If health expenditure is a primary outcome for a given HEARTH activity, adaptations may be made to disaggregate reporting of medical expenses by additional categories, to further increase accuracy. Examples include separate questions for: preventative care, non-prescription medications, transportation to access health-related services, etc.[73]	
UNIT: Number (USD)	DISAGGREGATE BY: Sex of Sick Household Member: Female, Male Age groups: <5; 5-14; 15-18; 19-49, 50+
TYPE: Outcome	DIRECTION OF CHANGE: Higher is Better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary household decision-maker (male or female) from sample households, who is most responsible for managing household member health care. If this person is not available, another adult from the household may be used for reporting.
REPORTING NOTES	
In addition to calculating the average expenditures per sick household member, the total number of participant households of the health-sensitive activity must be reported, to allow a weighted average to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted). Activities should also report on the numerator (average amount of medical costs for all household members over the past 3 months) and denominator (average number of sick household members) used to calculate the indicator. Finally, activities should also report on the standard deviation.	

[73] For more details, please see the health expenditure related questions in the Feed the Future core questionnaire.

INDICATOR TITLE: Average number of outpatient consultations per sick family member	
DEFINITION: To measure the average number of outpatient consultations per sick family member, this indicator will first identify all individuals within a household who experienced any ailment(s) over the past three months. Then, a follow-up question will be asked for each household member who was sick regarding the total number of outpatient consultations used to seek curative treatment for illness, over the previous three months. An outpatient is defined as a non-hospitalized individual. Outpatient consultations exclude preventive care visits like vaccination and antenatal care. Consultations are defined as a visit by a patient to a health care provider in which the patient presents with a problem or issue and the health care provider provides medical evaluation, diagnosis, treatment, and/or referral for that person. For the purposes of this indicator, do not include curative consultations conducted by community health workers at the household or community level.[74] To construct this indicator, the total number of outpatient consultations of all household members over the past 3 months will be calculated, and then divided by the total number of sick household members. If an individual in a household sought outpatient treatment, a follow-up question should also be asked about the type of healthcare facility that they received the consultation, which may include the following: health center, traditional healer, government hospital, private facility, or other.	
ADAPTATION: HEARTH activities should adapt the questionnaire to include locally relevant types of healthcare facilities, as those listed in the core questionnaire are illustrative.	
UNIT: Number	DISAGGREGATE BY: Sex of Sick Household Member: Female, Male Age groups: <5; 5-14; 15-18; 19-49, 50+
TYPE: Outcome	DIRECTION OF CHANGE: Higher is Better
MEASUREMENT NOTES	

[74] Definitions taken from the OFDA Health PIRS: "Health PIRS." USAID/OFDA Proposal Guidelines. United States Agency for International Development, February 2018. https://www.usaid.gov/sites/default/files/documents/1866/USAID-OFDA_Health_PIRS_Feb_2018.pdf.

INDICATOR TITLE: Average number of outpatient consultations per sick family member	
INTENDED RESPONDENT:	Primary household decision-maker (male or female) from sample households, who is most responsible for managing household member health care. If this person is not available, another adult from the household may be used for reporting.
REPORTING NOTES	
In addition to calculating the average number of visits per sick household member, the total number of participant households of the health-sensitive activity must be reported, to allow a weighted average to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted). Activities should also report on the numerator (average number of outpatient consultations for all household members over the past 3 months) and denominator (average number of sick household members) used to calculate the indicator. Finally, activities should also report on the standard deviation.	

INDICATOR TITLE: Average number of visits for community-based treatment per sick child 5 and under

DEFINITION:

To measure the average number of visits for community-based treatment per sick child (5 years of age and under), this indicator will first identify all children within a household who experienced any ailment(s) over the past three months. Then, a follow-up question will be asked for each child who was sick regarding the total number of visits for community-based treatment over the previous three months.

Community-based treatment is defined as diagnosis and treatment of common childhood illnesses (malaria, diarrhea and/or acute respiratory infections) by trained community health workers (CHWs) at the household or community-level. The strategies for diagnosis and level of treatment provided by CHWs should be dictated by Ministry of Health policy and/or receive approval from health authorities. Common childhood illnesses include, for the purposes of this indicator, malaria, diarrhea, and acute respiratory infections. CHWs are members of a community who are chosen by community members or organizations to provide basic preventive health care through health information, messaging, and health facility referrals. In some countries CHWs are also able to provide curative care for members of their community, depending on Ministry of Health protocols. CHWs may be formally or informally trained, depending on Ministry of Health requirements. CHWs can be referred to by different names depending on the context: Lay health workers; Volunteer health workers; Community health promoters; Village health workers; Village health volunteers; Community health agents; Health surveillance assistants.[75]

To construct this indicator, the total number of visits for community-based treatment for all children over the past 3 months will be calculated, and then divided by the total number of sick children.

It is recommended to ask this across a range of common childhood illnesses, which should be adapted for each HEARTH, rather than by specific illness to increase the potential sample size (i.e., to increase the likelihood that a household had at least one child with the illness in question over the last three months).

ADAPTATION:

HEARTH activities should adapt the questionnaire to include locally relevant/important types of common childhood illnesses, as relevant. For the purposes of this indicator, illnesses should include at minimum malaria, diarrhea, and acute respiratory infections for comparison across the HEARTH portfolio.

[75] Definitions taken from the OFDA Health PIRS: "Health PIRS." USAID/OFDA Proposal Guidelines. United States Agency for International Development, February 2018. https://www.usaid.gov/sites/default/files/documents/1866/USAID-OFDA_Health_PIRS_Feb_2018.pdf.

INDICATOR TITLE: Average number of visits for community-based treatment per sick child 5 and under	
UNIT: Number	DISAGGREGATE BY: Sex of Child: Male, Female Type of Childhood Illness
TYPE: Outcome	DIRECTION OF CHANGE: Higher is Better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary household decision-maker (male or female) from sample households, who is most responsible for managing household member health care. If this person is not available, another adult from the household may be used for reporting.
REPORTING NOTES	
In addition to calculating the average number of visits per child, the total number of participant households of the health-sensitive activity must be reported, in order to allow a weighted average to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted). Activities should also report on the numerator (average number of visits for community-based treatment for all children over the past 3 months) and denominator (average number of sick children) used to calculate the indicator. Finally, activities should also report on the standard deviation.	

INDICATOR TITLE: Percent of children 0-35 months of age who received their first dose of measles-containing vaccine by 12-months of age

DEFINITION: This indicator is adapted from the USAID Standard Indicator for the number of children who received their first dose of measles-containing vaccine by 12 months of age (HL 6.4-62), measured using questions adapted from the DHS Women's module. These questions would be asked for all surviving children born 0-35 months before the survey being conducted.

To construct this indicator, the number of children 0-35 months of age who received their first dose of measles-containing vaccine by 12-months of age will be calculated, and then divided by the total number of surviving children aged 0-35 months.

This module is a set of 3 questions regarding (Q1) whether the child ever received a measles-containing vaccine, (Q2) if the first dose was received before 12 months of age, and (Q3) how many times the child received the measles vaccine (if relevant). A child will thus be counted in the numerator of this indicator if they received their first dose before 12 months of age.

DATA COLLECTION:

The age of each household member, including children, should be collected during the household roster module. Then, a set of up to 3 questions will be asked regarding vaccinations received by children born in the last 3 years. First, respondents will be asked (Q1) if the child ever received a measles vaccination, that is, an injection in the arm to prevent measles. If yes, follow-up questions will be asked regarding (Q2) if the first dose of the measles-containing vaccine was received by 12 months of age, and (Q3) how many times the child received the measles vaccine (if relevant).

ADAPTATION:

The questionnaire should be adapted to use the name of the measles containing vaccination (MCV) used in the country locally: measles, measles mumps & rubella, or measles & rubella, if relevant.

Q3 regarding how many times the child received the measles vaccine should only be asked in countries where the vaccination schedule includes more than one dose of the measles-containing vaccine, to determine the percent of children who completed the full vaccine schedule (if relevant).

If of interest for a given activity, follow-up questions regarding where the child received the vaccine (public, private, or NGO) health facility, or other source, such as a vaccination campaign) may be included, but it is not necessary for the measurement/reporting of this indicator.

UNIT:	DISAGGREGATE BY:
Percent	Sex of Child: Male, Female

INDICATOR TITLE: Percent of children 0-35 months of age who received their first dose of measles-containing vaccine by 12-months of age	
TYPE: Outcome	DIRECTION OF CHANGE: Higher is Better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary household decision-maker (male or female) from sample households, who is most responsible for managing household member health care. If this person is not available, another adult from the household may be used for reporting.
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the health-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

INDICATOR TITLE: Number of people gaining access to basic drinking water services as a result of USG assistance

DEFINITION:

Basic drinking water services, according to the Joint Monitoring Programme (JMP), are defined as improved sources or delivery points that by nature of their construction or through active intervention are protected from outside contamination, in particular from outside contamination with fecal matter, and where collection time is no more than 30 minutes for a roundtrip including queuing. Access must be measured from the beneficiary's place of residence, and does not include access at a day school, health facility or place of work.

Drinking water sources meeting this criteria include:

- piped drinking water supply on premises;
- public tap/standpost; tube well/borehole;
- protected dug well; protected spring;
- rainwater; and/or
- bottled water (when another basic service is used for hand washing, cooking or other basic personal hygiene purposes).

All other services are considered to be "unimproved", including: unprotected dug well, unprotected spring, cart with small tank/drum, tanker truck, surface water (river, dam, lake, pond, stream, canal, irrigation channel), and bottled water (unless basic services are being used for hand washing, cooking and other basic personal hygiene purposes).

The following criteria must be met for persons counted as gaining access to basic drinking water services as a result of USG assistance:

1. The total collection time must be 30 minutes or less for a round trip (including wait time). Given this definition, the number of people considered to have "gained access" to a basic service will be limited by the physical distance to the service from beneficiaries' dwellings, the amount of time typically spent queuing at the service, and the production capacity of the service.

2. The service must be able to consistently (i.e. year-round) produce 20 liters per day for each person counted as "gaining access." This amount is considered the daily minimum required to effectively meet a person's drinking, sanitation, and hygiene needs.

3. The service is either newly established or was rehabilitated from a non-functional state within the reporting fiscal year as a result of USG assistance.

4. Persons counting toward the indicator must not have previously had similar "access" to basic drinking water services, prior to the establishment or rehabilitation of the USG-supported basic service.

Note: Although USAID expects that all drinking water services supported by USG assistance be tested for fecal coliform and arsenic during the program cycle, compliance with water quality

INDICATOR TITLE: Number of people gaining access to basic drinking water services as a result of USG assistance	
standards is not required for attribution to this indicator. For guidance on water testing requirements during the program cycle, contact USAID/E3/Water Office. Limitations: Providing "access" does not necessarily guarantee beneficiary "use" of a basic drinking water service and thus potential health benefits are not certain to be realized from simply providing "access." This indicator does not capture the full dimensions of a water service's reliability or affordability--two other important factors that influence the likelihood that those defined as having "access" will actually use the service. For more information on these factors please refer to indicator HL.8.1-3.	
ADAPTATION: N/A	
UNIT: Number	DISAGGREGATE BY: Sex (Female, Male) Residence (Rural, Urban) Wealth Quintile
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary adult decision-maker who is most knowledgeable about the household's water source.
REPORTING NOTES	
In addition to reporting the number of households gaining access to basic drinking water services, the total number of participant households of the health-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

INDICATOR TITLE: Number of people gaining access to safely managed drinking water services as a result of USG assistance

DEFINITION:

A safely managed drinking service is defined as one that meets the definition of a basic drinking water service (see indicator HL.8.1-1), and is also:

- Located on premises: water is provided directly to the household or on premises;
- Available when needed: consistently produces 20 liters per day for each person counted as "gaining access." This amount is considered the daily minimum required to effectively meet a person's drinking, sanitation, and hygiene needs;
- Compliant with faecal (and priority chemical) standards: meets a fecal coliform standard of 0 CFU/100 mL, arsenic standard of 10 parts per billion, and (at a minimum) host country standards for other chemicals that have been identified to pose a site-specific risk to human health.

Persons are counted as "gaining access" to a safely managed drinking water service if the service is either newly established, rehabilitated from a non-functional state, or upgraded from a basic water service within the reporting fiscal year as a result of USG assistance, and these persons did not previously have similar "access" to a safely managed drinking water service prior to the establishment or rehabilitation of the USG-supported safely managed service.

Limitations: Providing "access" does not necessarily guarantee beneficiary "use" of an safely managed drinking water service and thus potential health benefits are not certain to be realized from simply providing "access." Although, the chosen definition of "access" does attempt to define standard ease of use/accessibility and minimum volume of water to meet potential user needs, this definition does not capture the water service's affordability. For more information on this factor please refer to indicator HL.8.1-3.

ADAPTATION:

N/A

UNIT:	DISAGGREGATE BY:
Number	Sex (Female, Male) Residence (Rural, Urban) Wealth Quintile
TYPE:	DIRECTION OF CHANGE:
Outcome	Higher is better

MEASUREMENT NOTES

INDICATOR TITLE: Number of people gaining access to safely managed drinking water services as a result of USG assistance	
INTENDED RESPONDENT:	Primary adult decision-maker who is most knowledgeable about the household's water source.
REPORTING NOTES	
In addition to reporting the number of households gaining access to safely managed drinking water services, the number of participant households of the health-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

INDICATOR TITLE: Number of people receiving improved service quality from an existing basic or safely managed drinking water service as a result of USG assistance

DEFINITION:

A person is counted for this indicator when their current primary drinking water service qualifies as a "basic," or "safely managed" (see indicators HL.8.1-1 and HL.8.1-2) but, the quality of "service" they receive is further "improved" as a result of USG assistance in terms of its ease of accessibility, reliability, water quality and/or affordability. Access must be measured from the beneficiary's place of residence, and does not include access at a day school, health facility or place of work.

Specifically, "improved service quality" is defined as being achieved if:

- The accessibility measure, time taken to collect water from a basic or safely managed service, is further reduced to less than the minimum requirements for a basic water service (see indicator HL.8.1-1) or safely managed water service (see indicator HL.8.1-2); and/or
- Reliability of supply improves such that the person's main service is available regularly or more frequently, i.e. there is no regular rationing of supply or regular seasonal failure of their improved service; and/or,
- Water quality improvements are made that would be reasonably expected to result in long term improvements to the fecal, biological or chemical contamination of a drinking water sources (e.g., construction of water treatment systems, support to service provider to consistently chlorinate water, implementation of a water safety plan); and/or,
- - Affordability of their basic or safely managed drinking water services improves such that the average price they pay for water is no higher than two times the average water tariff for piped water into the dwelling in their country (where applicable).

ADAPTATION:

N/A

UNIT:	DISAGGREGATE BY:
Number	Sex (Female, Male) Residence (Rural, Urban) Wealth Quintile
TYPE:	DIRECTION OF CHANGE:
Outcome	Higher is better

MEASUREMENT NOTES

INDICATOR TITLE: Number of people receiving improved service quality from an existing basic or safely managed drinking water service as a result of USG assistance	
INTENDED RESPONDENT:	Primary adult decision-maker who is most knowledgeable about the household's water source.
REPORTING NOTES	
In addition to reporting the number of households receiving improved service quality, the number of participant households of the health-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

INDICATOR TITLE: Percent of children under five with diarrhea in the past two weeks	
DEFINITION: Diarrhea accounts for approximately 8 percent of all deaths among children under age 5 worldwide in 2017, despite the availability of a simple treatment solution. Most deaths from diarrhea occur among children under two living in South Asia and sub-Saharan Africa. [76] This indicator measures the percentage of children under five (0-59 months) experiencing an episode of diarrhea (as defined by a survey respondent, usually the child's mother or other primary caregiver) at any time during the two weeks preceding data collection.	
ADAPTATION: The term(s) used for diarrhea in each country should be adapted to encompass the expressions used for all forms of diarrhea, including bloody stools (consistent with dysentery), watery stools, etc.	
UNIT: Percent	DISAGGREGATE BY: Sex: Male, Female
TYPE: Outcome	DIRECTION OF CHANGE: Lower is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Children under five (0-59 months)
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the health-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

[76] Food for Peace Indicators Handbook Part 1: Indicators for Baseline and Endline Surveys for Development Food Security Activities. Revised: May 2020.

INDICATOR TITLE: Percent of children under five with diarrhea in the past two weeks treated with ORS	
DEFINITION: Oral rehydration solution (ORS) is an effective, low-cost prevention and management intervention for diarrhea. This indicator measures the percent of children under 5 (0-59 months) with diarrhea in the past two weeks who were treated with ORS, divided by the total number of children under 5 with diarrhea in the past two weeks.	
ADAPTATION: Similar considerations for the definition of diarrhea (outlined above) are applicable to this indicator.	
UNIT: Percent	DISAGGREGATE BY: Sex: Male, Female
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Children under five (0-59 months)
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the health-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

Biophysical

Overview

HEARTH activities engage private sector partners to co-design activities that conserve high-biodiversity landscapes and improve the lives of local communities. Measuring progress towards achieving targets for biodiversity, ecosystems, and environments across HEARTH projects requires robust design of indicators and approaches grounded in standards of practice and best available science. Measuring biophysical indicators is a cross-sectoral activity as interventions with explicit biophysical objectives as well as those acting on other parts of the system (e.g., human well-being) will have biophysical impacts. This is particularly salient given the alignment of HEARTH projects global biodiversity and climate change frameworks such as the Sustainable Development Goals[77], the Post-2020 Biodiversity Framework[78] (to be finalized at the 15th Conference of Parties of the Convention on Biological Diversity), as well as Nationally Determined Contributions under the Paris Agreement[79]. This module is intended to provide guidance for measuring a range of relevant indicators across these critical areas.

Framework for Biophysical Outcomes

In this module, biotic (e.g., biodiversity, communities, ecosystems) and abiotic (e.g., climate, water, air) components are referred to collectively as "biophysical" outcomes. Biophysical outcomes can be conceptualized as both immediate outputs, intermediate, and ultimate outcomes from an intervention. Intermediate biophysical outcomes emerge as a product of immediate changes from the intervention (e.g., planting trees), which can then have downstream impacts on ecosystem services and human well-being. Biophysical outcomes can also emerge as an eventual change (or a *downstream outcome)* from more immediate changes to human activity (e.g., change in agricultural practices, or decreased harvest volume).

Global efforts have been undertaken to standardize the collection and framing of these metrics to ensure comparability of data. The Essential Biodiversity Variables (EBV) framework[80] was used to develop categories of indicators, which defines classes of derived measurements required to 'study, report, and manage biodiversity, focusing on status and trend in elements of biodiversity that aim to provide a connection between primary observations and high-level indicators of biodiversity. The EBV is the standard framework for tracking biodiversity and ecosystem metrics at a global level. Using this framework aligns HEARTH metrics to global tracking and monitoring standards. The EBVs aim to provide information to populate indicators to assess progress toward global targets for biodiversity and sustainability. The existing 6 EBV classes were consolidated into 3 broad EBV classes—species,

[77] https://sdgs.un.org/goals
[78] https://www.cbd.int/doc/c/abb5/591f/2e46096d3f0330b08ce87a45/wg2020-03-03-en.pdf
[79] https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs/nationally-de termined-contributions-ndcs
[80] GEO BON. (n.d.). What are Ebvs? Group on Earth Observations. Retrieved from https://geobon.org/ebvs/what-are-ebvs/.

communities, and ecosystems—given their relevance for HEARTH. The framework was further customized to capture biophysical aspects, i.e., climate and the abiotic environment (**Table 5**). This framework is used to ground the indicators and measurement approaches outlined in this module.

***Table 5**: Modified EBV Framework of Variables as a Guide for Indicator Development*

Class	Variables
Species	Diversity (intraspecific), distribution, abundance, migration/dispersal/gene flow, morphology/traits of a species
Communities	Diversity (interspecific, trophic, functional), species relationships and interactions within a community (a group of species)
Ecosystems	Productivity, extent, size, cover of ecosystems, including habitat for species of conservation interest; biophysical processes (e.g., soil, water, nutrients, structure); change in forest cover extent
Environment + Climate	Air quality and emissions, hydrology and flows, temperature and precipitation, chemical composition, weather, fire, shrink/swell of soils, change in greenhouse gas emissions

Data Standardization, Structure, And Management

In biodiversity science and ecology, there are significant and focused international efforts for standardizing data collection to ensure data quality and maximize interoperability to facilitate robust global monitoring and tracking towards global biodiversity and sustainability targets (e.g., Aichi Targets, Sustainable Development Goals, Paris Climate Accords).[81,82] The impetus behind these global efforts for data standardization (e.g., Group on Earth Observations Biodiversity Observation Network, Global Biodiversity Information Facility, Ocean Biogeographic Information System, Organization for International Standardization) is to ensure data quality, transparency, interoperability, and reusability. As part of this module, guidance is provided on site-specific data collection and management to maximize reusability and interoperability so that data can be used to inform future projects and link to global databases.

[81] Navarro, L. M., Fernández, N., Guerra, C., Guralnick, R., Kissling, W. D., Londoño, M. C., Muller-Karger, F., Turak, E., Balvanera, P., Costello, M. J., Delavaud, A., El Serafy, G. Y., Ferrier, S., Geijzendorffer, I., Geller, G. N., Jetz, W., Kim, E.-S., Kim, H. J., Martin, C. S., … Pereira, H. M. (2017). Monitoring Biodiversity Change Through Effective Global Coordination. Current Opinion in Environmental Sustainability, 29, 158–169. https://doi.org/10.1016/j.cosust.2018.02.005.

[82] Tittensor, D.P., Walpole, M., Hill, S.L.L., et al. (2014). Amid-term analysis of progress toward international biodiversity targets. Science,346, 241-244.

Recommended Outcomes and Indicators

As the potential suite of biophysical indicators is quite broad, their applicability and utility will depend on the scope and scale of individual HEARTH projects. As HEARTH supports a diverse set of projects in several countries and sectors, and because all of USAID's Standard Indicators are required as applicable, relevant indicators for monitoring progress for HEARTH projects should be chosen in a bespoke fashion. Lastly, the indicators listed are primary indicators that can then be used to conduct secondary analyses to investigate different learning questions.

This module covers five outcomes of interest related to the four EBV classes. Outcome 1 is improvement of population status of target species (EBV Class Species and Communities). Outcomes 2 and 3 are related to EBV Classes Communities and Ecosystems as they cover improvements to ecosystems for biodiversity. Outcomes 4 and 5 are related to EBV Class Environment, covering improvements to water quality and climate change mitigation.

General Note: Target area should be defined by each project as a set of clear, contiguous spatial units.

Outcome	Description	Recommended Indicator
Population status of target species maintained or improved	Recording presence/absence allows for comparison across areas with an ecosystem and across ecosystems if observations are made using regular spatial and temporal intervals. HEARTH activities aiming to target biodiversity outcomes should track changes to species presence/absence at the minimum across their target area. Choice of species should be guided by the evaluation questions and the ecology of the site. Proper baseline data should be collected as a comparator and if possible, data from other areas that can serve as an appropriate counterfactual. Multiple temporal and spatial sampling sites are suggested for rigor and controlling for influence of contextual variables and observation heterogeneity. In a five year program cycle, it may not always be possible to observe meaningful change in this indicator. See the discussion on *Species Occurrence and Abundance* to determine when this indicator is most appropriate.	**Indicator:** Change in presence/absence of target species(s) across target area over a set time interval **Additional Guidance:** Species Monitoring
	Recording abundance of species allows for calculation of diversity indices such as species richness and species evenness.	**Indicator:** Change in abundance of target species(s) across target

Outcome	Description	Recommended Indicator
	HEARTH activities aiming to target biodiversity outcomes can track changes to species abundance across spatial units in their target area. Choice of species should be guided by the evaluation questions and the ecology of the site. Proper baseline data should be collected as a comparator and if possible, data from other areas that can serve as an appropriate counterfactual. Multiple temporal and spatial sampling sites are suggested for rigor and controlling for influence of contextual variables and observation heterogeneity.	area over a set time interval **Additional Guidance:** Species Monitoring
Improved or maintained condition of natural ecosystems	Recording presence/absence allows for comparison across areas with an ecosystem and across ecosystems if observations are made using regular spatial and temporal intervals. In this case, specific indicator species should be selected that signal change to desired ecosystem conditions. See more details above.	**Indicator:** Change in presence/absence of target species(s) across target area over a set time interval **Additional Guidance:** Species Monitoring
	This indicator should measure the change in number of individuals (abundance) OR presence/absence of target species(s) observed within defined areas/spatial units that are important for wildlife movement (e.g., migration corridor, game trail, breeding or other seasonal aggregation area). The important distinction between the other species indicators is the focus on areas important for movement compared to any target landscape. If the indicator focuses on presence/absence of multiple species, the indicator should be presented as a total species count.	**Indicator:** Change in abundance of target species(s) observed within defined areas/spatial units (target area) over set time interval OR Change in presence/absence of target species(s) observed within defined areas/spatial units (target area) over a set time interval **Additional Guidance:** Species Monitoring

Outcome	Description	Recommended Indicator
	Maintaining (or increasing) the total extent of natural ecosystems across the intervention area is a frequent outcome in HEARTH and other programs with an environmental component. This guidance focuses on forests because (1) they are a biodiversity focal interest in many HEARTHs and (2) there is a spatially explicit and globally coherent dataset that allows for data aggregation across geographies. HEARTHs interested in other ecosystem types can adapt this guidance and use other data sources to estimate the extent of these ecosystems over time. HEARTH activities located within forested landscapes and that include an intermediate result or result related to habitat degradation, habitat destruction, or deforestation require a metric of forest cover loss. The GLAD Global Forest Change dataset provides a globally consistent, periodically updated, and open access database of forest cover loss that eliminates the need for individual HEARTHs carrying out analyses based on raw satellite images. It should be noted however that forest loss data are not equal to deforestation, but can be used as a proxy.	**Indicator:** Change in total area of one or more classes of vegetation, e.g., forest class, across the defined spatial unit(s) **Additional Guidance:** Geospatial Data
	Land potential is the long-term potential of the land to sustainably generate ecosystem services, which fall into four general categories: (1) provisioning, such as the production of food and water; (2) regulating, such as the control of climate and disease; (3) supporting, such as nutrient cycles and crop pollination; and (4) cultural, such as spiritual and recreational benefits. Understanding land potential is important both for human uses, such as agriculture and livestock keeping, but also for conserving biodiversity and natural resources.[83] The Land Capability Classification (LCC) is a land evaluation ranking that groups soils based on their potential for agriculture and other uses and is useful for HEARTHs that include a focus	**Indicator:** Change in Land Capability Classification (LCC) **Additional Guidance:** Soil Quality

[83] Feed The Future. (2018). Feed the Future Survey Implementation Document Agriculture Interviewer's Manual Zone of Influence Survey. Section 7.2 "Land potential assessment overview." Retrieved from https://docs.google.com/document/d/1FpvRuoCH2V3UGPnnyRtFNDR3k7VtTwT4/edit#.

Outcome	Description	Recommended Indicator
	on improving sustainable agriculture or the agricultural productivity of land.[84]	
Reduce loss of habitats for biodiversity	Maintaining (or increasing) the total extent of natural ecosystems across the intervention area is a frequent outcome in HEARTH and other programs with an environmental component. This guidance focuses on forests because (1) they are a biodiversity focal interest in many HEARTHs and (2) there is a spatially explicit and globally coherent dataset that allows for data aggregation across geographies. HEARTHs interested in other ecosystem types can adapt this guidance and use other data sources to estimate the extent of these ecosystems over time. HEARTH activities located within forested landscapes and that include an intermediate result or result related to habitat degradation, habitat destruction, or deforestation require a metric of forest cover loss. The GLAD Global Forest Change dataset provides a globally consistent, periodically updated, and open access database of forest cover loss that eliminates the need for individual HEARTHs carrying out analyses based on raw satellite images. It should be noted however that forest loss data are not equal to deforestation, but can be used as a proxy.	**Indicator:** Change in total area of one or more classes of vegetation, e.g., forest class, across the defined spatial unit(s) **Additional Guidance:** Geospatial Data
Pollution of water sources reduced	A change in the turbidity of natural aquatic environments is one of the most immediately apparent indicators of soil erosion, for example, when runoff from heavy rain causes nearby natural waters to become muddy or appear dirty. Turbidity is an important aspect of water quality for several reasons. Soil particles suspended in water are unpleasant to drink, and they also provide attachment sites for pathogenic microorganisms to proliferate. Further, when water turbidity increases, i.e., light transmits less readily through the water, it can reduce the growth rates of aquatic plants and animals, make them more vulnerable to disease, and reduce overall ecological productivity.	**Indicator:** Turbidity of natural aquatic environments (surface, freshwater sources) near agricultural activity sites **Additional Guidance:** Water Quality Data

[84] LandPKS Knowledge Hub. What is Land Capability Classifcation? Retrieved from https://landpotential.org/knowledge/what-is-land-capability-classification/

Outcome	Description	Recommended Indicator
	A fundamental aspect of water chemistry, pH strongly influences plant and animal growth and reproduction in natural aquatic environments. Minerals and other elements of soil that may erode from agricultural sites and be transported to natural aquatic environments can significantly influence the water's pH.	**Indicator:** pH of natural aquatic environments (surface, freshwater sources) near agricultural activity sites **Additional Guidance:** Water Quality Data
	Most strains of *E. coli* are harmless and live in the intestines of people and warm-blooded animals, but some strains can cause illness. The presence of *E. coli* in drinking water usually indicates recent fecal contamination, which means there is a good chance that pathogens are present. It is considered unsafe to drink water that contains any amount of *E. coli*. According to the World Health Organization (WHO), *E. coli* is considered the most suitable indicator of fecal contamination in drinking water.[85]	**Indicator:** Presence / absence of *E. coli* bacteria in drinking water sources (freshwater, surface) around agricultural activities sites **Additional Guidance:** Water Quality Data
	Nitrate is a common constituent of most commercial fertilizers, and it also is commonly produced by chemical oxidation of ammonia (NH3) found in organic fertilizers such as animal waste. Nitrate readily dissolves in water and can reach high levels, sometimes an order of magnitude greater than background levels, near agricultural activity sites that are treated with fertilizer. Chemical oxidation of ammonia also is a major source of nitrite in natural aquatic environments, and use of organic fertilizers such as animal waste may increase nitrite concentrations in aquatic environments near agricultural activity sites. Because nitrite in soil and water may further oxidize to nitrate when oxygen is available, it is recommended to test water samples for both nitrite and nitrate.	**Indicator:** Change in concentration of nitrites and nitrates in natural aquatic environments (surface, freshwater sources) near agricultural activity sites **Additional Guidance:** Water Quality Data

[85] Guidelines for drinking-water quality, second edition, addendum to volume 1: Recommendations. (1999). Chemistry International -- Newsmagazine for IUPAC, 21(2). https://doi.org/10.1515/ci.1999.21.2.49a.

Outcome	Description	Recommended Indicator
Reduced greenhouse gas (GhG) emissions from focal enterprise activities	Reducing, sequestering, or avoiding GhG emissions will slow the rate of climate change and reduce climate change impacts. Reducing GhG emissions can also have strong ancillary benefits for air and water pollution, energy security, health, and gender issues.	**Indicator:** GhG emissions, estimated in metric tons of CO2 equivalent, reduce sequestered, or avoided in full or in part by USG assistance (GCC Standard Indicator - EG 13-6)[86] **Additional Guidance:** Climate Change
	Improved land management is essential for reducing emissions from the land use sector. A spatial indicator is useful for determining the scale and potential impact of sustainable landscapes interventions.	**Indicator:** Number of hectares under improved management expected to reduce greenhouse gas emissions as a result of USG assistance (GCC Standard Indicator - EG 13-8)[87] **Additional Guidance:** Climate Change

[86] USAID. (2020). 2020 GCC Standard Indicator Handbook: Definition Sheets. Climate Links. Section 13-6. Retrieved from https://www.climatelinks.org/sites/default/files/asset/document/2020_USAID_GCC-Indicator-Handbook-August-2020-Update.pdf.

[87] USAID. (2020). 2020 GCC Standard Indicator Handbook: Definition Sheets. Climate Links. Section 13-8. Retrieved from https://www.climatelinks.org/sites/default/files/asset/document/2020_USAID_GCC-Indicator-Handbook-August-2020-Update.pdf.

Biophysical Measurement Guidance

The following section offers a guidance series for selection, design, and analysis of biophysical outcomes and indicators, including the following guidance:

- Identifying target species for monitoring for biodiversity and ecosystem health
- Accessing and using existing geospatial data for monitoring terrestrial landscape extent and condition
- Collecting and assessing water quality data for agricultural activities
- Collecting and assessing soil quality in agriculture and agroforestry projects using LandPKS
- Guidance on using and assessing Global Climate Change (GCC) Standard Indicators for climate change mitigation

Important factors to consider when choosing site-specific biophysical monitoring indicators and units

There are important factors to consider when choosing which indicators and methods for collection are best suited to each HEARTH's needs. In particular, the scale at which activities are able to observe and detect biophysical change will depend on two factors:

1) The spatial and temporal scale at which the intervention is likely to have impact and at which change is hypothesized to occur; and
2) The spatial and temporal sampling strategy used to monitor change

This is important to keep in mind for determining the appropriate spatial unit(s) and frequency for monitoring. For example, if a project intends to restore habitat important for species movement (e.g., connectivity), a monitoring plan should consider how far the species of interest can move, what areas they are likely to move in, and how frequent movement will occur to identify the size of spatial areas to monitor for species occurrence and how frequently data collection should occur. Scale is also important to consider in terms of when change is expected to occur. For example, if a project intends to monitor forest recovery, a monitoring plan should determine which species are expected to emerge at what stages of forest succession. In tropical rainforests, pioneer species, which are typically fast growing with a shorter generation time, may emerge first, followed by slower growing plants which grow in between the pioneer species. Projects should consider what changes they are likely to observe (e.g., in this example, which species are likely to emerge) to choose appropriate indicators and sampling design within the timeline of their monitoring period.

Identifying Target Species for Monitoring Biodiversity and Ecosystem Health

Background

This guidance illustrates key points for species monitoring in support of HEARTH MERL objectives. Optimal planning and implementation of species monitoring is a widely researched area; thus, this guidance intends to be a primer for core elements for species monitoring and provides a reference list that can be explored for further information.

Many HEARTH activities include outcomes related to improvements or maintenance of biodiversity and overall ecosystem health and provision of ecosystem services. Changes in the abundance and diversity of species have critical impacts on all aspects of biodiversity and ecosystem functioning including community and food web stability and the delivery of ecosystem services.[88] Thus, monitoring the dynamics, distribution, and diversity of different types of species can help answer questions such as:

- Is the intervention associated with changes to species occurrence, distribution, and/or abundance?
- Is the intervention associated with improvements to habitat quality and extent?
- Is the intervention associated with improvements to habitat connectivity for target species?

Monitoring changes to species occurrence and abundance can be useful to make inferences about population and species viability, habitat quality, and overall ecosystem health; however, they *should not* be used in isolation to understand impacts in these areas. Measuring any of these data types will require clear and robust sampling design that is grounded in species and population-specific knowledge (e.g., range, population structure, behavior, ecology, etc.). Data from species monitoring should be integrated into broader assessments that bring together data across relevant components and scales of an ecosystem needed to understand ecosystem stability and resilience. Analytical techniques for evaluating species occurrence data and calculating trends are not within the scope of this guidance.

Broad Overview of Methods

Choosing the type of method to monitor species depends on the time and resources available, appropriate spatial scale for sampling, and types of species being monitored. Below is a summary of types of methods commonly employed along with brief details on resource considerations (**Table 6**).

[88] Jetz, W., McGeoch, MA., Guralnick, R., Ferrier, S., Beck, J., Costello, MJ., Fernandez, M., Geller, G.N., Keil, P., Merow, C., Meyer, C., Muller-Karger, FE., Pereira, HM., Regan, EC., Schmeller, DS., Turak, E. "Essential biodiversity variables for mapping and monitoring species populations." Nature Ecology & Evolution 3 no. 4 (2019): 539-551.

Table 6: *Brief Summary of Types of Tools and Methods Used to Monitor Species*

Method	Tools required	Considerations for monitoring
Observations	Species identification guides, binoculars, surveying equipment (depending on species and ecosystem), data collection devices (notepads, tablets, phones, etc.)	Simple way to track species presence/absence and/or abundance. Can be collected by experts or non-experts (e.g., citizen scientists, community, or government patrols, etc.). Collection by non-experts will likely require the use of spot-checks or technology-based tools to ensure accurate species identification. Useful in that it is an opportunistic method but not as replicable.
Visual transects	Species identification guides, binoculars, surveying equipment (depending on species and ecosystem), data collection devices (notepads, tablets, phones, etc.)	Can be resource-intensive depending on the target species (e.g., time spent making observations, number of transects), but useful in that it provides a controlled spatial and temporal scale of observation. Requires skilled personnel who can accurately identify multiple species.
Tools to remotely track movements	Different types of technical options for tracking movements of wildlife across ecosystems. Genetic and chemical tagging can be used to determine evolutionary significant connectivity (e.g., dispersal, gene flow) across sites in an ecosystem. Physical tagging (e.g., radio telemetry, banding or GPS collars), radar monitoring	Can be resource-intensive and often difficult to implement over large spatial scales. Different types of data are useful to inform different types of decisions. For example, physical tracking data from satellite tags and radio collars (such as that used in the Tagging of Pacific Predators program)[89] can be used to identify wildlife movement patterns across seasons and key habitat areas for protection and monitoring (e.g., spawning sites). Geochemical and physical tagging can be used to identify individuals returning to habitats over multiple seasons/years or other types of movements. Requires methodological expertise and is best conducted in partnership with research institutions. Genetic tools for estimating genetic connectivity can be used as well, but requires methodological expertise and laboratory access and sufficient funding for sequencing. Choice of genetic markers depends on the question.

[89] Tagging of Pacific Predators (TOPP). Census of Marine Life. (n.d.). Retrieved from http://www.coml.org/projects/tagging-pacific-predators-topp.html#:~:text=The%20Tagging%20of%20Pacific%20Predators,animals%20in%20the%20North%20Pacific.

Method	Tools required	Considerations for monitoring
Environmental DNA (Deoxyribonucleic Acid)	Reagents for preserving genetic material (e.g., RNAlater, ethanol, etc.), equipment for preserving DNA (e.g., dry shippers, storage vials, other types of temperature control), molecular laboratory equipment, data storage, computing software for analyzing data	Environmental DNA (eDNA) can be useful for tracking presence/absence of a wide range of species with little disturbance to habitat. eDNA is a relatively new tool for species monitoring, but has been used successfully in many different contexts, including soils, marine, and freshwater ecosystems. Depending on the physical environment, eDNA may be present from species that have recently occurred in the immediate area (few minutes to few hours). It is relatively cheap and can be replicated across scale. Limitations to eDNA is that they are not well tested and may not be appropriate to be used to monitor species abundance (presence/absence only). They also may likely miss rare occurrences of species and will only capture species that are permanently resident to area or occur in high numbers. Like the genetic tools listed above, eDNA requires access and funding to laboratory resources, analysis, and expertise for analyzing data.
Camera trapping	Camera traps, data storage devices, computing software for analyzing data	Camera traps can be useful for tracking presence/absence of a wide range of species with little disturbance to habitat. However, camera trapping can be resource intensive depending on the objectives (e.g., how many traps, what types of traps).
DNA barcoding	Reagents for preserving genetic material (e.g., RNAlater, ethanol, etc.), equipment for preserving DNA (e.g., dry shippers, storage vials, other types of temperature control), molecular laboratory equipment, data storage, computing software for analyzing data	DNA barcoding can be useful for tracking species abundance and presence/absence, particularly when visual identification of species is either difficult or not feasible. Barcoding uses a conserved sequence of DNA that is present in all species. Each species has a unique DNA fingerprint or barcode that differentiates them from other species. DNA barcoding is particularly useful in monitoring contexts where whole bodies are not present (e.g., meat and fish markets, parts of plants) or where cryptic species may be abundant (genetically distinct species that are not easily distinguished visually). Like genetic tools listed above, eDNA requires access and funding to

Method	Tools required	Considerations for monitoring
		laboratory resources and analysis and expertise for analyzing data.
Remote sensing	Access to satellite imagery, computing software for analyzing data.	Remote sensing can be a useful tool when aiming to track highly migratory and large species (that can be readily identified by satellite imagery). Existing efforts to track large migratory animals (e.g., elephants) can be leveraged for datasets. Similar types of programs like those used for camera trap data, exist to count individuals from satellite imagery. Analysis often requires technical support from Geographic Information System (GIS) and bioinformatic specialists.
Collection and synthesis of existing data	Species occurrence databases including historical data, expert curated species distribution maps, existing research, spatial distribution modeling	Relies on existing data and reduces cost for additional data collection, however, insights are usually limited to a coarser spatial resolution and may be prone to missing data and gaps depending on how well the species in question has been documented and how reliable the existing data are (e.g., publicly contributed data may have species identification issues).

Generally, a wide range of methods are available to monitor species and the choice of method should be tailored to the question(s), the species, the scale at which monitoring will be deployed, and resources available. Estimates of costs are wide ranging and while cost estimates are not provided here – it is recommended that HEARTH projects not only consider the costs of equipment and personnel, but also costs for data storage, transportation, training, etc.

Choosing Target Species for Monitoring

True monitoring of changes in biodiversity would require accurate species identification and counting to measure changes in species abundance and indices of community diversity across all species within a community or ecosystem. However, this is typically not realistic nor feasible for most projects. Thus, choosing which species to measure is critical and should be grounded in both the desired objectives of the intervention as well as the types of management actions pursued. HEARTH activities are recommended to use a structured decision-making approach for identifying candidate species for monitoring. This is a systematic approach using key concepts from structured decision-making and drawing on ecological and biological knowledge and stakeholder priorities.[90] For example, a project may

[90] Bal, P., Tullock, AIT., Addison, PF., McDonald-Madden, E., Rhodes, JR. "Selecting indicator species for biodiversity management." Frontiers in Ecology and Evolution 16 no. 10 (2018): 589-598.

aim to reduce species decline within an area by managing threats that are thought to be acting against these species such as the USAID Saving Species Project.

To understand whether these management actions are effective for reducing species decline, the project should identify candidate indicator species (species that are likely indicators of a biotic response to either environmental stress and/or management actions) for monitoring.

Valuable indicator species may be species that can provide early warning of biotic responses to environmental stressors, represent precursors of broader community or ecosystem-wide change, that are well-studied (clear understanding of life history and ecology), and have clear taxonomic distinctions (to avoid issues of misidentification or ongoing speciation). Depending on management objectives, the candidate species for monitoring can include keystone species, area limited umbrella species, dispersal limited species, resource-limited species, process-limited species, flagship/charismatic species, invasive species, and/or species associated with specific habitat features of interest (**Table 7**). For example, in agricultural projects, tracking the presence of native pollinator species across the project area may be important. Ecosystem health can also be measured through monitoring changes in habitat cover (see geospatial guidance).

Table 7: *Types of Indicator Species and Definitions*[91]

Type	Definition	Examples
Keystone species	Species upon which other species in the ecosystem depend on, as such, if this species were to decline or disappear, the ecosystem would drastically change	Predators (grey wolves, sea otters), prey (Antarctic krill, Canadian snowshoe hares), ecosystem engineers (beavers), mutualists (pollinators), plants (saguaro cactus)
Area-limited 'umbrella' species	Species that require large areas of suitable habitat to maintain viability and whose habitat requirements also cover those for a wider array of associated species	Species with large home ranges (e.g., bears, wolves, large cats)
Dispersal-limited species	Species that are limited in their ability to move from area to area or those with high mortality risk (in moving)	Species restricted to microclimates (e.g., sky islands, humid areas) like amphibians
Resource-limited species	Species requiring specific resources that might be available on a limited basis	Species that rely on specific habitats or prey species

[91] Carignan, V., Villard, M-A. "Selecting Indicator Species to Monitor Ecological Integrity: A Review." Environmental Monitoring and Assessment 78 (2002): 45-61.

Type	Definition	Examples
Process-limited species	Species sensitive to ecological processes (e.g., fire, flood, grazing, competition, etc.)	Species that require fire or flood for germination
Flagship species	Species that attract public support for conservation or are on priority lists (e.g., International Union for Conservation of Nature Red List species)	Giant panda, gorillas, whales
Species associated with specific habitat features	Species that are strongly linked to specific habitat features, such that their persistence is closely linked to the persistence of that feature	Bird species that are closely linked to a habitat type (e.g., overbirds are indicators of a closed-canopy mature forest with a sparse understory)
Invasive species	Species that are non-native to the particular area. Typically, the term 'invasive' species is given to non-native species that grow and reproduce quickly and spread aggressively, with the potential to cause harm to native species and/or ecosystems.	Cane toads, zebra mussel, some carp species, etc.

Deciding which species to measure, the scale and frequency of sampling, and methods to use should be determined by reviews of relevant and reliable published literature and developed in collaboration with implementing partners, stakeholders, and experts knowledgeable about the target ecosystems. The following steps are recommended to define a species monitoring plan:

- HEARTH activities should first consider the relevant ecosystem components that are closely linked to intervention outcomes and determine appropriate scales of impact. They should consult with relevant stakeholders and experts to identify priority species of interest (e.g., culturally and socially important species, indicator and/or keystone species, endangered species, etc.). Triangulating across these sources, projects can come up with a preliminary list of potential species for monitoring.
- Next, they should prioritize species where sufficient information exists regarding their distribution, ecology, and life history – as selecting relatively less-understood species will complicate designing appropriate sampling protocols. Similarly, priority should be given to species with clear taxonomic boundaries. For example, species complexes and cryptic species may increase the risk of misidentification depending on the sampling method and question – that is, the species of interest should be able to be clearly and easily identified.

- Next, projects should consult with relevant experts and determine which species may likely respond to changes occurring outside the manageable interests of the project and adjust priorities accordingly. For example, species with home ranges far beyond the target area may not be the best choice for monitoring as their abundance will be affected by factors unobservable for the project. Approaches that employ species distribution modeling along with climate and other land-use change models can also be used to predict which species and which locations are most likely to experience impacts under changing conditions for monitoring prioritization.[92] Open-source tools like Wallace can be used for this type of geospatial modeling.[93] These types of confounding variables should be considered in the monitoring and evaluation protocol.
- Next, they should consider whether datasets on target species already exist and are of sufficient quality in their target region, and whether they can be leveraged to answer questions of interest.
- Last, they should consider the time and resources they have available and what types of techniques are needed to track different types of species, and prioritize accordingly.[94, 95]

Species occurrence and abundance

Measuring species presence-absence is the most straightforward and simple biodiversity metric and can help answer questions such as 'is this species present in the target area?' or 'does this species use this target area?' Aggregating species presence-absence data over multiple species can give an overall picture of species diversity (as a measure of species richness). However, often presence-absence data can only provide a limited picture of biodiversity and can often be insufficient to inform questions on population and species viability and overall ecosystem health. For example, rare species and species with large home ranges and absence in data collected may not reflect true reality of occurrence as the probability of observing those types of species is much lower than for common species. Thus, presence-absence data combined with fine-scale spatial and temporal sampling can provide a better understanding of where and when different species occur (or do not occur) across an ecosystem. This type of data can be useful to inform questions such as 'what degree of demographic connectivity occurs between these habitat areas/fragments?' or 'how do species move between protected and non-protected areas?' or 'how does occurrence change over seasons?' Measuring the absolute or relative species abundance, whether alone or with detailed spatial and temporal data, can provide a finer-scale picture of how populations change over time and space, thereby lending insight to the viability of populations and can be used to calculate likelihood of species survival, particularly for species that may be harvested. For example, data on

[92] Blair, ME., Rose, RA, Ersts, PJ., Sanderson, EW., Redford, KH., Didier, K., Sterling, EJ., Pearson, RG. "Incorporating climate change into conservation planning: Identifying priority areas across a species' range." Frontiers of Biogeography 4 no. 4 (2012): 157-167.

[93] Kass, JM., Vilela, B., Aiello-Lammens, M., Muscarella, R., Merow, C., Anderson, RP. "Wallace: A flexible platform for reproducible modeling of species niches and distributions built for community. expansion." *Methods in Ecology and Evolution 9 no. 4* (2018): 1151-1156.

[94] Bal, P., Tullock, AIT., Addison, PF., McDonald-Madden, E., Rhodes, JR. "Selecting indicator species for biodiversity management." Frontiers in Ecology and Evolution 16 no. 10 (2018): 589-598.

[95] Hilty, J., Merenlender, A. "Faunal indicator taxa selection for monitoring ecosystem health." Biological Conservation 92 no. 2 (2000): 185-197.

abundance of native species versus invasive species collected over multiple seasons can be used to understand patterns in recovery of native community composition for invasive species removal and control projects.

How to measure species occurrence and abundance

Given the diversity of possible species that may be chosen for monitoring, this guide cannot provide specific details for each type of species. However, there are numerous standardized methods and guides currently in use by international organizations aimed at biodiversity assessment. HEARTH activities are recommended to use Conservation International's Core Standardized Methods for Rapid Biological Field Assessment as a starting point.[96] This guide identifies a core, at-the-minimum set of standardized methods aimed at making the results of rapid surveys comparable and replicable across sites and time. These methods highlight both methods to record presence-absence as well as relative or absolute abundance.[97] In addition, data from previous Rapid Assessment Program expeditions can be found on the Rapid Assessment Program Bulletin of Biological Assessment. Other good sources of monitoring protocols for specific species can also be found through the International Union for Conservation of Nature Species Programme,[98] for example, for great apes.[99] HEARTH activities are recommended to start with this guidance and ensure that collected data comply with data standards outlined below.

In general, HEARTH activities are also recommended to work to identify potential research partners in-country to collaborate for collecting and assessing biodiversity and ecosystem data. These types of collaborations are critical as they build and sustain local scientific capacity and situate biodiversity monitoring within stakeholder communities within the geographic context – components that are critical for making progress towards equity and long-term sustainability of efforts.[100, 101]

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[96] Core standardized methods - conservation international. Conservation.org. (n.d.). Retrieved from https://www.conservation.org/docs/default-source/publication-pdfs/ci_biodiversity_handbook_lowres.pdf.

[97] Larsen, TH. "Core standardized methods for rapid biological assessment." Conservation International, Arlington, VA (2016).

[98] IUCN SSC Species Monitoring Specialist Group. (n.d.). Retrieved from https://www.speciesmonitoring.org/

[99] Kühl, H., Maisels, F., Ancrenaz, M., Williamson, E.A. (2008). "Best practice guidelines for surveys and monitoring of great ape populations." IUCN.

[100] Barber, PH., Ablan-Lagman, MCA., Ambariyanto, Berlinck, RGS., Cahyani, D., Crandall, ED., Ravago-Gotanco, R., Juinio-Meñez, MA., Mahardika, GN., Shanker, K., Starger, CJ., Toha, AHA., Anggoro, AW., Willette, DA. (2014). "Advancing biodiversity research in developing countries: the need for changing paradigms." Bulletin of Marine Science 90 no. 1: 187-210.

[101] Ahmadia, Gabby N., Cheng, Samantha H., Andradi-Brown, Dominic A., Baez, Stacy K., Barnes, Megan D., Bennett, Nathan J., Campbell, Stuart J., Darling, Emily S., Estradivari , Gill, David, Gress, Erika, Gurney, Georgina G., Horigue, Vera, Jakub, Raymond, Kennedy, Emma V., Mahajan, Shauna L., Mangubhai, Sangeeta, Matsuda, Shayle B., Muthiga, Nyawira A., Navarro, Michael O., Santodomingo, Nadia, Vallès, Henri, Veverka, Laura, Villagomez, Angelo, Wenger, Amelia S., Wosu, Adaoma. (2012). "Limited Progress in Improving Gender and Geographic Representation in Coral Reef Science." Frontiers in Marine Science 8: 1334.

Data Standardization

HEARTH activities are and will be occurring across diverse ecosystems and geographies, thus, it is unlikely that activities will be measuring the same species. However, in order for data from across projects to be combined for portfolio-wide evaluation, population and species data should be collected in a standardized manner that allow for data within and across species to be collated and shared to be used broadly. Given the importance of species occurrence data for tracking impacts of policies and progress toward USAID and international biodiversity goals and efforts (e.g., Sustainable Development Goals (SDGs)), Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services assessments) – information on the status and trends of global biodiversity must be available in a form that is easily understood, standardized, scientifically rigorous, and representative of species populations across taxa and regions over time.[102] As such, HEARTH activities are recommended to use the following standard frameworks for measuring and reporting species occurrence data.

HEARTH projects should ensure they collect environmental and ecosystem data along with species data. For example, meta-data to be collected with species occurrence data should include time of observation, climate, location (ideally specific latitude and longitude), altitude or depth, habitat type, ecosystem type, etc. The meta-data should comply with global standards for biodiversity and environmental data. HEARTH activities are recommended to use the standards set forth by the Global Biodiversity Information Facility for sampling event data (using the Darwin Core Standard)[103] and associated ecological meta-data (using Ecological MetaData Language).[104] When possible, data should be published to the Global Biodiversity Information Facility occurrence database.[105]

Accessing And Using Existing Geospatial Data for Monitoring Terrestrial Landscape Extent and Condition

Background

Many HEARTH activities include intermediate results related to terrestrial landscape extent and condition. This guidance focuses on forest ecosystems because (1) they are common focal interests in HEARTH activities, and (2) there is a spatially explicit global database that allows for assessment of forest cover dynamics. Similar analyses of total extent and loss are possible for other ecosystem types, but these will need to rely on data collected and analyzed by each HEARTH activity; however, this type of analysis is beyond the scope of this guidance.

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[102] Jetz, W., McGeoch, MA., Guralnick, R., Ferrier, S., Beck, J., Costello, MJ., Fernandez, M., Geller, G.N., Keil, P., Merow, C., Meyer, C., Muller-Karger, FE., Pereira, HM., Regan, EC., Schmeller, DS., Turak, E. (2019). "Essential biodiversity variables for mapping and monitoring species populations." Nature Ecology & Evolution 3 no. 4: 539-551.

[103] Introduction to sampling-event data. GBIF. (n.d.). Retrieved from https://www.gbif.org/sampling-event-data

[104] Gbif. (n.d.). GMPHowToGuide · Gbif/IPT Wiki. GitHub. Retrieved from https://github.com/gbif/ipt/wiki/GMPHowToGuide.

[105] Search Occurrences. GBIF. (n.d.). Retrieved from https://www.gbif.org/occurrence/search.

Analyses of habitat extent should not be used to assess habitat quality or to assess the odds of the long-term persistence of species, populations, or ecosystems. Ecosystem extent metrics have been used in broader assessments about ecological resilience, but should not be used in isolation to determine an ecosystem's resistance to change or its capacity to bounce back from perturbation.[106]

Data Sources to Estimate Historical Forest Cover Change

This guidance is focused on the use of these indicators using a global dataset of tree cover extent for the year 2000 and annual tree cover loss that is freely available and updated annually.[107] These data can be combined with national and local forest cover classification systems within defined spatial units to assess absolute tree cover loss and the rate of tree cover loss. These data allow HEARTH partners around the world to access and analyze annual tree cover loss statistics without requiring analysis of raw remotely sensed images.

There are two main ways to access these data:

- **Global Forest Watch (GFW)** (spreadsheet output): Raster datasets are available for download from the University of Maryland Global Land Analysis and Discovery (GLAD) laboratory's Global Forest Change Data Download website.[108]
- **Forest cover loss data can be obtained as a spreadsheet from GFW**, which provides a user-friendly web-based interface to access, upload, and download data. Users can upload a spatial unit, visualize baseline tree cover extent across activity sites, and download tabular forest extent and loss area data as a spreadsheet.

Forest cover loss can be analyzed using either the GFW or the GLAD data, or in Google Earth Engine. Additional details for using these data are in Annex 2.

Choosing Indicators

Activities with intermediate results related to the preservation of forest cover may consider including the forest extent indicator. Absolute measurements of forest cover by themselves may have limited utility in assessing the impacts of an activity. Specifically, forest cover within HEARTH sites could be analyzed with respect to the start of the intervention; in this case, the hypothesis is that sometime after the start of the HEARTH intervention forest loss will be reduced (**Figure 2**). A comparison to a group of similar sites outside the area of influence of the HEARTH activity would provide stronger evidence of impacts. (**Figure 3**). Whenever feasible, a carefully selected group of sites not participating in HEARTH activities should form the basis for comparisons. When such a comparison group exists, statistical testing can be used to determine whether there are significant differences between the HEARTH sites

[106] Timpane-Padgham, Britta L., Tim Beechie, and Terrie Klinger. (2017). "A systematic review of ecological attributes that confer resilience to climate change in environmental restoration." PLoS One 12, no. 3: e0173812.

[107] Hansen, Matthew C., Peter V. Potapov, Rebecca Moore, Matt Hancher, Svetlana A. Turubanova, Alexandra Tyukavina, David Thau et al. (2013). "High-resolution global maps of 21st-century forest cover change." science 342, no. 6160: 850-853.

[108] Global Forest Change 2000–2020 data download. Global Forest Change. (n.d.). Retrieved from https://storage.googleapis.com/earthenginepartners-hansen/GFC-2020-v1.8/download.html.

and the comparison group. Selection of an appropriate comparison group is beyond the scope of this guidance.

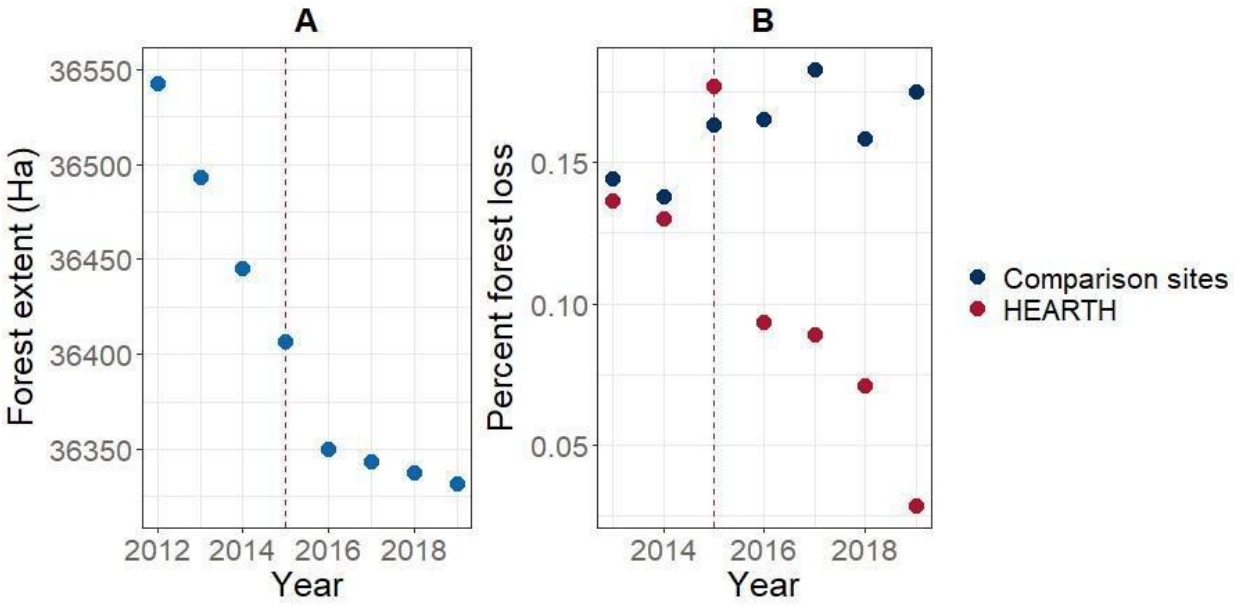

Figure 2 **Figure 3**

Figure 2: *Before and After Comparison of Simulated Forest Extent Data within HEARTH Activity Sites.*
(The plot shows that overall forest extent trends diverge after the start of the HEARTH activity [vertical dashed line]).

Figure 3: *Simulated Percent Forest Loss Data in HEARTH Activity Sites and a Group of Comparison Sites*
(The plot shows that percent loss trends are similar before the start of the HEARTH activity [vertical dashed line] but diverge after).

Habitat Fragmentation

Habitat fragmentation, a process by which a contiguous habitat patch is converted into smaller and often disjunct patches, is a common consequence of human alteration of natural ecosystems. Fragmentation can have important impacts on biodiversity and ecosystem function. The degree of fragmentation in a landscape can be described using several metrics, but there is no consensus on a single metric that is robust and amenable to aggregation across different landscapes.[109] Therefore, we do not include a habitat fragmentation metric in the HEARTH MERL indicators, but instead recommend that HEARTH activities including a fragmentation outcome evaluate including a metric selected upon consideration of local conditions and the activity's theory of change. HEARTH activities interested in measuring habitat fragmentation and needing technical assistance should contact the HEARTH MERL team.

A frequently used, open-source tool for deriving habitat fragmentation metrics is FRAGSTATS.[110] An introduction to FRAGSTATS was produced by Chen and Iannone (2020).[111] FRAGSTASTS metrics can be derived using (1) its stand-alone tool,[112] (2) plug-ins for GIS software, or (3) analytical packages in a statistical programming language (e.g., "landscapemetrics" in R or "PyLandStats" in Python).[113]

Collecting And Assessing Soil Quality in Agriculture and Agroforestry Projects Using LandPKS

Background

Healthy soils are the foundation of sustainable, productive agriculture, but in order to understand the different characteristics of their land (such as how much water or carbon it can store), farmers and land

[109] Wang, Xianli, F. Guillaume Blanchet, and Nicola Koper. (2014). "Measuring habitat fragmentation: an evaluation of landscape pattern metrics." Methods in Ecology and Evolution 5, no. 7: 634-646.

[110] University of Massachusetts Amherst. University of Massachusetts. (n.d.). Retrieved from https://www.umass.edu/landeco/research/rmlands/applications/hrv_upl/documents/fragstats_overview.htm.

[111] Chen, Benxin, and Basil V, Iannone III. "FRAGSTATS: A Free Tool for Quantifying and Evaluating Spatial Patterns". (2020). https://edis.ifas.ufl.edu/pdf/FR/FR431/FR431-Dtqvkt8643.pdf.

[112] University of Massachusetts Amherst. University of Massachusetts. (n.d.). Retrieved from https://www.umass.edu/landeco/research/rmlands/applications/hrv_upl/documents/fragstats_overview.htm.

[113] Bosch, Martí. "PyLandStats: An open-source Pythonic library to compute landscape metrics." PloS one 14, no. 12 (2019): e0225734.

managers need to measure its potential. Land Potential Knowledge System (LandPKS)[114] is a free mobile app that allows users to easily identify soil types, monitor soil health, vegetation cover, composition and height, and track activities and management over time. This section outlines the basic questions HEARTH Activity managers and potential users may ask when considering using LandPKS, with links to resources and training where available. A user guide for project and impact evaluators is also available online.[115]

Should My HEARTH Activity Use LandPKS?

One of HEARTH's Project Outcomes (Project Outcome BP.2) involves restoring or improving landscapes for biodiversity. Because of HEARTH activities' geographic and sectoral variety, LandPKS may not be appropriate for every project. However, if an activity involves agriculture, agroforestry, or a sector dependent upon healthy soils, LandPKS will help to assess baseline soil health and soil potential at the beginning of the intervention and to monitor progress throughout the life of the project.

LandPKS is a free mobile application (or app), that can be downloaded from the Apple App Store for iPhones[116] or on Google Play for Android phones. [117]

LandPKS is primarily meant to be used in the field, to gather data and monitor change. However once baseline data has been set up, information is saved to a Data Portal[118] where reports can be generated in .csv format. LandPKS does not recommend using the app on multiple devices with the same login, so creating a HEARTH Activity-wide account is not advisable unless one person is collecting and managing all of the data. Instead, discrete accounts should be created by individuals who will be able to collect localized field data over time. Farmers or land managers are best positioned to collect data and manage the LandPKS account, given their proximity to sites. They can also make use of the LandManager Module[119] to track land management activities (planting dates, yields, pest management, nutrient management, irrigation and rainfall, tillage, crop residue management, erosion control).

Step-By-Step Instructions for Starting Up with LandPKS

1) Download the LandPKS mobile app

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[114] Land PKS. Knowledge for Sustainable Land Mass. (n.d.). Retrieved from https://landpotential.org/.

[115] Barnese, D. (2020, December 8). User guide for project and impact evaluators. LandPKS. Retrieved from https://landpotential.org/knowledge/project-and-impact-evaluators-user-guide/.

[116] project, L. P. K. S. (2016, September 18). LandPKS. App Store. Retrieved from https://apps.apple.com/us/app/landpks/id1084892005.

[117] Google. (n.d.). LandPKS - apps on Google Play. Google. Retrieved from https://play.google.com/store/apps/details?id=org.landpotential.lpks.landcover&hl=en.

[118] Land PKS. Knowledge for Sustainable Land Mass. (n.d.). Retrieved from https://landpotential.org/.

[119] Barnese, D. (2021, February 18). Training video: Land Management. LandPKS. Retrieved from https://landpotential.org/knowledge/intro-to-landpks-landmanagement-module/.

    a. Register a Gmail address to use the LandPKS app and access your data on the Data Portal.
2) Click the + to create a new site (You can click on the Map to view possible soils without creating a site)
    a. Name your first site and obtain the GPS coordinates. Multiple plots may be added, if necessary.
3) To create a baseline, data must be collected in the field. Three modules are required.
    a. LandInfo: record slope, texture, color for Soil ID.[120]
    b. Vegetation and LandCover: rapid (20-minute) vegetation monitoring with a measuring implement.[121]
    c. SoilHealth: record and store lab data + field observations aligned with soil health indicators. (More on this below)
    d. One further module may be of use, but has limitations:
        i. Habitat: used to define suitable habitat. However, currently only has data from North America.[122]
4) To back up your data to the cloud and give you access to the Data Portal, click "Synchronize Now" at the top of the data input screen when you have a data connection.
5) View data and results in the Report tab
    a. Soil ID: view your updated site-specific soil ranking, access information about potential vegetation and restoration options through EDIT.
    b. LandManagement & SoilHealth: generate PDF reports.

Guidance For Choosing Indicators

Soil quality, or soil health, is the ability of soil to function as an ecosystem that sustains animals, plants, and humans. A soil's dynamic properties reflect its health, and improved management can increase productivity, biodiversity, and overall sustainability. Once information is gathered in step 3a above, a Land Capability Classification (LCC) score may be generated. The LCC score may be used to help identify which soil health indicators may be most useful in tracking improvement.

To record soil health indicators for a specific site, users must input information into the LandPKS Soil Health module. The module records data about the dynamic properties of soil, allowing users to identify sustainable practices to support soil to grow crops, manage rainwater, or filter pollutants. Soil inherent properties can provide information about ecosystem type and are noted in some of the modules (see Ponding, below).

[120] Kerchof, C. (2021, January 27). Training videos: LandInfo. LandPKS. Retrieved n.d., from https://landpotential.org/knowledge/landinfo-training/.

[121] Kerchof, C. (2021, April 27). Training videos: Vegetation. LandPKS. Retrieved from https://landpotential.org/knowledge/vegetation-landcover-video-training/.

[122] Barnese, D. (n.d.). Intro to the landPKS habitat module. LandPKS. Retrieved from https://landpotential.org/knowledge/intro-to-the-landpks-habitat-module/.

Assessing Soil Quality in LandPKS

Fourteen short (between 1 and 6 minute) training videos[123] explain the indicators that LandPKS tracks, and a recent webinar also briefly describes the module. In general, it is not necessary to evaluate all the indicators for every project, but only those that are needed to assess soil health at the time. Some indicators will be more representative of soil health than others, depending on site conditions, soil type, landscape position, climate, time of year, and production system. The indicators tracked by LandPKS are:

Soil Cover[124] is the percent of soil surface covered by live plants, dead plant material, or organic mulch. This indicator can be evaluated in 3 different ways:

- Landcover Transect – transfers the completed information the user has reported in the LandCover module to display Total Cover Percent
- Ocular Estimate – allows the user to record multiple ocular estimate observations
- Other – allows for other methods of estimating Cover Percent

Residue Breakdown[125] is the rate of decomposition as indicated by many environmental and soil conditions. These include soil microbial community, chemical and physical characteristics of the residue, soil water content, soil temperature, and soil aeration. The indicator is evaluated by comparison of expectations for similar soil, topography, climate, and residue type, on a scale of "much greater than expected" to "none or very little."

Surface Crusts[126] are thin layers of soil at the soil surface that have different physical and/or chemical characteristics than the underlying soil. There are 3 types of crusts: Biological, Chemical, and Physical. Physical crusts can be either Structural (formed by water) or Depositional (caused by deposited soil particles). Surface crusting is evaluated by:

- Whether crusts are present
- Thickness of layer
- Level of development – determined by applying force to crust sample
- Extent percentage

[123] Barnese, D. (2021, July 12). Training videos: Soil Health. LandPKS. Retrieved from https://landpotential.org/knowledge/intro-to-the-landpks-soilhealth-module/.

[124] Soil Health trainings 2: Set-up and soil cover. YouTube. (2021, May 20). Retrieved from https://youtu.be/Rogcmd8-fYg.

[125] Soil Health trainings 3: Residue breakdown. YouTube. (2021, May 20). Retrieved from https://youtu.be/puIND54_uPk.

[126] Soil Health trainings 4: Surface crusts (surface crusting). YouTube. (2021, May 20). Retrieved from https://youtu.be/U6aOei0xaEg.

Ponding[127] is the soil characteristic that shows the extended periods that standing water stays on the soil surface. It can be an indicator of crusts, poor soil structure, poor aggregate stability, compaction or inherent soil properties, and/or landscape position. Ponding is measured by duration.

Root Restriction[128] is a near-surface layer of dense soil that is hard for plant roots and water to penetrate. These can be naturally occurring, or human caused. Root restriction measurements can be recorded in 3 ways:

- Measuring using an instrument called a measure penetrometer
- Measure Other – such as wire flag, sharp rod, or shove
- Describe Layer – by entering depth to the top of compaction layer, thickness, level of development, and extent

Aggregate Stability[129] is the ability of soil aggregates to resist collapsing into smaller pieces due to tillage, wind, or water erosion. This indicator is measured by using the Cylinder method, Strainer Method, and/or a Soil Stability Kit.

Soil Structure[130] is the grouping of soil particles into aggregates. These can occur in different patterns, resulting in different soil structures. They influence the pore space in the soil and how easily air, water, and roots can move through the soil. This indicator is evaluated by identifying the soil structure type. Multiple observations can be made:

- Granular
- Subangular Blocky
- Angular Blocky
- Lenticular
- Platy
- Wedge Prismatic
- Columnar
- Single Grain
- Massive

Soil Color[131] is a physical soil property that gives an indication of the various processes occurring in the soil as well as the type of minerals in the soil. The indicator records the Munsell color notation at each depth. This can be determined with a Munsell book, or the app using a camera and white balance

[127] Soil Health trainings 5: Ponding (Ponding/infiltration). YouTube. (2021, May 20). Retrieved from https://youtu.be/VzYIW385s5g.

[128] Soil Health trainings 6: Root restriction (penetration resistance). YouTube. (2021, May 20). Retrieved from https://youtu.be/EouDj8P7a4U.

[129] Soil Health trainings 7: Aggregate stability (water-stable aggregates). YouTube. (2021, May 23). Retrieved from https://youtu.be/N_Ilu3YEHSc.

[130] Soil Health trainings 8: Soil structure. YouTube. (2021, May 24). Retrieved from https://youtu.be/pHPZWTBXGZs.

[131] Soil Health trainings 9: Soil color. YouTube. (2021, May 24). Retrieved from https://youtu.be/_MX4XBZAuil.

card or yellow post-it note as a color reference. Multiple observations can be recorded for each method.

Plant Roots[132] anchor the plant, absorb water and nutrients, store food and nutrients, and move water and nutrients to the stem. This indicator is evaluated by checking all the root characteristics that apply, such as:

- Whether roots are covered in rhizosheaths (coatings of soil on roots that indicate microbial activity)
- Are part of soil aggregates
- Are healthy, fully branched, etc.

Biological Diversity[133] affects soil structure and therefore water availability by performing many vital functions such as converting dead and decaying organic matter and minerals to plant nutrients. This indicator is evaluated by identifying the amount of soil diversity present, from "numerous" to "none."

Biopores[134] are channels in the soil that are formed by the activity of plant and animal life. They allow air and water to move through the soil and are pathways for root growth. The indicator is evaluated by recording the number of biopores in a 10 x 10 cm area.

Runoff and Erosion[135] reflect soil movement and loss from the site. It can be used to detect excessive runoff, which can reduce the water availability for plants. The indicator is evaluated by identifying the extents of three characteristics found at the site:

- Water Flow Pattern
- Rills
- Gullies

[132] Soil Health trainings 10: Plant roots. YouTube. (2021, May 24). Retrieved from https://youtu.be/YAbmhJ1VZaY.

[133] Soil Health trainings 11: Biological diversity. YouTube. (2021, May 24). Retrieved from https://youtu.be/L_u44M7LriE.

[134] Soil Health trainings 12: Biopores. YouTube. (2021, May 24). Retrieved from https://youtu.be/0XBiloO7_rQ.

[135] SoilHealth trainings 13: Runoff and Erosion. YouTube. (2021, May 24). Retrieved from https://youtu.be/fP8XG1TQBVo.

Soil Smell[136] may indicate numerous inferred characteristics of the soil. This can mean the presence or lack of biological activity and/or poor soil structure. The indicator is determined by selecting one of three distinct scents:

- Fresh, sweet earthy smell
- Little or no smell
- Swampy, stagnant, or mineral smell

Collecting And Assessing Water Quality Data for Agricultural Activities

Background

The HEARTH MERL team aims to aggregate data from activities across multiple geographies and ecological contexts to test the effectiveness and impacts of the HEARTH approach. To do this, USAID and its partners need to collect, analyze, and report data using shared protocols. This guidance highlights key points for monitoring water quality in support of HEARTH MERL objectives.

Many HEARTH activities aim to reduce agricultural pollution of natural water aquatic environments such as lakes, streams, and estuaries. The most common types of agricultural water pollution that HEARTH practitioners are likely to encounter are:

- **Pathogenic microorganisms**. According to the WHO, microorganisms such as bacteria, parasites, and viruses are the most widespread human health risk associated with drinking water.[137] Although many microorganisms naturally occur in soil and water at agricultural sites, and some can be pathogenic, the biggest problems come from human waste or animal waste used as fertilizer. Microorganisms found in human and animal feces cause a variety of serious diseases such as cholera, diarrhea, hepatitis A, and typhoid.
- **Soil erosion.** Soil particles in water provide attachment sites for pathogenic microorganisms to proliferate, and they also reduce water clarity, which can negatively affect aquatic plants and animals and overall ecological productivity. Soil particles in water also can make it unpalatable for drinking.
- **Fertilizer runoff.** Practically all fertilizer contains nitrogen, which is essential for plant survival and reproduction. When people use commercial chemicals or animal waste to fertilize crops, excess nitrogen often runs off into natural aquatic environments, beyond the initial areas of application, via above and belowground pathways. Nitrogen compounds in water can cause a variety of human health problems, and there is some evidence that it might cause several types of cancer. Excess nitrogen in natural waters also may dramatically increase aquatic plant growth—a process known as eutrophication—causing cascading impacts on freshwater

[136] SoilHealth trainings 14: Soil Smell and further resources. YouTube. (2021, May 24). Retrieved from https://youtu.be/fTwioGDvLLk.

[137] World Health Organization (WHO). 2017. Guidelines for drinking-water quality: fourth edition incorporating the first addendum. Geneva: World Health Organization. Licence: CC BY-NC-SA 3.0 IGO.

ecosystems. In some cases, nutrient-driven increases in aquatic plant productivity, followed by decomposition of the plants after they die, can significantly reduce the amount of oxygen dissolved in the water, thereby killing fish and other aquatic animals.

- **Pesticides**. Among the most harmful agricultural chemicals that pollute natural waters, pesticides are strictly regulated according to USAID's Environmental Procedures (Code of Federal Regulations Part 216.[138] For any activity in a Mission's portfolio that involves assistance for the procurement and/or use of pesticides, the Mission should complete an Initial Environmental Examination and Environmental Mitigation and Monitoring Plan. A Mission's procedures for promoting or using pesticides—including a list of approved chemicals—and for monitoring pesticide pollution in any USAID-funded activity, should be established before the activity is approved. Accordingly, this guidance refers HEARTH practitioners to the Mission's existing pesticide monitoring protocols, as established by the Mission Environmental Officer and DC-based Bureau Environmental Officer. Many of these protocols will already be standardized at a global or regional scale through USAID's Environmental Procedures review and approval process.

Broad Overview of Methods

The table below lists five common indicators for water pollution, organized according to the type of pollution they indicate (**Table 8**). They directly address the human and ecological health issues described above. In the HEARTH water quality PIRS, all the suggested tests for these indicators are simple and inexpensive, and practitioners can conduct them in the field or in an office setting. For most of the indicators, there also are more accurate methods available, and there are additional tests that practitioners could conduct for more comprehensive analysis, but they would require more specialized expertise and instrumentation and would typically be more expensive. None of the indicators listed below require laboratory analysis.

If HEARTH practitioners monitor these indicators regularly over time, they will provide useful measures of three of the most common types of agricultural water pollution and their long-term trends.

Table 8: *Common Indicators for Water Pollution*

Type of Pollution	Indicators	Considerations
Pathogenic microorganisms	E. coli	*Escherichia coli* (*E. coli*) is a type of coliform bacteria. Most *E. coli* are harmless and live in the intestines of people and warm-blooded animals, but some strains can cause illness. The presence of *E. coli* in drinking water usually indicates recent fecal contamination, which means there is a good chance that pathogens are present. It is considered unsafe to drink water that contains any amount of *E. coli*.

[138] USAID. (2007). Environmental Compliance Procedures. USAID-funded projects and activities. Retrieved from https://www.usaid.gov/sites/default/files/documents/2020_Digital_Booklet.pdf.

Type of Pollution	Indicators	Considerations
		According to the WHO, *E. coli* is considered the most suitable indicator of fecal contamination in drinking water.[139] Contamination can be measured by either membrane filtration or multiple-well methods.
Soil erosion	Turbidity	Turbidity is a measure of water clarity. It is largely a function of how much particulate matter such as soil is suspended in the water. Practitioners can measure turbidity in the field with a hand-held tool called a turbidity tube, aka transparency tube, and visual observation.
	pH	Water pH is influenced by many factors, but one important factor is the amount of positively and negatively charged mineral ions in the water, which will likely have come from rocks and soil nearby. Practitioners can measure water pH with a test strip of indicator paper or hand-held pH meter. pH meters need to be calibrated before measurement.
Fertilizer runoff	Nitrate and Nitrite	Nitrate and nitrite are both simple molecules containing nitrogen and oxygen; they are commonly found in water that is polluted with fertilizer. Practitioners can measure nitrate and nitrite concentrations in water with a test strip of indicator paper.

Guidance On Choosing Indicators

When designing a water sampling program, practitioners need to consider the types of pollution they wish to address, the relevant ecological and social contexts, and the resources available. Perhaps less obvious are considerations of how to establish baseline water quality conditions at the beginning of HEARTH activities, how seasonal changes or changes in HEARTH activity implementation might affect agricultural water pollution, and even how to allocate responsibility for getting the work done. All these factors are relevant to determining which indicators are needed, and which are feasible to track.

[139] World Health Organization (WHO). 2017. Guidelines for drinking-water quality: fourth edition incorporating the first addendum. Geneva: World Health Organization. Licence: CC BY-NC-SA 3.0 IGO.

USAID has produced several useful Sector Environmental Guidelines to help answer these types of questions, especially those focused on Crop Production,[140] Dryland Agriculture,[141] and Water Supply and Sanitation,[142] which specifically address questions about the potential for agricultural water pollution and water quality monitoring. USAID also has a website focused on water quality assurance that has several useful resources. [143]

Data Standardization

Water quality analysis is a well-developed, standardized practice with widely recognized methods. The PIRS for the HEARTH water quality indicators recommend commercially available test kits and tools that come with instructions for standardized data collection. The PIRS also includes instructions for data collection and disaggregates.

Guidance On Using and Assessing Global Climate Change (GCC) Standard Indicators for Climate Change Mitigation

Background

USAID frames its work and efforts on climate change in line with the USAID Climate Strategy 2022-2030[144] and three climate-related Executive Orders: EO 13990 - Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis,[145] EO 14008 - Tackling the Climate Crisis at Home and Abroad,[146] and EO 14013 - Rebuilding and Enhancing Programs to Resettle Refugees and Planning for the Impact of Climate Change on Migration.[147] Both mitigation and adaptation are

[140] USAID. (2019, March). Sector Environmental Guideline: Crop production. Retrieved from https://www.usaid.gov/sites/default/files/documents/1865/CropProduction_SEG_25Mar2019.pdf.

[141] USAID. (2014). Sector Environmental Guidelines: Dryland Agriculture. Retrieved from https://www.usaid.gov/sites/default/files/documents/1860/SectorEnvironmentalGuidelines_DrylandAgriculture.pdf.

[142] USAID. (2017, August). Sector Environmental Guidelines. Retrieved from https://www.usaid.gov/sites/default/files/documents/1860/Water_SEG_2017.pdf.

[143] Water quality assurance plan (WQAP) template: Special compliance topics: Environmental procedures U.S. agency for international development. U.S. Agency for International Development. (2020, August). Retrieved from https://www.usaid.gov/environmental-procedures/environmental-compliance-esdm-program-cycle/special-compliance-topics/water.

[144] https://www.usaid.gov/sites/default/files/documents/USAID-Climate-Strategy-2022-2030.pdf

[145] Biden, J. R. (2021, January 20). Executive Order on Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis. whitehouse.gov. Retrieved from https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-protecting-public-health-and-environment-and-restoring-science-to-tackle-climate-crisis/.

[146] Biden, J. R. (2021, January 27). Executive Order on Tackling the Climate Crisis at Home and Abroad. whitehouse.gov. Retrieved from https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/.

[147] Biden, J. R. (2021, February 4). Executive Order on Rebuilding and Enhancing Programs to Resettle Refugees and Planning for the Impact of Climate Change on Migration. whitehouse.gov. Retrieved from https://www.whitehouse.gov/briefing-room/presidential-actions/2021/02/04/executive-order-on-rebuilding-and-enhancing-programs-to-resettle-refugees-and-planning-for-the-impact-of-climate-change-on-migration/.

critical strategies to address the climate crisis. However, reducing, sequestering, or avoiding GhG emissions will also slow the rate of climate change and reduce climate change impacts. Furthermore, reducing GhG emissions can have impacts (co-benefits in some cases and tradeoffs in others) for air and water pollution, energy security, health, and gender issues[1].

USAID's climate change indicators were updated in 2020, with excellent templates and guidance sheets. Therefore, this guidance acts as a signpost for HEARTH staff and Implementing Partners, with all climate-indicator-related resources in one place.

Broad Overview of Methods

Changes to GhG emissions are usually measured in metric tons of CO_2 (or CO_2-equivalent). Practically, this means projects need to develop a baseline of emissions (or emissions inventory), and then compare the "business-as-usual" case (i.e., what would have happened without the intervention) to changes in emissions over the life of the activity. Developing a targeted GhG projection is a key step towards developing successful emissions reduction strategies, and effectively reducing emissions in an activity.

On a project level, USAID programs with climate change benefits are required to report against a set of standard indicators, each with its own definition and some with supplementary guidance. Since effective performance monitoring starts with a clear view of a project's goals, there are climate change related results frameworks and other materials available to help guide project design and performance monitoring.[148]

On a more strategic level, other projections that have been developed by governments or organizations may be used for several reasons, such as reporting to the United Nations Framework Convention on Climate Change, or as part of a cost-effectiveness analysis to inform decision-making, policy development, or action plans. Assessments of policies and actions are useful for providing a quantitative basis for policy development and can also enable policymakers and stakeholders to assess the impact of various potential policies or actions on GhG emissions.

Guidance On Choosing Indicators

HEARTH's Project Biophysical Outcome 5 (Reduce GhG emissions from focal enterprise activities) should be measured using the GCC Standard Indicators. The most up-to-date versions of GCC Standard Indicator Reporting Templates (as of September 2021) can be accessed online.[149] The handbook walks you through each indicator (many of which are also listed below), with guidance for OUs on how, when, and why (or why not) to include them.

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[148] Climate Change Monitoring and Evaluation Resources. Global Climate Change. (2020, August). Retrieved from https://www.climatelinks.org/climate-change-monitoring-evaluation-resources.

[149] USAID. (2020). 2020 GCC Standard Indicator Handbook: Definition Sheets. Climate Links. Retrieved from https://www.climatelinks.org/sites/default/files/asset/document/2020_USAID_GCC-Indicator-Handbook-August-2020-Update.pdf.

Several HEARTH Activities seek to reduce or avoid deforestation through improved land management, and climate change mitigation may be a result of successful interventions. Indicators EG 13-6 (GhG emissions, estimated in metric tons of CO2 equivalent, reduce sequestered, or avoided in full or in part by USG assistance) or EG 13-8 (Number of hectares under improved management expected to reduce greenhouse gas emissions as a result of USG assistance) may be the most directly relevant to HEARTH Outcome BP.4.

In order to measure a reduction in GhG emissions against a 'business-as-usual' case, project information should be entered into USAID's Agriculture, Forestry, and other Land Use (AFOLU) Carbon Calculator.[150] The AFOLU Carbon Calculator can also be used to generate GhG projections for a variety of land-related activities. Guidance on how to use the AFOLU Carbon Calculator is available online.[151]

If deemed necessary, HEARTH may also refer to the World Resource Institute Policy and Action Standard for guidance on how to generate a 10-year projection,[152] or contact USAID's Natural Climate Solutions Team for additional technical assistance on developing a projection of emission reductions.

What else could HEARTH activities measure?

Some HEARTH activities may also benefit from considering Adaptation, Clean Energy, and Sustainable Landscapes Indicators.[153] Targeted usage of these climate-related indicators can help USAID to capture the human resilience benefits of activities and training, as well as the links from USAID-funded programs to wider sustainability goals. A summary sheet, showing helpful information like category, and disaggregation level is available.[154] Additionally, individual, downloadable, reporting templates for Adaptation, Clean Energy, and Sustainable Landscapes have been created in Microsoft Excel.[155]

Global Climate Change Indicators of Relevance to HEARTH

EG 11: Adaptation

[150] GCC standard indicator reporting templates. Global Climate Change. (2019, October 7). Retrieved from https://www.climatelinks.org/resources/gcc-standard-indicator-reporting-templates.

[151] Casarim, F., and Murry, L. (2014). How To Use the AFOLU Carbon Calculator. USAID.org. Retrieved from http://afolucarbon.org/static/documents/How%20to%20use%20the%20AFOLU%20Carbon%20Calculator.pdf.

[152] Rich, D., Bhatia, P., Finnegan, J., Levin, K., and Mitra, A. (2015, July 11). Policy and action standard. World Resources Institute. Retrieved from https://www.wri.org/research/policy-and-action-standard.

[153] GCC standard indicator reporting templates. Global Climate Change. (2019, October 7). Retrieved from https://www.climatelinks.org/resources/gcc-standard-indicator-reporting-templates.

[154] Climate Links. (n.d.). Global Climate Change: Standard Indicator Summary Sheet. USAID Security Sector Governance and justice indicators guide. Retrieved from https://www.climatelinks.org/sites/default/files/2019_USAID_GCC_Indicators%20Summary%20Sheet.pdf.

[155] GCC standard indicator reporting templates. Global Climate Change. (2019, October 7). Retrieved from https://www.climatelinks.org/resources/gcc-standard-indicator-reporting-templates.

EG.11-1 Number of people trained in climate change adaptation supported by USG assistance

EG.11-2 Number of institutions with improved capacity to address climate change risks as supported by USG assistance

EG.11-4 Amount of investment mobilized (in USD) for climate change adaptation as supported by USG assistance

EG.11-6 Number of people using climate change information or implementing risk-reducing actions to improve resilience to climate change as supported by USG assistance

EG12: Clean Energy

EG.12-1 Number of people trained in clean energy supported by USG assistance

EG.12-2 Number of institutions with improved capacity to address clean energy issues as supported by USG assistance

EG.12-3 Number of laws, policies, regulations, or standards addressing clean energy formally proposed, adopted, or implemented as supported by USG assistance

EG.12-4 Amount of investment mobilized (in USD) for clean energy as supported by USG assistance

EG.12-5 Clean energy generation capacity supported by USG assistance that has achieved financial closure

EG.12-6 GhG emissions, estimated in metric tons of CO2 equivalent, reduced, sequestered, or avoided through clean energy activities supported by USG assistance

EG. 12-7 Projected GhG emissions reduced or avoided from adopted laws, policies, regulations, or technologies related to clean energy as supported by USG assistance

EG13: Sustainable Landscapes

Indicator EG.13-1 Number of people trained in sustainable landscapes supported by USG assistance

EG.13-2 Number of institutions with improved capacity to address sustainable landscapes issues as supported by USG assistance

EG.13-4 Amount of investment mobilized (in USD) for sustainable landscapes as supported by USG assistance

EG.13-5 Number of people receiving livelihood co-benefits (monetary or non-monetary) associated with implementation of USG sustainable landscapes activities

EG.13-6 GhG emissions, estimated in metric tons of CO2 equivalent, reduced, sequestered, or avoided through sustainable landscapes activities

EG. 13-8 Number of hectares under improved management expected to reduce greenhouse gas emissions as a result of USG assistance.

Performance Indicator Reference Sheets

INDICATOR TITLE: Change in presence/absence of target species(s) across target area over a set time interval

DEFINITIONS

"Target species" - This can be a single or group of species depending on the evaluation questions and the ecology of the area. The target species should be agreed upon and defined. Choice of target species should be made based on the evaluation question and any available baseline or inventory data.

"Target area" - This will depend on the HEARTH activity and project area; however, the target area should be defined with clear spatial bounds and ideally be ecologically relevant to the evaluation question. For the indicator on areas important for wildlife movement, these areas must be properly bounded based on biologically relevant areas for the species in question. For example, assessment of species range and likely areas for different types of usage can be used to identify areas for monitoring.

"Set time interval" - This is the temporal sampling interval for making observations. The interval and duration will depend on the HEARTH activity and its timeline, target species, and available resources.

DATA COLLECTION:

Data should be collected through observations and recorded with specific spatial and temporal data including latitude and longitude of observation and time of observation. Details on habitat type should also be recorded. Proper species identification is required, and care should be taken for species that are cryptic in nature.

Presence counts per unit area of sampling can be used to calculate species richness across unit areas. Species richness is calculated by totaling the number of species present (out of all species being sampled) over each unit area.

Each HEARTH activity must choose an appropriate date for the baseline data, based on an assessment of its theory of change. Analyses can include data from a period before the start of the HEARTH activity. The baseline year choice and the rationale for that choice must be included in each activity's MEL plan.

INDICATOR TITLE: Change in presence/absence of target species(s) across target area over a set time interval

LIMITATIONS:

For a single species, this metric only provides information on whether a species is present in the area. It is not informative about the dynamics of that population, nor can it be used to indicate health of that species.

For multiple species, this metric can be used to calculate a similarity index of species diversity between sites. As the observations gathered here do not include the number of unique individuals per species, they cannot be used to calculate diversity indices for species richness.

Presence/absence data can be confounded by "false zeros" which indicate non-detection events for species that may be present but not observed. Ideally, interpreting presence/absence data should be treated as detection/non-detection data. Chance of detection will depend on the sampling scheme and biology and ecology of the target species. As such, presence/absence data are prone to miss rare or hard to detect species. To adjust for this bias, conducting replicate surveys at sampling locations and/or using multiple observers can help. In addition, sampling probability models can be used to guide design of sampling intervals. Tools like PowerSensor![156] can be used to assess the ability of alternative sampling designs in wildlife sampling to detect changes in presence over time. The tool can be used also to evaluate sampling designs with varying numbers of sampling points and sampling durations for populations with different initial occupancies, detection probabilities, and occupancy changes (relevant for HEARTH indicator for change in species abundance).

To understand whether habitats are improved for species, projects should track the abundance of a target species that would be expected to utilize the area for specific purposes (e.g., mating, breeding, nursery, or hunting) and behaviors that are observed. However, presence/absence data can at the minimum indicate whether species that were previously present (or not present) have changed. This can provide information on overall habitat utility and quality. It cannot indicate any measures of species health or risk unless the project is certain they have sampled all potential spatial areas where the species may occur (to avoid ascertainment bias). Therefore, presence/absence should be not used to discern trends of species health nor habitat quality.

Poor metadata collection (e.g., spatial, temporal, habitat data) can also limit the utility of presence/absence data.

UNIT:	DISAGGREGATE BY:
	Target species: Number of observations indicating presence/absence of different target species or functional groups

[156] Tropical Ecology Assessment and Monitoring Network. (n.d.). How Much Change Can You Detect in Your Occupancy-Based Monitoring Project? PowerSensor! Retrieved from https://jaap.shinyapps.io/powerSensor.

INDICATOR TITLE: Change in presence/absence of target species(s) across target area over a set time interval	
Number of species detected per unit area per unit of time	should be recorded separately (if multiple target species are under observation). Temporal units: Each HEARTH activity should determine the appropriate temporal sampling intervals for this indicator. Temporal sampling should be based on feasibility and ecological relevance for the target species. Spatial units: Each HEARTH activity should determine the appropriate level of geographic aggregation for this indicator. Additional disaggregation may be appropriate in specific cases, for example, by locality, ecosystem type, or if different approaches were implemented at different sites. The level of spatial aggregation for these data must be clearly noted in the activity's MEL plan.
FREQUENCY: TBD – based on relevant sampling intervals for target species and landscape	DATA SOURCE: Implementing partners will collect presence/absence data through observations. These can be done using a variety of approaches from visual transects to camera trapping to environmental DNA and other types of physical traps and trackers (e.g., radio collars, Passive Integrated Transponder tags, etc.).
REPORTING NOTES	
Each HEARTH activity should assess whether a target is appropriate for this indicator.	

INDICATOR TITLE: Change in abundance of target species(s) across target area over a set time interval

DEFINITIONS:

"Abundance" - Total number of individuals in a taxon or taxa in a defined area, a population, or a community. Abundance is typically expressed as relative abundance which refers to the total number of individuals of one taxon compared with the total number of individuals of all other taxa in a defined area, volume, or community.[157]

"Target species" - This can be a single or group of species depending on the evaluation questions and the ecology of the area. The target species should be agreed upon and defined. Choice of target species should be made based on the evaluation question and any available baseline or inventory data.

"Target area" - This will depend on the HEARTH activity and project area; however, the target area should be defined with clear spatial bounds and ideally be ecologically relevant to the evaluation question. For the indicator on areas important for wildlife movement, these areas must be properly bounded based on biologically relevant areas for the species in question. For example, assessment of species range and likely areas for different types of usage can be used to identify areas for monitoring.

"Set time interval" - This is the temporal sampling interval for making observations. The interval and duration will depend on the HEARTH activity and its timeline, target species, and available resources.

DATA COLLECTION:

Data should be collected through observations and recorded with specific spatial and temporal data including latitude and longitude of observation and time of observation. Details on habitat type should also be recorded. Proper species identification is required, and care should be taken for species that are cryptic in nature. If the indicator is intended to measure abundance over areas important for species movement, care should be taken to observe frequency of movement as well.

There are many ways to calculate indices to compare relative abundance of species over different areas. Projects should choose which index they intend to use and keep consistent over the project MEL plan. The following three approaches are suggested:

1) Shannon-Wiener Index (H') - this is one of the most commonly used indexes for ecological studies of diversity. H' is calculated as:

[157] Millennium Ecosystem Assessment. (2005). Millennium assessment. Color Maps and Figures. Retrieved from http://www.millenniumassessment.org/documents/document.767.aspx.pdf

INDICATOR TITLE: Change in abundance of target species(s) across target area over a set time interval

$$H' = -\sum\left[\left(\frac{n_i}{N}\right)\times\ln\left(\frac{n_i}{N}\right)\right]$$

Where n_i = number of individuals or amount (e.g., biomass) of each species (the ith species) and N = total number of individuals (or amount) for the site, and ln = the natural log of the number.

Advantages of using H' is that is relatively easy to calculate on a site-by-site basis and can be fairly sensitive to actual site differences. However, H' can also be similar between sites even if the sites are very different in terms of community composition (see below for species abundance distributions).

2) Simpson's Index (λ) - λ is a measure of dominance and gives the probability that any two individuals drawn at random from an infinitely large community belong to different species. 1- λ can be used to measure species diversity. λ can be calculated as:

$$\lambda = \sum \frac{n_i(n_i - 1)}{N(N-1)}$$

Where n_i = number of individuals or amount of each species (i.e., the number of individuals of the ith species) and N = total number of individuals for the site. For this index, 0 indicates high species diversity and 1 indicates low species diversity.

Simpson's Index is less sensitive to species richness and can be weighted towards the most abundant species. It is less sensitive to site level differences.

3) Species abundance distributions - Comparing species abundance across different communities (e.g., between project sites and non-project sites, and/or over time) can be difficult because communities are often comprised of different species whose abundance characteristics will differ widely. To deal with this complexity, species abundance curves can be used. A species abundance curve plots the number of species against observed abundance to determine patterns across communities. Species abundance curves usually indicate some kind of "skew" whether that is towards many species observed in lower abundance or a few species observed with higher abundance. Determining what is "more" or "less" abundant will depend on the area in question and assumptions being made about how that community is assembled and functions. To account for these skews, different types of mathematical models can be used to transform the data depending on

INDICATOR TITLE: Change in abundance of target species(s) across target area over a set time interval

assumptions about how that community functions (for more information, see McGill et al. 2007).[158]

Each HEARTH activity must choose an appropriate date for the baseline data, based on an assessment of its theory of change. Analyses can include data from a period before the start of the HEARTH activity. The baseline year choice and the rationale for that choice must be included in each activity's MEL plan.

LIMITATIONS:

Sampling for species abundance requires more intensive sampling and replicates to ensure completeness of the species inventory. Like presence/absence data, abundance counts can be confounded by "false zeros" which indicate non-detection events for species that may be present but not observed. Chance of detection will depend on the sampling scheme and biology and ecology of the target species. As such, measuring species abundance should employ replicate surveys at sampling locations and/or using multiple observers to account for this type of ascertainment bias. In addition, sampling probability models can be used to guide design of sampling intervals.

Species abundance will also be influenced by a species distribution (known as the 'positive distribution-abundance relationship') where widespread species tend also to occur at high abundances through their range and more range-restricted species will be rarer and potentially harder to detect. To account for this distribution-abundance influence, analyses of species abundance should aim to disaggregate data based on species type (e.g., habitat generalists vs. specialists, dispersal-limited vs. highly dispersive).

To understand whether habitats are improved for species, projects can track the abundance of a target species that would be expected to utilize the area for specific purposes (e.g., mating, breeding, nursery, or hunting) and behaviors that are observed. However, to do that, abundance data should also be complemented by behavioral data and potentially age/size data.

Poor metadata collection (e.g., spatial, temporal, habitat data) can also limit the utility of presence/absence data.

UNIT:	DISAGGREGATE BY:

[158] McGill, B. J., Etienne, R. S., Gray, J. S., Alonso, D., Anderson, M. J., Benecha, H. K., Dornelas, M., Enquist, B. J., Green, J. L., He, F., Hurlbert, A. H., Magurran, A. E., Marquet, P. A., Maurer, B. A., Ostling, A., Soykan, C. U., Ugland, K. I., and White, E. P. (2007). Species abundance distributions: Moving beyond single prediction theories to integration within an ecological framework. Ecology Letters, 10(10), 995–1015. https://doi.org/10.1111/j.1461-0248.2007.01094.x

INDICATOR TITLE: Change in abundance of target species(s) across target area over a set time interval	
Number of individuals of a species detected per unit area per unit of time	Target species: Number of observations indicating abundance of different target species or functional groups should be recorded separately (if multiple target species are under observation). Temporal units: Each HEARTH activity should determine the appropriate temporal sampling intervals for this indicator. Temporal sampling should be based on feasibility and ecological relevance for the target species. Spatial units: Each HEARTH activity should determine the appropriate level of geographic aggregation for this indicator. Additional disaggregation may be appropriate in specific cases, for example, by locality, ecosystem type, or if different approaches were implemented at different sites. The level of spatial aggregation for these data must be clearly noted in the activity's MEL plan.
FREQUENCY: TBD – based on relevant sampling intervals for target species and landscape	DATA SOURCE: Implementing partners will collect abundance data through observations. These can be done using a variety of approaches from visual transects to physical and camera trapping.
REPORTING NOTES	
Each HEARTH activity should assess whether a target is appropriate for this indicator.	

INDICATOR TITLE: Change in total area of one or more classes of vegetation, e.g., forest class, across the defined spatial unit(s)

DEFINITION:

This indicator should use global data on forest extent and loss from the University of Maryland Global Land Analysis and Discovery (GLAD) laboratory's Global Forest Change dataset,[159] as additionally provided by the World Resources Institute's Global Forest Watch (GFW) program.[160]

Forest loss data can be downloaded directly from the University of Maryland GLAD website[161] using the "Download data" link for analysis and display in a geographic information system (GIS). Alternatively, the GFW web interface allows users to specify specific areas of interest (e.g., HEARTH sites) and calculate the area of forest cover loss at different times without use of a GIS. For example, if a farm is a beneficiary in a HEARTH activity, the boundaries of that farm can be uploaded to GFW to calculate how many hectares of forests were lost each year (since 2001). Data on forest extent and loss can then be downloaded from GFW as a spreadsheet.

Notably, users need to be aware that GFW only reports on forest loss, which can be the result of a variety of factors, including deforestation but also natural processes such as fire, disease, and storm damage. Therefore, users should not equate forest loss data as reported by the GLAD Forest Change dataset to deforestation unless these data have been ground-truthed. Over a HEARTH's landscape, and in the absence of additional information (e.g., a forest fire affecting HEARTH intervention sites but not the comparison sites), it may be assumed that natural factors driving forest loss are uniformly distributed. Therefore, the working hypothesis about the effectiveness of the HEARTH approach in conserving forests is that trends in forest cover loss within HEARTH sites will differ from those seen outside them.

In addition, both GLAD and GFW provide data on global forest extent in the year 2000 as a baseline for the forest loss datasets, also available from the above web sites. These datasets define forest as vegetation taller than 5m in height, and these data are provided as a percentage of forest cover the range 0–100.

When calculating forest extent and loss, GFW allows users to define a threshold percentage tree cover that marks a geographical unit as forest or non-forest. That is, each pixel in a map will be classified as forest only if it contains tree cover for at least that specified threshold percentage. HEARTHs are recommended to use a default threshold of 30%, which is the default in the GFW

[159] Hansen, M. C., Potapov, P. T., Moore, R., Hancher, M., and Turubanova, S. A. (n.d.). Global Forest Change. Google Crisis Map. Retrieved from http://earthenginepartners.appspot.com/google.com/science-2013-global-forest.

[160] Vizzuality. (n.d.). Forest Monitoring, land use and deforestation trends. Global Forest Watch. Retrieved from https://www.globalforestwatch.org./.

[161] Hansen, M. C., Potapov, P. T., Moore, R., Hancher, M., and Turubanova, S. A. (n.d.). Global Forest Change. Google Crisis Map. Retrieved from http://earthenginepartners.appspot.com/google.com/science-2013-global-forest.

INDICATOR TITLE: Change in total area of one or more classes of vegetation, e.g., forest class, across the defined spatial unit(s)

website. That is, unless the user specifies a different percentage under the "Displaying Tree cover loss with X % canopy density" entry in GFW, the results will be based on a default 30% threshold.

Each HEARTH should consider whether the specific attributes of the intervention or the ecosystem(s) included in its area of influence warrant using a different threshold percentage. If this is the case, the new threshold and the rationale behind the different value should be clearly reported in the activity's MEL plan.

Forest loss data can be converted to a percentage lost by year as follows. To calculate the percentage forest loss in Year$_n$:

$$\%\ loss\ in\ Year_n = \frac{\left(Forest\ extent\ in\ Year_{n-1} - Forest\ extent\ in\ Year_n\right) x\ 100}{Forest\ extent\ in\ Year_{n-1}}$$

Yearly forest loss percentages cannot be added but can be averaged throughout a specific period.

DATA COLLECTION:

All raw data for this indicator come from the Global Forest Watch forest loss database or the University of Maryland's Global Forest Change Data.

GFW includes step by step instructions for accessing its data.[162]

The University of Maryland's Global Forest Change[163] provides instructions for downloading the data as well as descriptions of each layer. If using these data, tree cover for the year 2000 is available in the *treecover2000* layer. The *lossyear* layer includes the cells that changed from a forest to non-forest state in a specific year. Producing layers showing forest and non-forest areas per year requires basic map algebra using raster layers of the HEARTH activity sites.

Each HEARTH activity must choose an appropriate date for the baseline forest cover data, based on an assessment of its theory of change. Analyses can include data from a period before the start of the HEARTH activity. It is likely that global databases will remain producing forest loss data for

[162] Tree cover loss. Global Forest Watch Open Data Portal. (n.d.). Retrieved from https://data.globalforestwatch.org/documents/tree-cover-loss/explore.

[163] Hansen, M. C., Potapov, P. T., Moore, R., Hancher, M., and Turubanova, S. A. (n.d.). Global Forest Change. Google Crisis Map. Retrieved from http://earthenginepartners.appspot.com/google.com/science-2013-global-forest.

INDICATOR TITLE: Change in total area of one or more classes of vegetation, e.g., forest class, across the defined spatial unit(s)

many more years, and therefore the impacts of HEARTH investments could potentially be analyzed for a period following the end of the activity.

The baseline year choice and the rationale for that choice must be included in each activity's MEL plan.

LIMITATIONS:

As explained above, forest cover loss data includes both natural and anthropogenic influences, meaning that raw forest loss data by themselves should not be interpreted as measuring deforestation.

Forest cover data by themselves are a poor proxy for biodiversity. There are documented instances of "empty forests" where forest canopy remains, but the ecosystem is species poor, for example as a result of overhunting. Therefore, in the absence of additional information (e.g., biological surveys), forest cover extent or loss data alone should not be used to make inferences about the status of biodiversity or ecosystem function.

Data limitations for this indicator also include those associated with the input spatial data. The use of global databases generally trades off some accuracy and/or sensitivity for coverage. Individual HEARTHs may consider ground-truthing forest cover loss data for a sample of their sites to assess the accuracy of the GLAD GFW data for their specific landscapes. Raw data from GLAD GFW should be included in the MEL plan of each activity using this indicator. Any modifications to the data should be described in detail in the activity's MEL plan. Data limitations of the forest loss data from GLAD and GFW.[164]

Besides other factors mentioned elsewhere in this sheet, data limitations for this indicator also include those associated with the source data on forest loss. GFW warns that "the overall prevalence of false positives (commission errors) in these data at 13%, and the prevalence of false negatives (omission errors) at 12%, though the accuracy varies by biome and thus may be higher or lower in any particular location. The model often misses disturbances in smallholder landscapes, resulting in lower accuracy of the data in sub-Saharan Africa, where this type of disturbance is more common. The authors are 75 percent confident that the loss occurred within the stated year, and 97 percent confident that it occurred within a year before or after. Users of the data can smooth out such uncertainty by examining the average over multiple years."

[164] Vizzuality. (n.d.). Interactive World Forest Map and Tree Cover Change Data: GFW. Global Forest Watch. Retrieved from https://www.globalforestwatch.org/map/?modalMeta=tree_cover_loss.

INDICATOR TITLE: Change in total area of one or more classes of vegetation, e.g., forest class, across the defined spatial unit(s)	
Additional information about the potential limitations of these data can be found in the Usage Notes section in the University of Maryland's Global Forest Change Data Download website.[165]	
UNIT: Forest extent in the global datasets is defined for 30 by 30-meter units and is measured as a percentage of those units that show forest cover. For the GFW web interface, forest area is provided in hectares. The minimum value is zero (indicating that there are no pixels that include canopy cover at the specified percentage threshold). The maximum value is the total area of analysis (e.g., the total area of a specific farm or protected area), indicating that the totality of that specific spatial unit is covered by forests. Forest loss areas are cumulative through time. For example, results from 2011 through 2020 can be added to report a total forest cover loss figure for that period.	DISAGGREGATE BY: Each HEARTH activity should determine the appropriate level of geographic aggregation for this indicator. If using the GFW web interface, it will be time consuming to upload individual sites (e.g., farm boundaries). Aggregation may be appropriate and should be defined in each activity's MEL plan. For example, sites may be aggregated by locality, ecosystem type, or if different approaches were implemented at different sites. The level of spatial aggregation for these data must be clearly noted in the activity's MEL plan.
FREQUENCY: Annual	DATA SOURCE: Forest loss data can be obtained from Global Forest Watch[166] or the University of Maryland's Global Forest Change dataset.[167]
REPORTING NOTES	

[165] Global Forest Change 2000–2020data download. Global Forest Change. (n.d.). Retrieved from https://storage.googleapis.com/earthenginepartners-hansen/GFC-2020-v1.8/download.html.

[166] Vizzuality. (n.d.). Forest Monitoring, land use and deforestation trends. Global Forest Watch. Retrieved from https://www.globalforestwatch.org/.

[167] Tree cover loss. Global Forest Watch Open Data Portal. (n.d.). Retrieved from https://data.globalforestwatch.org/documents/tree-cover-loss/explore.

INDICATOR TITLE: Change in total area of one or more classes of vegetation, e.g., forest class, across the defined spatial unit(s)
HEARTH activities should report areas as decimals with two decimal places.
RATIONALE FOR TARGETS
Each HEARTH activity should assess whether a target is appropriate for this indicator. It may be difficult to set a quantifiable target for this indicator given the multiplicity of factors that modulate forest cover loss and the fact that forest cover loss can result from natural processes. Instead, activities may choose to determine forest loss trends within and outside the HEARTH areas of influence. That is, the theory of change for an activity may indicate that overall forest loss should decelerate within HEARTH sites when compared to similar sites outside the activity's area of influence. In this case, there should not be a target for forest cover loss, but the expectation is to measure divergent trends in the two groups of sites.

INDICATOR TITLE: Change in Land Capability Classification (LCC)

DEFINITIONS:

The Land Capability Classification (LCC) is a land evaluation ranking that groups soils based on their potential for agriculture and other uses. LCC is used to help determine if land is suitable for certain uses as well as assess risks for degradation.[168] LCC classifies land on a scale of 1-8 to determine the best use for land, with additional sub-class codes that indicate which soil indicators are limiting factors. LandPKS uses the following definitions for determining LCC:

Class:

1. Slight limitations that restrict use
2. Moderate limitations that reduce the choice of plants or use conservations practices
3. Severe limitations that reduce the choice of plants, required conservations practices, or both
4. Very severe limitations that reduce the choice of plant or require very careful management, or both
5. Little or no hazard of erosion but have other limitations that are impractical to remove; limit use mainly to pasture, rangeland, forestland, or wildlife habitat
6. Severe limitations, unsuited for cultivation; limit use mainly to pasture, rangeland, forestland, or wildlife habitat
7. Very severe limitations, unsuited for cultivation; limit use to mainly rangeland, forestland, or wildlife habitat
8. Limitations that preclude use for commercial plant production; limit use to mainly recreation, wildlife habitat, water supply, infrastructure, or esthetic purposes

Sub-class:

- e: Erosion risk: limitations created from soil movement by wind or water
- s-a: Soil water storage capacity: limitations caused by availability of water for plants
- s-d: Soil depth: limitations caused by plant rooting depth
- s-k: Salinity: Limitations caused by risk from salinity
- s-l: Lime requirement: limitations caused by soil pH
- s-r: Surface stoniness: limitations caused by soil covered with stones and boulder
- s-t: Surface soil texture: limitations caused by soil texture near the surface (impacts to soil cultivation and seedling establishment).
- w-d: Water table depth: Limitations created by occurrence of shallow water table
- w-f: Flooding during the growing season: Limitations created by surface accumulation of water (overflow from rivers or streams, run-on from upslope areas, or topographic depressions)

[168] LandPKS Knowledge Hub. What is Land Capability Classifcation? Retrieved from https://landpotential.org/knowledge/what-is-land-capability-classification/

INDICATOR TITLE: Change in Land Capability Classification (LCC)

DATA COLLECTION:

LCC data is collected in the LandPKS platform. Data collectors should complete the LandInfo,[169] Vegetation and LandCover,[170] and SoilHealth[171] modules in LandPKS, each with training videos available. After the soil texture, slope, and soil limitations sections are entered, the LCC can be found on the report screen. A user guide for project and impact evaluators is also available online with more details.[172]

Generally, entering more data will improve the accuracy of classification. LandPKS also allows users to adjust their LCC based on criteria that are or are not important for their use. For example, if the soil is limited by flooding during the growing season, but farmers are planning on growing rice, the flooding (w-f) indicator can be turned off, and the classification will be recalibrated without this subclass. This function can also be used to run scenarios about the potential of the soil if the user were to mitigate against particular soil risk factors.[173]

LIMITATIONS:

Unlike other LCC systems, LandPKS does not consider climate in its LCC classes due to the variability in climate requirements between different crops and cultivars. Note that this indicator is most useful for HEARTHs that include an objective related to sustainable agriculture and improvement of land for agriculture.

UNIT:	DISAGGREGATE BY:
LCC class 1 through 8, and sub-class	Farm size

[169] Kerchof, C. (2021, January 27). Training videos: LandInfo. LandPKS. Retrieved n.d., from https://landpotential.org/knowledge/landinfo-training/.

[170] Kerchof, C. (2021, April 27). Training videos: Vegetation. LandPKS. Retrieved from https://landpotential.org/knowledge/vegetation-landcover-video-training/.

[171] Kerchof, C. (2021, April 27). Training videos: Soil Health. LandPKS. Retrieved from https://landpotential.org/knowledge/intro-to-the-landpks-soilhealth-module/.

[172] Barnese, D. (2020, December 8). User guide for project and impact evaluators. LandPKS. Retrieved from https://landpotential.org/knowledge/project-and-impact-evaluators-user-guide/.

[173] LandPKS Knowledge Hub. What is Land Capability Classifcation? Retrieved from https://landpotential.org/knowledge/what-is-land-capability-classification/

INDICATOR TITLE: Change in Land Capability Classification (LCC)	
FREQUENCY: TBD – based on relevant sampling intervals	DATA SOURCE: HEARTH activities or farm managers will collect LCC data through LandPKS.
REPORTING NOTES	
Each HEARTH activity should assess whether a target is appropriate for this indicator.	

INDICATOR TITLE: Turbidity of natural aquatic environments (surface, freshwater sources) near agricultural activity sites

DEFINITION:

"Natural aquatic environments" refers to surface freshwater sources such as lakes, rivers, and streams whose turbidity and/or pH could be affected by soil erosion from agricultural activity sites.

"Turbidity" is a measure of the clarity of a liquid, i.e., how easily light transmits through the liquid. More turbid water is less clear; less turbid water is clearer.

"Near agricultural activity sites" will depend on the local context. Soil is most likely to be transported from agricultural sites via wind or water runoff to natural aquatic environments.

DATA COLLECTION:

To assess whether natural aquatic environments might be polluted with soil erosion, one simple, inexpensive, and readily available tool is the turbidity tube (also known as a transparency tube).[174, 175]

Practitioners can fill a turbidity tube with water samples and make direct observations of water clarity.

LIMITATIONS:

Regarding the validity of turbidity as a soil erosion indicator, it is important to note that events other than soil erosion might also cause water to become turbid, e.g., heavy stream flow or eutrophication. Practitioners should use sampling procedures that help identify potential links between soil erosion and observed changes in turbidity. For example, practitioners can collect samples from a stream near a farm both upstream and downstream of the farm to help isolate the source of particulates in the water; practitioners can monitor weather conditions during the water sampling periods and note whether either or both of the two main causes of agricultural soil erosion–wind and precipitation at the farm site(s)–might be correlated with turbidity measurements.

UNIT:	DISAGGREGATE BY:
	Each water sample collected should have a unique sample ID number. Samples tested for turbidity and/or pH should be

[174] Transparency/turbidity tubes. Performance Results Plus, Inc. (n.d.). Retrieved from https://prph2o.com/transparency-turbidity-tubes/.

[175] Avanator. (n.d.). Turbidity tube. VWR. Retrieved from https://us.vwr.com/store/product/8891171/turbidity-tube.

INDICATOR TITLE: Turbidity of natural aquatic environments (surface, freshwater sources) near agricultural activity sites	
Number of centimeters of water in the tube	disaggregated by sample ID, the date the samples were collected and tested, and the locations where the samples were collected.
FREQUENCY: TBD per USAID guidance.	DATA SOURCE: Implementing partners collect natural water samples and test for turbidity.
REPORTING NOTES	
Sample ID numbers, collection and test dates, sampling locations, results, and other relevant information can be stored in a spreadsheet.	
RATIONALE FOR TARGETS	
Some countries regulate turbidity in drinking water as a contaminant; in general, it is recommended to filter and disinfect surface freshwater sources prior to drinking. For example, the United States Environmental Protection Agency (US EPA) National Primary Drinking Water Regulations require filtration and disinfection of all public water systems that use surface freshwater sources.[176] Targets for turbidity will vary with local environmental conditions and public health regulations. For environmental protection, practitioners working on agricultural activities should strive at least to maintain baseline conditions and not contribute to soil erosion that increases turbidity. If soil erosion from agricultural activities affects public drinking water sources, practitioners should promote filtration and disinfection and comply with local regulations.	

[176] Environmental Protection Agency. (n.d.). National Primary Drinking Water Regulations. EPA. Retrieved from https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#three.

INDICATOR TITLE: pH of natural aquatic environments (surface, freshwater sources) near agricultural activity sites

DEFINITION:

"Natural aquatic environments" refers to surface freshwater sources such as lakes, rivers, and streams whose turbidity and/or pH could be affected by soil erosion from agricultural activity sites.

"pH" is a measure of how acidic or basic water is. pH is measured on a scale from 0 to 14, with 7 being neutral. Acidic water has a pH less than 7; basic water has a pH greater than 7.

"Near agricultural activity sites" will depend on the local context. Soil is most likely to be transported from agricultural sites via wind or water runoff to natural aquatic environments.

DATA COLLECTION:

Testing the pH of water samples is simple and inexpensive; pH test strips and pH meters are widely used and readily available. Test strips are recommended because they do not require calibration. They often are sold in kits with other strips that indicate other water quality parameters.[177]

A pH meter may be more accurate than a pH test strip.[178]

But many pH meters require calibration with solution standards; without proper calibration, the meters' readings are questionable.

UNIT:	DISAGGREGATE BY:
Scale from 0 to 14	Each water sample collected should have a unique sample ID number. Samples tested for turbidity and/or pH should be disaggregated by sample ID, the date the samples were collected and tested, and the locations where the samples were collected.
FREQUENCY:	DATA SOURCE:
TBD per USAID guidance.	Implementing partners collect natural water samples and test for pH.

[177] Varify. (n.d.). Complete drinking water test kit. Complete Drinking Water Test Kit. Retrieved from https://varifytest.com/collections/drinking-water-tests/products/complete-drinking-water-test-kit.

[178] Sharma, T., and Singh, A. P. (2013). Laboratory practices: Useful to the new research scholars, technicians, lab caretaker of school/college/institutional laboratories. PH Testers. Retrieved from https://www.amazon.com/Lab-pH-Meters/b?ie=UTF8&node=39327101.

INDICATOR TITLE: pH of natural aquatic environments (surface, freshwater sources) near agricultural activity sites
REPORTING NOTES
Sample ID numbers, collection and test dates, sampling locations, results, and other relevant information can be stored in a spreadsheet.
RATIONALE FOR TARGETS
Targets for the pH of a natural aquatic system will vary with local environmental conditions. The US EPA does not regulate the pH of water, but the agency recommends that public drinking water supplies should have a pH between 6.5 and 8.5. [179] More acidic water may be more likely to be contaminated with pollutants, and more basic water may damage appliances and water pipes. Practitioners working on agricultural activities should strive at least to maintain baseline conditions and not contribute to soil erosion that alters the pH of nearby natural waters.

[179] Environmental Protection Agency. (n.d.). National Primary Drinking Water Regulations. EPA. Retrieved from https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#three.

INDICATOR TITLE: Presence / absence of *E. coli* bacteria in natural waters (surface, freshwater sources) near agricultural activity sites

DEFINITION:

"Natural waters" refers to surface freshwater sources such as lakes, rivers, and streams that could be contaminated by pathogenic microorganisms traveling from agricultural activity sites.

"*Escherichia coli (E. coli)*" is a type of coliform bacteria.

"Near agricultural activity sites" will depend on the local context. Microorganisms are most likely to travel from agricultural sites to natural waters by being carried on the wind or in water runoff.

DATA COLLECTION:

To assess whether natural waters might be polluted with pathogenic microorganisms, practitioners should test for *E. coli*, a reliable indicator of recent fecal contamination. There are simple, "off-the-shelf" *E. coli* test kits available that come with instructions for conducting the tests in a home or office setting (these tests will require incubation for several hours at a constant warm temperature and a fluorescent light to detect results), e.g.

- LaMotte total coliform and E. coli bacteria test kit[180]
- Simplex Health coliform bacteria water test with E. coli detection[181]

LIMITATIONS:

Presence/absence tests for *E. coli* only determine whether water is contaminated; they do not measure the amount of bacteria in contaminated samples. If implementing partners wish to quantify the amount of *E. coli* in natural waters, the best option probably will be to consult with professional water quality analysts, e.g., at a university or commercial lab.

UNIT:	DISAGGREGATE BY:
Number of test results with presence/absence of E. coli	Each water sample collected should have a unique sample ID number. Samples should be disaggregated by sample ID, the date the samples were collected and tested, and the locations where the samples were collected. Other important disaggregates are:

[180] Forestry-Suppliers.com. (n.d.). LaMotte® total coliform and E. Coli bacteria test kit. Forestry Suppliers, Inc. https://www.forestry-suppliers.com/product_pages/products.php?mi=33252and;itemnum=77411and;redir=Y.

[181] Coliform bacteria water test with e. coli detection (1 test). SimplexHealth. (2021, October 8). https://www.simplexhealth.co.uk/product/simplexhealth-water-bacteria-test-with-e-coli-detection/.

INDICATOR TITLE: Presence / absence of *E. coli* bacteria in natural waters (surface, freshwater sources) near agricultural activity sites	
	Sample, positive control, negative control: If positive and/or negative control samples are used, results for the natural water samples should be disaggregated from results for the controls
FREQUENCY: TBD per USAID guidance.	DATA SOURCE: Implementing partners collect natural water samples and test for presence/absence of *E. coli*.
REPORTING NOTES	
Sample ID numbers, collection and test dates, sampling locations, results, and other relevant information can be stored in a spreadsheet.	
RATIONALE FOR TARGETS	
Both the US EPA[182] and the WHO[183] recommend that drinking water should not contain any *E. coli*. It is considered unsafe to drink water that is contaminated with *E. coli*.	

[182] Environmental Protection Agency. (n.d.). Revised Total Coliform Rule and Total Coliform Rule. Retrieved from https://www.epa.gov/dwreginfo/revised-total-coliform-rule-and-total-coliform-rule.

[183] Guidelines for drinking-water quality, second edition, addendum to volume 1: Recommendations. (1999). Chemistry International -- Newsmagazine for IUPAC, 21(2). https://doi.org/10.1515/ci.1999.21.2.49a.

INDICATOR TITLE: Change in concentration of nitrites and nitrates in natural aquatic environments (surface, freshwater sources) near agricultural activity sites

DEFINITIONS:

Nitrite and nitrate are constituents and/or byproducts of inorganic commercial fertilizers and animal waste used as fertilizer, and they are commonly found in natural aquatic environments near agricultural activity sites.

- Nitrite (chemical formula NO2-) is a negatively charged molecule consisting of one nitrogen atom and two oxygen atoms.
- Nitrate (chemical formula NO3-) is a negatively charged molecule consisting of one nitrogen atom and three oxygen atoms.

"Natural aquatic environments" refers to surface freshwater sources such as lakes, rivers, and streams whose concentrations of nitrite and nitrate could be affected by fertilizer runoff from agricultural activity sites.

"Near agricultural activity sites" will depend on the local context. Fertilizer that contains or is chemically converted into nitrites and nitrates will most likely be transported from agricultural sites via water runoff to natural aquatic environments.

DATA COLLECTION:

There are many simple, inexpensive, and readily available commercial kits that include test strips of indicator paper for measuring levels of nitrite and nitrate. They often are sold with other strips that indicate other water quality parameters.[184,185]

UNIT:	DISAGGREGATE BY:
Parts per million (ppm)	Each water sample collected should have a unique sample ID number. Samples tested for nitrite and nitrate should be disaggregated by sample ID, the date the samples were collected and tested, and the locations where the samples were collected.
FREQUENCY:	DATA SOURCE:
TBD per USAID guidance.	

[184] Complete drinking water test kit. Varify. (n.d.). Retrieved from https://varifytest.com/collections/drinking-water-tests/products/complete-drinking-water-test-kit.

[185] 16 in 1 drinking water test kit strips, 100 CNT. Home Water Quality Test for Water. Med Lab Diagnostics. (n.d.). Retrieved from https://www.medlabdiagnosticssupplies.com/products/16-in-1-drinking-water-test-kit-strips-200-cnt-home-water-quality-test-for-water.

INDICATOR TITLE: Change in concentration of nitrites and nitrates in natural aquatic environments (surface, freshwater sources) near agricultural activity sites	
	Implementing partners collect water samples and test for nitrite and nitrate.
REPORTING NOTES	
Sample ID numbers, collection and test dates, sampling locations, results, and other relevant information can be stored in a spreadsheet.	
RATIONALE FOR TARGETS	
The amount of nitrite and nitrate in natural aquatic systems will vary with local environmental conditions. Practitioners working on agricultural activities should strive at least to maintain baseline conditions and not contribute to fertilizer runoff that increases concentrations of nitrite and nitrate. If fertilizer runoff from agricultural activities affects public drinking water sources, practitioners should aim to not exceed local health regulations or WHO guidelines for nitrite (3 mg/L) and nitrate (50 mg/L). [186]	

[186] Nitrate and nitrite in drinking-water. (n.d.). Retrieved from https://www.who.int/water_sanitation_health/dwq/chemicals/nitrate-nitrite-background-jan17.pdf.

INDICATOR TITLE: Greenhouse gas (GhG) emissions, estimated in metric tons of CO2 equivalent, reduced, sequestered, or avoided through sustainable landscapes activities supported by USG assistance[187]

DEFINITION:

Sustainable landscapes programming slows, halts, or reverses greenhouse gas emissions from land use, including forests and agricultural ecosystems.

This indicator reports the estimated quantity of GhG emissions, in metric tons of CO2-equivalent, reduced, sequestered, or avoided supported in full or in part by USG assistance, as compared to a baseline level of GhG emissions. The baseline is the "business-as-usual" reference for GhG emissions that would have occurred during the reporting period if there had been no USG intervention.

This indicator applies to estimated emissions reduced, sequestered, or avoided, for the specified reporting period. This can include both emissions reductions from activities implemented during the reporting period as well as activities which were implemented during a previous reporting period but are still achieving ongoing reductions in GhG emissions. Implementers are encouraged to include these continuing results by estimating tons of CO2e avoided during the current reporting period. Regarding land use-related emissions reductions or increased sequestration, if a USG supported project continues to conserve the same hectares of land as in a previous reporting period, those hectares should be included in the calculations for the current reporting period to determine the emissions reductions of the project.

DATA COLLECTION:

This indicator is a calculated estimate, and often not the result of direct emissions measurements. This indicator applies to estimated GhG emissions reductions from carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O) and other global warming pollutants. Relevant sectors for projects that may report on this indicator include, but are not limited to, climate change, natural resource management, agriculture, biodiversity, energy, industry, urban, and transport.

The 100-year Global Warming Potential of gases from the Intergovernmental Panel on Climate Change 4th Assessment Report or later should be used for calculations.

Land-Use Programs (including Sustainable Landscapes):

USAID has developed the AFOLU Carbon Calculator using standard methodologies and some default data. All Sustainable Landscapes programs (focused or indirect) must reference and adhere

[187] USAID. (2020). 2020 GCC Standard Indicator Handbook: Definition Sheets. Climate Links. Retrieved from https://www.climatelinks.org/sites/default/files/asset/document/2020_USAID_GCC-Indicator-Handbook-August-2020-Update.pdf.

INDICATOR TITLE: Greenhouse gas (GhG) emissions, estimated in metric tons of CO2 equivalent, reduced, sequestered, or avoided through sustainable landscapes activities supported by USG assistance[187]	
to the methods and tools in the USAID AFOLU Carbon Calculator (http:/www.afolucarbon.org) if applicable, unless a more rigorous calculation is available.	
UNIT: Metric tons of CO_2 equivalent (tCO_2e)	DISAGGREGATE BY: N/A
FREQUENCY: Annually. However, reporting by implementing partners may be required on a more frequent basis.	DATA SOURCE: Data will be collected and reported by implementing partners with knowledge of their specific activities and programs.
REPORTING NOTES	
All USAID Operating Units should document tools, methods, and data sources used for this indicator in the PPR Sustainable Landscapes Key Issue Narrative.	

INDICATOR TITLE: Number of hectares under improved management expected to reduce greenhouse gas emissions as a result of USG assistance[188]

DEFINITION:

Sustainable landscapes programming slows, halts, or reverses greenhouse gas emissions from land use, including forests and agricultural ecosystems.

Emissions of greenhouse gases (GHGs), such as carbon dioxide (CO2) and methane (CH4), can be reduced, avoided, or sequestered as a result of improved management practices, including protection, restoration, and management.

For hectares included under this indicator, the improved management approaches applied must be reasonably expected to result in emission reductions.

'Improved management' includes protection, restoration, and management activities that reduce emissions while promoting enhanced management of natural resources for one or more objectives, such as mitigating climate change, conserving biodiversity, maintaining ecosystem services, strengthening sustainable use of natural resources, and/or promoting community participation. An area is considered to be under improved management practices when, at least partially as a result of USG support, additional areas have been conserved or restored, or additional emissions reductions are expected be achieved due to changes in management planning, implementation of management plans or policies, or application of data to management decisions and enforcement actions.

Improved management should be reported for activities where the USG-supported activity can be plausibly linked to the approaches applied. Implementing partners should clearly articulate the milestones used to gauge success and provide a short narrative describing the milestones reached in the reporting period. The conversion to hectares of some management actions can be challenging but should be based on the theory of change behind how the management action is expected to lead to emissions reductions. Operating Units should document tools, methods, and data sources used for this indicator in the PPR Sustainable Landscapes Narrative.

Hectares reported may include sustained improvements in previously reported hectares and/or new, additional hectares. The same hectares should only be reported once per year per implementing mechanism.

Results for this indicator should be classified under two sets of disaggregates:

1) The type of intervention: Protection, Restoration, or Management; and
2) The intervention land type: Forest or Non-Forest.

[188] USAID. (2020). 2020 GCC Standard Indicator Handbook: Definition Sheets. Climate Links. Retrieved from https://www.climatelinks.org/sites/default/files/asset/document/2020_USAID_GCC-Indicator-Handbook-August-2020-Update.pdf.

INDICATOR TITLE: Number of hectares under improved management expected to reduce greenhouse gas emissions as a result of USG assistance[188]

'Protection' includes improved management activities that prevent the loss of native ecosystems. Examples of protection include: reducing conversion of forests to agricultural lands; preventing or mitigating forest fires; halting or slowing illegal mining or logging; preventing the loss of biodiversity and native ecosystems; and supporting the enforcement of designated protected areas.

'Restoration' includes improved management activities that expand the spatial extent of native cover types, including forest and non-forest ecosystems, to areas from where they had previously been lost or degraded as a result of human activity. Examples of restoration include: planting native trees in degraded forested areas; peatland restoration; and rehabilitating mangroves or watersheds for improved ecosystem services.

'Management' includes improved management activities that avoid or reduce GhG emissions or enhance carbon sinks on working or managed lands through improved management practices. Examples of management include: planting fruit, woodfuel, and/or timber trees for economic development; alternate wetting and drying of rice; improved agroforestry and silvopastoral systems; nutrient management; and improved grazing practices.

'Forest' lands can be defined broadly for the purpose of this indicator. Operating Units may choose to refer to the definition of forests used by the local government (e.g., the country Forest Reference Emission Level) or partner organizations (e.g., FAO). Examples of landscapes included under this disaggregate are: forest in national parks, nature reserves and other protected areas; forest stands on agricultural lands (e.g., windbreaks and shelterbelts of trees); mangrove forests; peat swamp forests; and plantation forests (e.g., timber, pulp, rubber).

'Non-forest' lands include areas with little or no tree cover. Examples of landscapes included under this disaggregate are: rice paddies; pastures with few or no trees; agricultural lands (e.g., oil palm, fruit, coffee, cacao plantations); and agroforestry systems.

DATA COLLECTION:

Implementing Partners should collect geospatial data associated with the hectares under improved management. These data should be collected at the relevant scales of implementation or impact of the activities or sub-activities (e.g., national, provincial, municipal, household, or plot). These datasets should further be tagged and calculated for each applicable disaggregate: protection, restoration, and management.

UNIT:	DISAGGREGATE BY:
Number of hectares	Type of intervention: Protection, Restoration, or Management

INDICATOR TITLE: Number of hectares under improved management expected to reduce greenhouse gas emissions as a result of USG assistance[188]	
	Intervention land type: Forest or Non-Forest
FREQUENCY: Annually. However, reporting by implementing partners may be required on a more frequent basis.	DATA SOURCE: Data will be collected and reported by implementing partners with knowledge of their specific activities and programs. Implementing partners will collect geospatial data or other documentation to estimate the number of hectares under improved management based on the expected impact of the management improvements that have been applied.
REPORTING NOTES	
If an area with expected emission reductions under improved management is also a biologically significant area for biodiversity (indicator EG10.2-2) or shows improved biophysical conditions (indicator EG10.2-1), then the corresponding hectares can be reported under each applicable indicator in the same year.	

Conservation Knowledge, Attitudes & Practices (KAP)

Pathways To Change

For many other HEARTH outcome areas, improved conservation knowledge and attitudes are prerequisites for behavior change. This may occur through strategic approaches which focus on awareness raising or otherwise demonstrating the benefits of conservation and NRM. Improved conservation knowledge/attitudes should result in reduced unsustainable use of resources and other threat reduction. This outcome area is a key link between the people and prosperity outcomes and realizing biophysical impacts.

Recommended Outcomes and Indicators

Outcome	Description	Recommended Indicator & Duration
Improved knowledge and attitudes towards conservation and NRM	To measure the perceived importance of benefits of conservation and ecosystem services, this indicator includes a set of custom questions which ask (1) how important respondents believe it is to protect nature and the environment to receive 14 different types of ecosystem benefits (e.g., provide wild food sources, filter clean water, provide clean air, protect from storm surges, cultural benefits, etc.), and (2) perceptions of the biggest threats to ecosystems in their community. An average score across all 14 ecosystem benefits will then be created for each household and averaged across the sample. A variety of standard approaches to conservation valuation were explored, including willingness to pay for ecosystem services, contingent valuation, and choice experiments, but ultimately these approaches are not recommended given that they would need to be tailored specifically to each HEARTH activity and local context,	**Indicator:** Average score measuring the perceived importance of protecting nature and the environment **Source:** Adapted from the USAID Madagascar CCP Baseline Survey[189] **Duration:** 5-7 minutes

[189] "USAID/Madagascar Conservation and Communities (CCP) Project Baseline Household Survey Final Report." United States Agency for International Development, 2020. https://pdf.usaid.gov/pdf_docs/PA00WK75.pdf.

Outcome	Description	Recommended Indicator & Duration
	and therefore not comparable across the portfolio. Please see Annex 3. Conservation Valuation for more details.	
Reduced unsustainable use of resources	Each HEARTH is recommended to develop a custom list of activities related to ecosystem resources/extraction, which should be threats to the biophysical environment outcomes identified from the results chains and situation models. Then for each threat that the household self-reports engaging in, a set of 6 questions would be asked regarding for what purpose, its level of importance, how frequently they engage in the activity, if their engagement has changed over the past year and why, and their perception of the ecosystem status in the future. Suggestive activities/threats based on a review of HEARTH results chains include the following but should be adapted for each context: collecting timber and non-timber forest products, wildlife hunting, and forest clearing (for agriculture or other purposes). If it is important for the HEARTH activity theory of change, additional questions on who in the household makes decisions on engaging in the activity and who engages most in the activity itself can be added to allow for disaggregations by gender.	**Indicator:** Percent of households who engaged in unsustainable use of ecosystem resources in the past year **Source:** Adapted from custom FTF Cambodia indicator.[190] **Duration:** 5-10 minutes (depending on how many activities the household engages in)
	To measure the extent to which households are engaging in land conversion (i.e., clearing forests, fallow agricultural land, or mangroves), this indicator includes a set of custom questions which ask (1) whether the household cleared any land for cultivation in the past year, (2) how much land was cleared, (3-4) the type and location of land cleared, and (5-6) plans for clearing land in the future. The indicator is constructed based on the percent of households who self-report clearing land to allow for cultivation/livestock, and the additional questions will	**Indicator:** Percent of households that cleared land for cultivation in the past year **Source:** Adapted from the USAID Madagascar CCP Baseline Survey[191] **Duration:** 2-3 minutes

[190] 2019 USAID/Cambodia Food Security and Environment Population Based Survey (final report forthcoming).

[191] "USAID/Madagascar Conservation and Communities (CCP) Project Baseline Household Survey Final Report." United States Agency for International Development, 2020. https://pdf.usaid.gov/pdf_docs/PA00WK75.pdf.

Outcome	Description	Recommended Indicator & Duration
	provide descriptive information on the amount/type of land conversion.	

Performance Indicator Reference Sheets

INDICATOR TITLE: Average score measuring the perceived importance of protecting nature and the environment

DEFINITION:

The core HEARTH questionnaire includes a set of questions that asks respondents how important they believe it is to protect nature and the environment for each of 14 ecosystem services. The 14 ecosystem services are: provide wild food sources such as plants and/or fungi; provide wild meat; provide energy sources such as fuelwood, solar power, etc.; provide clean, safe water; provide clean air; keep soil fertile and productive; protect communities and property from storm impacts; provide raw materials for making and building things; pollinate plants and crops to produce food; reduce or control the spread of many diseases; provide raw materials for most medicines; for cultural benefits; and for the benefit, use, or enjoyment of future generations.

Answer choice options are on a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree. To construct the scale for analysis, answer choice options should be recoded as follows, so that disagreement is counted negatively, agreement is counted positively, and neutral responses do not contribute to the score:

Strongly disagree = -2

Somewhat disagree = -1

Neither agree nor disagree = 0

Somewhat agree = 1

Strongly agree = 2

For each household, an average score should be calculated across all ecosystem services/benefits for which the respondent provided answers for, and then averaged across the sample for reporting.

In addition, follow-up questions are asked regarding (1) whether there are any perceived threats to the ecosystems in their community, and (2) if yes, what the biggest ecosystem threats are to the community. Descriptive analysis of these responses will provide further insights into threats facing the community ecosystems.

ADAPTATION:

The set of ecosystem services/benefits should be adapted for the local context as appropriate. For example, "protect communities and property from storm impacts" may only be appropriate for

INDICATOR TITLE: Average score measuring the perceived importance of protecting nature and the environment	
coastal communities. This may include adding/removing services that are/not relevant, as well as adapting the question text for local conditions. HEARTH activities may also choose to add open-ended questions to further explore the relationship between perceptions and conservation actions. For example, "Under what circumstances might the needs of your household or community come into conflict with protecting natural resources?" could provide insights into why support for protection does not lead to conservation action. In addition, it is possible that the order of ecosystem services/benefits may potentially influence or bias responses. Ideally, HEARTH activities will be able to randomize question order to help mitigate this bias. If this is not possible, it is recommended that teams put more directly salient/important benefits (e.g., those that are the targets of awareness raising campaigns) first, so that these responses are less influenced by order effects. Finally, for the follow-up question on the perceived biggest threats to ecosystems, it is important that HEARTHs adapt the answer choice options for the local context as well. For example, "slash-and-burn agriculture" might not be appropriate in many contexts and may need to be adapted along with appropriate translations into local languages.	
UNIT: Score ranging from -2 to 2	DISAGGREGATE BY: N/A
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary household decision-maker (male or female) from sample households. If this person is not available, another adult from the household may be used for reporting.
REPORTING NOTES	
In addition to reporting the average score, the number of participant households of the conservation knowledge/attitude-sensitive activity must be reported, to allow a weighted average to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs.	

INDICATOR TITLE: Average score measuring the perceived importance of protecting nature and the environment

comparison/control households if an evaluation is being conducted). Finally, activities should also report on the standard deviation.

INDICATOR TITLE: Percent of households who engaged in unsustainable use of ecosystem resources in the past year

DEFINITION:

Each HEARTH is recommended to develop a custom list of activities related to ecosystem resources/extraction, which should be threats to the biophysical environment outcomes identified from the results chains and situation models. Then for each activity/threat identified, questions would be asked about (Q1) whether the household engages in this activity, (Q3) for what purpose, (Q4) its level of importance, (Q5) how frequently they engage in the activity, (Q6) if their engagement has changed over the past year (and Q7, why) and (Q9) their perception of the ecosystem status in the future. Suggestive activities/threats based on a review of HEARTH results chains include the following but should be adapted for each context: collecting timber and non-timber forest products, wildlife hunting, and forest clearing (for agriculture or other purposes). If the household engages in none of these activities/threats, a follow-up question is asked regarding drivers for why not (Q2).

If it is important for the HEARTH activity, additional questions on who in the household makes decisions on engaging in the activity (Q8a) and who engages most in the activity itself (Q8b) can be added to allow for disaggregations by gender.

The indicator is constructed based on the percent of households who self-report engaging in ANY of the custom activities/threats (Q1), and the additional questions will provide descriptive information to help explain changes over time and motivations, as well as guide programming.

This indicator is intended to measure threat reduction from within communities. Additionally, there may be external threats (e.g., poaching, resource extraction, pollution from non-community members), which could be measured directly, particularly if monitoring systems are set up. However, external threats are expected to be HEARTH activity/context specific and would require specific data collection approaches not covered by this indicator. Questions regarding perceptions of ecosystem threats are included in the indicator measuring the perceived importance of protecting nature and the environment and may be adapted to specify internal vs. external threats if of interest to HEARTH activity teams.

The timeframe of one year is used for this indicator, so that information is captured for all seasonal activities, as well as activities that might be engaged in less frequently or less regularly (e.g., activities only engaged in during times of shocks/stress). Using the standard timeframe of one year will facilitate comparison across HEARTH activities, and given the nature of questions (i.e., respondents are not asked about the intensity of their engagement, specific amounts of resources harvested, etc.) concerned with reductions in precision, which would normally be impacted for longer recall periods, are mitigated.

For illicit activities (e.g., illegal poaching or land clearing) it should be recognized that respondents may under report behavior. Overall, whether accurate/reliable data on illegal behaviors can be collected will depend on how taboo the behavior is, and so it is important for the local context to

INDICATOR TITLE: Percent of households who engaged in unsustainable use of ecosystem resources in the past year	
be considered. For example, poaching may be illegal, but if practiced widespread in a community, respondents will be more likely to report on the behavior accurately. If under-reporting is of concern, there is an extensive literature on a variety of approaches to encourage more truthful self-reporting, including randomized response, list randomization, and asking about peers. These approaches tend to be more complicated to implement and effectiveness has been shown to be context dependent, but additional guidance/support can be provided for HEARTH activities upon request. Additionally, when asking about any illegal activities, it will be important for Missions and IPs to ensure appropriate data protection/security measures to appropriately protect respondents from any potential adverse risks.	
ADAPTATION: As mentioned above, the list of activities related to ecosystem/resource extraction or threats should be tailored to each HEARTH activity, and the list of activities provided in the core HEARTH questionnaire (collecting non-timber forest products, collecting timber products, wildlife hunting, and forest clearing) are meant to be suggestive. Additionally, the purpose for engaging in the activity (Q3) and drivers for not engaging in any activities (Q2) or engaging less in activities (Q7) should be adapted for the local context as well. For example, suggested answer choices for Q2 and Q7 include "over exploitation/limited resources" whereas some activities might choose to define this further by adding separate answer choices for competition for resources vs. other drivers that limit resources (e.g., pesticides reducing bee populations, limiting honey available for collection). Q8a (who makes decisions on engaging) and Q8b (who most engages in) should only be asked for activities where gender disaggregation is important for threat reduction in line with the theory of change, as these questions will increase the time to complete this module. Finally, if hunting or poaching is of particular concern for a given HEARTH, activities may want to add follow-up questions regarding which species of animals households hunt.	
UNIT: Percent	DISAGGREGATE BY: Threat Type: Collecting NTFPs, Collecting Timber Products, Wildlife Hunting, Forest Clearing (list to be adapted) Conservation KAP Score: Positive, Negative Sex of Decision-Maker (if included): Female, Male

INDICATOR TITLE: Percent of households who engaged in unsustainable use of ecosystem resources in the past year	
TYPE: Outcome	DIRECTION OF CHANGE: Lower is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary household decision-maker (male or female) from sample households. If this person is not available, another adult from the household may be used for reporting.
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the conservation knowledge/attitude-sensitive activity must be reported, to allow a weighted average to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

INDICATOR TITLE: Percent of households that cleared land for cultivation in the past year	
DEFINITION: To measure the extent to which households are engaging in land conversion, this indicator includes a set of custom questions which ask (Q1) whether the household cleared any land for cultivation in the past year (yes/no), (Q2) how much land was cleared (in hectares), (Q3-Q4) the type and location of land cleared, and (Q5-Q6) plans for clearing land in the future. The indicator is constructed based on the percent of households who self-report clearing land to allow for cultivation/livestock (Q1), and the additional questions will provide descriptive information on the amount/type of land conversion, as well as motivations to guide programming. Note that the suggested answer choice options for Q6 include to "grow different crop types (diversification)" as well as to "grow more crops to sell" and to "grow more crops to consume", to identify different motivating factors related to increasing agricultural production, important for many HEARTH activity theories of change.	
ADAPTATION: HEARTH activities should adapt the answer choices for Q3 (type of land), Q4 (location of the land), and Q6 (reasons for intending to clear more land in the next year) to local contexts as appropriate, as the answer choices provided in the core HEARTH questionnaire are suggestive.	
UNIT: Percent	DISAGGREGATE BY: Conservation KAP Score: Positive, Negative
TYPE: Outcome	DIRECTION OF CHANGE: Lower is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary household decision-maker (male or female) from households participating in conservation knowledge/attitude-sensitive activities. If this person is not available, another adult from the household may be used for reporting.
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the conservation knowledge/attitude-sensitive activity must be reported, to allow a weighted average to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

Agriculture & Land

Pathways To Change

Agricultural productivity, measured by crop production and yield, may increase through several different pathways, including from greater agricultural investment, use of improved practices (e.g., improved seed varieties), membership/participation in farmer groups, as well as from biophysical improvements in ecosystems and strengthened natural resource management. Specifically, many HEARTH activities will directly promote the use of sustainable/regenerative practices, leading to their increased use and an increase in hectares under improved management practices or technologies. Moreover, livelihoods from agricultural production may also improve through a variety of pathways, including diversification or focus on high value crops, increased use of post-harvest processing, and connections to buyers or other actors in the value chain. Additionally, several HEARTH activity strategic approaches focus on strengthening governance, including land tenure and security, mostly through community planning and mapping activities and securing resource rights.

Recommended Outcomes and Indicators

Outcome	Description	Recommended Indicator & Duration
Increased agricultural productivity	Crop production is defined as the amount of target crops harvested by each household or producer. We recommend limiting questions about crops to no more than three target crops of interest to each HEARTH activity, instead of collecting detailed information about all crops grown by each household. This would quickly add time to the survey, with less value added the more uncommon crop types are. To report on annual production more accurately, we recommend asking questions about each target crop cultivated for each season in the past year (as opposed to asking about the past season only, as is done in Feed the Future). If the target crops are trees or other types of crops with non-seasonal products, this approach may be modified accordingly.	**Indicator:** Average crop production, by targeted crop **Source:** Adapted from FTF indicators EG.3-10, -11, -12 [Instrument Measurement (IM)-level] Yield of targeted agricultural commodities among program participants with U.S. Government (USG) assistance **Duration:** 5 minutes per targeted crop (up to 15 minutes total)

Outcome	Description	Recommended Indicator & Duration
	We recommend identifying a single lead farmer per household to answer all agriculture related questions, instead of identifying lead farmers for each crop type of plot. The latter approach, while potentially increasing accuracy, would add time and complexity to the survey. If agricultural production is a key outcome for a specific activity, HEARTHs can add additional farmer respondents if their budgets for data collection allows for increased accuracy.	
	Crop yield is the amount of target crops grown/harvested per unit area of land. For plot area, we recommend using self-reported data, but an alternative option is to walk the perimeter and enter the land area in hectares. This is more accurate, but more costly, both in terms of requiring additional training/supplies and more time. The additional time required depends on the number of plots and the distance to plots, which is context dependent. Nonetheless, we would expect that walking the plots would roughly double the length of the survey (including time to walk to plot) or require an additional field staff member. The same recommendations as above for season specific information and lead farmer identification apply for crop yield.	**Indicator:** Average crop yield, by targeted crop **Source:** Feed the Future (FTF) indicators EG.3-10, -11, -12 [IM-level] Yield of targeted agricultural commodities among program participants with USG assistance **Duration:** 1 minute for each plot. Note that this time is in addition to the time for crop production above.
	Farmer groups often consist of a number of smallholder farmers in a similar geographic area that work collectively to overcome challenges and increase their productivity/profitability.[192] This indicator measures the percent of households that are active members of farmer groups. We recommend a very brief set of questions about group participation from the larger Abbreviated Women's Empowerment in Agriculture (A-WEAI) module on group participation, focusing on	**Indicator:** Percent of households participating in farmer groups **Source:** Subset of FTF A-WEAI module 6.4B Duration: 2 minutes

[192] IFAD. "Farmer Organizations: Resources and bargaining power for rural producers." https://www.ifad.org/en/farmer-organizations.

Outcome	Description	Recommended Indicator & Duration
	participation in farmer groups as well as water user and forest user groups (as these are of interest for other outcome sectors). Ideally, questions about participation would be asked to both the primary adult male and female decision-maker, to be able to disaggregate by sex.	
Increased use of sustainable/ regenerative practices	This indicator measures the percentage of households who have applied improved management practices and/or technologies promoted by the HEARTH activity. Given that the specific practices or technologies promoted by each HEARTH activity will be different, we recommend that each activity develop a custom list of target practices/technologies. Then for each, questions would be asked about whether the household uses the target practices/technology. Where feasible/relevant, enumerators would be asked to follow-up self-reported data with direct observations to mitigate potential biases (recall, social desirability, etc.). We recommend including in the custom list of target practices/technologies not just practices that the activities hope to increase (e.g., integrated pest management) but also those that they hope to decrease (e.g., use of pesticides). Time to administer this module will depend on the number of target practices, so we recommend limiting it to *no more than five practices*. We recommend asking these questions at the plot/crop level, as we expect practices to be crop specific, although this may add time to the survey.	**Indicator:** Percent of households using HEARTH promoted technologies/practices **Source:** Custom, based on FTF indicator EG.3.2-24 [IM-level] Number of individuals in the agriculture system who have applied improved management practices or technologies with USG assistance **Duration:** 1 minute for each technology/practice
	In addition to knowing whether each of the above technologies or practices were used, it may be important to know the extent to which each is being used on households' agricultural plots.	**Indicator:** Number of hectares under improved management practices or technologies

Outcome	Description	Recommended Indicator & Duration
	After each question regarding the use or adoption of target practices/technologies identified above, we recommend asking if this is used on all of the household's crops/plots. If not, activities can ask what percent of the plot area with the target crop they use the given practice or technology. We can then calculate the hectares accordingly from the plot size.	**Source:** Custom, based on FTF indicator EG.3.2-25 [IM-level] Number of hectares under improved management practices or technologies with USG assistance **Duration:** 1 minute for each technology/practice
Increased land tenure and security	Secure access to land is a critical input for increasing agricultural productivity and food security. Land tenure/rights can improve productivity and conservation by encouraging behavior that fosters long term benefits. This may include higher levels of investment in productive land and improved access to credit.[193] We recommend questions adapted from (1) the Feed the Future questionnaire on agricultural land ownership/use rights, (2) SDG standard questions on agricultural land rights and security, and (3) DHS questions on women's home and land ownership. We recommend asking these questions both to the primary male and primary female decision-maker. We also recommend collecting data at the household rather than plot level and focusing questions on agricultural land. For more detail on considerations and assumptions underlying the recommendations for land-related target respondents, level (household vs. plot), and land type (agricultural vs. non-agricultural vs. combined), please see Annex 4. An option for community land ownership, if relevant given the context of HEARTH activities, is also presented there.	**Indicator:** Percent of households with legally recognized land tenure/rights **Source:** Custom, based on FTF indicator EG.10.4-7 [IM-level] Number of adults with legally recognized and documented tenure rights to land or marine areas; SDG questions on rights/security (Version 5: Questions 3 and 7) **Duration:** 2 minutes each for male/female respondent

[193] MacCartee, Julie, and Katie West. "Feed the Future Indicator Handbook." Agrilinks. Feed the Future, March 23, 2018. https://agrilinks.org/post/feed-future-indicator-handbook.

Outcome	Description	Recommended Indicator & Duration
	Perception of tenure is a widely used means to measure tenure security. Improvements in tenure security perception can also lead to increased investment, agricultural productivity, food security, child nutrition, and access to credit.[194] We recommend questions adapted from the USAID/Madagascar Conservation and Communities Project (CCP) baseline survey.[195] We recommend asking these questions both to the primary male and female decision-maker. We also recommend collecting data at the household rather than plot level and focusing questions on agricultural land.	**Indicator:** Percent of households with perceived tenure security **Source:** FTF indicator EG.10.4-8; USAID/Madagascar CCP Baseline. **Duration:** 2 minutes each for male/female respondent

[194] ibid

[195] USAID Madagascar Conservation and Communities (CCP) Project Baseline Household Survey Final Report (2020).

Performance Indicator Reference Sheets

INDICATOR TITLE: Average crop production, by targeted crop

APPLICABILITY:

This indicator is applicable for HEARTH activities that have explicit agriculture-related objectives and/or outcomes. Use of this indicator is encouraged for activities that seek to increase the amount or value of agricultural crop production, promote improved crop management practices, or engage in other efforts expected to affect agricultural production (such as crop insurance, land tenure, etc.).

DEFINITION:

Crop production is measured by the total amount of a crop harvested by a given household or producer over the previous calendar year.

The preferred unit for crop production is metric tons.

If there is more than one production cycle in the prior calendar year, total production should be counted (and summed) each time the land is cultivated. If the target crops are trees or other types of crops with non-seasonal products, this approach may be modified accordingly.

Each HEARTH should identify a short (we recommend not more than three) list of targeted crops that should be the focus of the production module. Alternatively, if the HEARTH does not focus on a smaller list of crops, the HEARTH may elect to ask each household to report on the three crops most important for their livelihood. Each HEARTH may wish to ask about whether a household cultivated any of a longer list of crops (to be able to monitor diversification) but asking about production for a longer list of crops can become very time consuming, often with little additional value after the first three most important crops.

DATA COLLECTION:

Activities seeking to measure crop production should first identify up to three crops targeted by the HEARTH activity and the local production cycles or seasons for crops in each country.

Data collection should begin by asking the household's lead farmer whether anyone in their household cultivated crops in the last 12-months. Among those that respond 'yes,' lead farmers should be asked about each individual plot that their household uses for agricultural production. For each plot, respondents should indicate which of the targeted crops were grown on that plot and during which local season each crop was grown. For each crop grown on a given plot, respondents should report the total amount of that crop harvested in each season. To reduce the

INDICATOR TITLE: Average crop production, by targeted crop

recall burden on respondents, multiple units of measurement may be provided (such as ounces, kilograms, and tons).

During the analysis stage, the reported amount of each harvested crop should be converted into the preferred unit (metric tons) and summed across each plot and season. This will result in the total amount of each targeted crop harvested in the last year by a given household, which should then be averaged across households.

Data should be collected annually at the same time of year. When possible, data for this indicator should be collected in the postharvest/sale period when data for other indicators, such as crop yields, are collected.

In addition to the standard crop production indicator questions, follow-up questions have been added regarding the sale of and revenue earned from each harvested crop, the amount of each crop consumed by the household, as well as the amount stored, gifted, or used for other purposes.

ADAPTATION:

Each targeted crop should be selected by the HEARTH activity. The selected crops are expected to vary by country and region. Local production cycles or seasons should also be specified based on each country and type of crop grown. Seasons should coincide with the planting and/or postharvest/sale periods for crops within each country. The number and timing of seasons may vary by crop, country, and region.

For tree crops, which do not follow the standard seasonal cycles of many staple crops, this approach may need to be adapted accordingly. In particular, many tree crops are not harvested within the same year that they are planted, and farmers may need to cultivate trees for several years before their first harvest. In these cases, it may be necessary to use only one production cycle (the last 12-months) and keep in mind that the amount harvested will not necessarily reflect the amount cultivated.

UNIT:	DISAGGREGATE BY:
Metric tons	Farm size Sex Age Commodity

INDICATOR TITLE: Average crop production, by targeted crop	
TYPE: Outcome	DIRECTION OF CHANGE: Stable and/or increasing is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Activity-level, activity participants, targeted commodity products.
REPORTING NOTES	
If a sample survey of activity participants is used to collect crop production data points, the sample weighted estimate of the total across all participants or the full population should be calculated for each data point using appropriate sample weights.	

INDICATOR TITLE: Average crop yield, by targeted crop

APPLICABILITY:

This indicator is applicable for HEARTH activities that have explicit agriculture-related objectives and/or outcomes. Use of this indicator is encouraged for activities that seek to increase the amount or value of agricultural crop production, promote improved crop management practices, or engage in other efforts expected to affect agricultural production (such as crop insurance, land tenure, etc.).

DEFINITION:[196]

Yield is a measure of the total output of production of an agricultural commodity divided by the total number of units in production (hectares planted of crops). Yield per hectare is a measure of productivity from that farm for USG-assisted producers.

Yield is calculated from the following data points:

1) Total Production (TP): metric tons by participants over the last calendar year.
2) Total Units of Production (UP): Area planted in hectares for participants over the last calendar year.

Yield is TP / UP per commodity.

If there is more than one production cycle in the reporting year, the data points for TP and UP should be counted (and summed) each time the land is cultivated. The sum of TP divided by the sum of UP will provide an estimate of the average yield achieved across the different production cycles.

TP is the amount that is produced, regardless of how it was ultimately used. It also includes any postharvest loss (i.e., postharvest loss should not be subtracted from total production).

For tree crops, Number of hectares harvested is recommended as UP; however, Number of trees or number of hectares cultivated may also be selected for UP.

DATA COLLECTION:

Activities seeking to measure crop yield should follow the process outlined above for average crop production as the measure of TP.

[196] MacCartee, Julie, and Katie West. "Feed the Future Indicator Handbook." Agrilinks. Feed the Future, March 23, 2018. https://agrilinks.org/post/feed-future-indicator-handbook.

INDICATOR TITLE: Average crop yield, by targeted crop

In addition to total crop production by the household, data on UP can be collected as follows:

The lead farmer for each household should be asked about each individual plot that their household uses for agricultural production. For each plot, respondents should report the total area. To reduce the recall burden on respondents, multiple units of measurement may be provided (such as hectares, square meters, or other locally used units of measurement). During the analysis stage, the reported area of each plot should be converted into the preferred unit (hectares).

For each plot and season, respondents should also be asked which of the targeted crops are cultivated on that plot, and what percentage of the total plot area is used for cultivating each targeted crop.

For each plot and season, the total area should be multiplied by the percentage of that plot used for cultivating the targeted crop. This value should be summed across all plots and seasons that are used to grow each crop, resulting in the total area cultivated for each targeted crop, or UP.

Yield is then calculated for each household and crop by dividing TP by UP, which should then be averaged across households.

Data should be collected annually at the same time of year. When possible, data for this indicator should be collected in the postharvest/sale period when data for other indicators, such as crop production, are collected.

ADAPTATION:

Each targeted crop should be selected by the HEARTH activity. The selected crops are expected to vary by country and region. Local production cycles or seasons should also be specified based on each country and type of crop grown. Seasons should coincide with the planting and/or postharvest/sale periods for crops within each country. The number and timing of seasons may vary by crop, country, and region.

For tree crops, which do not follow the standard seasonal cycles of many staple crops, this approach may need to be adapted accordingly. In particular, many tree crops are not harvested within the same year that they are planted, and farmers may need to cultivate trees for several years before their first harvest. In these cases, it may be necessary to use only one production cycle (the last 12-months) and keep in mind that the amount harvested will not necessarily reflect the amount cultivated.

UNIT:	DISAGGREGATE BY:

INDICATOR TITLE: Average crop yield, by targeted crop	
TP: Metric tons UP: Hectares	Farm size Sex Age Commodity
TYPE: Outcome	DIRECTION OF CHANGE: Stable and/or increasing is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Activity-level, activity participants, targeted commodity products.
REPORTING NOTES	
If a sample survey of activity participants is used to collect crop production data points, the sample weighted estimate of the total across all participants or the full population should be calculated for each data point using appropriate sample weights.	

INDICATOR TITLE: Percent of households participating in farmer groups

APPLICABILITY:

This indicator is applicable for HEARTH activities that have agriculture, livelihood, and/or empowerment-related objectives and/or outcomes. Use of this indicator is encouraged for activities that seek to promote agricultural production, collective action, empowerment, or livelihoods.

DEFINITION:

Farmer groups often consist of a number of smallholder farmers in a similar geographic area that work collectively to overcome challenges and increase their productivity/profitability. When smallholder agricultural producers work collectively, it becomes easier to access farming inputs and aggregate produce to reach larger markets. When successful, farmer groups allow smallholders to reduce costs and improve their bargaining power in markets.[197]

This indicator measures the percentage of households that participate in farmer groups at the time of data collection.

DATA COLLECTION:

We recommend a brief set of questions about group participation from the A-WEAI module on group participation, focusing on participation in farmer groups as well as water user and forest user groups (as these are of interest for other outcome sectors). At a minimum, this set of questions should ask households (i) whether the following groups are present in their community, and (ii) whether the respondent is an active member of the group:

- Agricultural/livestock/fisheries producer's group
- Water users' group
- Forest users' group

Although the module asks about existence and participation in a number of groups, only participation in agriculture, livestock or fisheries groups are counted for this indicator. The indicator is calculated by dividing the number who report participating in farmer groups divided by the total number of respondents (including those who report that such groups do not exist in the community).

Ideally, questions about participation would be asked to both the primary adult male and female decision-maker, to be able to disaggregate by sex.

[197] IFAD. "Farmer Organizations: Resources and bargaining power for rural producers." https://www.ifad.org/en/farmer-organizations.

INDICATOR TITLE: Percent of households participating in farmer groups	
ADAPTATION: HEARTH activities may be interested in asking about the presence and membership of a variety of groups, based on activity design and intended impacts. Additional groups may include (but are not limited to): credit/microfinance groups, mutual help or insurance groups, civic groups, local government, religious groups, and women's groups.	
UNIT: Percent	DISAGGREGATE BY: Sex
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary adult male and female decision-makers.
REPORTING NOTES	
If a sample survey of activity participants is used to collect group membership data points, the sample weighted estimate of the total across all participants or the full population should be calculated for each data point using appropriate sample weights.	

INDICATOR TITLE: Percent of households using HEARTH promoted technologies/practices

APPLICABILITY:

This indicator is applicable for HEARTH activities that have agriculture-related objectives and/or outcomes. Use of this indicator is encouraged for activities that seek to promote the use of improved agricultural technologies or practices.

DEFINITION:

This indicator measures the percentage of households who have applied improved management practices and/or technologies promoted by the HEARTH activity.

The indicator tracks those individuals who are changing their behavior while participating in HEARTH activities. Individuals who attended training or were exposed to a new technology do not count under this indicator unless the individual actually applies what she/he learned. For example, if an agricultural producer attends a training on the use of improved irrigation practices, they can only be counted under this indicator once they apply what was learned by using the improved irrigation practice.

Improved management practices or technologies are those promoted by the implementing partner as a way to increase agriculture productivity or support stronger and better functioning systems. The improved management practices and technologies are agriculture-related, including those that address climate change adaptation or climate change mitigation. Implementing partners promoting one or a package of specific management practices and technologies can report practices under categories of types of improved management practices or technologies. The indicator should count those specific practices promoted by the activities, not just any improved practice.

DATA COLLECTION:

Prior to data collection HEARTH activities should develop a custom list of target practices/technologies. We recommend including in the custom list of target practices/technologies not just practices that the activities hope to increase (e.g., integrated pest management) but also those that they hope to decrease (e.g., use of pesticides).

Depending on the focus of the HEARTH, the practices can be asked about generally or with reference to specific crops. Overall, the indicator should be counted if a farming household uses any practice on any crop (and be divided by the number of farming households, excluding any households that have not cultivated any crops or livestock). Disaggregation should be provided by the specific practice.

INDICATOR TITLE: Percent of households using HEARTH promoted technologies/practices

Management practice and technology type categories, with some illustrative (not exhaustive) examples, include:[198]

- Crop genetics: For example, improved/certified seed that could be higher-yielding, higher in nutritional content (e.g., through bio-fortification, such as vitamin A-rich sweet potatoes or rice, high-protein maize), and/or more resilient to climate impacts (e.g., drought tolerant maize, or stress tolerant rice); improved germplasm.
- Cultural practices: context specific agronomic practices that do not fit in other categories, e.g., seedling production and transplantation; cultivation practices such as planting density, crop rotation, and mounding.
- Livestock management: For example, improved livestock breeds; livestock health services and products such as vaccines; improved livestock handling practices and housing; improved feeding practices; improved grazing practices, improved waste management practices, improved fodder crop, cultivation of dual-purpose crops.
- Wild-caught fisheries management: For example, sustainable fishing practices; improved nets, hooks, lines, traps, dredges, trawls; improved hand gathering, netting, angling, spearfishing, and trapping practices.
- Aquaculture management: For example, improved fingerlings; improved feed and feeding practices; fish health and disease control; improved cage culture; improved pond culture; pond preparation; sampling and harvesting; management of carrying capacity.
- Natural resource or ecosystem management: For example, terracing, rock lines; fire breaks; biodiversity conservation; strengthening of ecosystem services, including stream bank management or restoration or re/afforestation; woodlot management.
- Pest and disease management: For example, Integrated Pest Management; improved fungicides; appropriate application of fungicides; improved and environmentally sustainable use of cultural, physical, biological, and chemical insecticides and pesticides; crop rotation; aflatoxin prevention and control.
- Soil-related fertility and conservation: For example, Integrated Soil Fertility Management; soil management practices that increase biotic activity and soil organic matter levels, such as soil amendments that increase fertilizer-use efficiency (e.g., soil organic matter, mulching); improved fertilizer; improved fertilizer use practices; inoculant; erosion control.
- Irrigation: e.g., drip, surface, and sprinkler irrigation; irrigation schemes.
- Agriculture water management -non-irrigation-based: e.g., water harvesting; sustainable water use practices; practices that improve water quality.
- Climate mitigation: technologies selected because they minimize emission intensities relative to other alternatives (while preventing leakage of emissions elsewhere). Examples include low-or no-till practices; restoration of organic soils and degraded lands; efficient

[198] MacCartee, Julie, and Katie West. "Feed the Future Indicator Handbook." Agrilinks. Feed the Future, March 23, 2018. https://agrilinks.org/post/feed-future-indicator-handbook.

INDICATOR TITLE: Percent of households using HEARTH promoted technologies/practices

nitrogen fertilizer use; practices that promote methane reduction; agroforestry; introduction/expansion of perennials; practices that promote greater resource use efficiency (e.g., drip irrigation, upgrades of agriculture infrastructure and supply chains).

- Climate adaptation/climate risk management: technologies promoted with the explicit objective of reducing risk and minimizing the severity of the impacts of climate change. Examples include drought and flood resistant varieties; short-duration varieties; adjustment of sowing time; agricultural/climate forecasting; early warning systems; diversification, use of perennial varieties; agroforestry; risk insurance.
- Marketing and distribution: For example, contract farming technologies and practices; improved input purchase technologies and practices; improved commodity sale technologies and practices; improved market information system technologies and practices.
- Post-harvest handling and storage: For example, improved transportation; decay and insect control; temperature and humidity control; improved quality control technologies and practices; sorting and grading, sanitary handling practices.
- Value-added processing: For example, improved packaging practices and materials including biodegradable packaging; food and chemical safety technologies and practices; improved preservation technologies and practices.
- Other: For example, improved mechanical and physical land preparation; non-market-and non-climate-related information technology; improved record keeping; improved budgeting and financial management; Improved capacity to repair agricultural equipment; improved quality of agricultural products or technology.

Then for each custom technology/practice identified, questions should be asked about whether the household uses the target practices/technology. Where feasible/relevant, enumerators would be asked to follow-up self-reported data with direct observations to mitigate potential biases (recall, social desirability, etc.).

ADAPTATION:

Given that the specific practices or technologies promoted by each HEARTH activity will be different, this indicator should be customized for each activity and country as described above. We recommend limiting this to a maximum of five practices, though this should be determined based on the number and types of practices targeted by the HEARTH.

UNIT:	DISAGGREGATE BY:
Percent	Targeted Practice Farm size

INDICATOR TITLE: Percent of households using HEARTH promoted technologies/practices	
	Sex Age Commodity
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Activity participants
REPORTING NOTES	
If a sample survey of activity participants is used to collect group membership data points, the sample weighted estimate of the total across all participants or the full population should be calculated for each data point using appropriate sample weights.	

INDICATOR TITLE: Number of hectares under improved management practices or technologies

APPLICABILITY:

This indicator is applicable for HEARTH activities that have agriculture-related objectives and/or outcomes. Use of this indicator is encouraged for activities that seek to promote the use of improved agricultural technologies or practices.

DEFINITION:

This indicator measures the area in hectares where households have applied improved management practices and/or technologies promoted by the HEARTH activity. The same considerations on the custom set of promoted practices and technologies outlined above apply to this indicator.

DATA COLLECTION:

Data collection for this indicator should directly follow the collection of the above indicator "Percent of households using HEARTH promoted technologies/practices."

After asking about the use or adoption of target practices/technologies identified above, respondents should provide the total area of land that they have applied any of the improved practices/technologies to. Asking about the total area of land for which *any* improved practice/technology has been applied to is preferable to asking about the area for each practice/technology individually. The latter approach would increase survey length and lead to double-counting land that receives more than one improved practice/technology.

Similar considerations for disaggregations apply as above.

ADAPTATION:

Given that the specific practices or technologies promoted by each HEARTH activity will be different, this indicator should be customized for each activity and country as described above.

UNIT:	DISAGGREGATE BY:
Hectares	Farm size Sex Age Commodity

INDICATOR TITLE: Number of hectares under improved management practices or technologies	
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Activity participants.
REPORTING NOTES	
If a sample survey of activity participants is used to collect group membership data points, the sample weighted estimate of the total across all participants or the full population should be calculated for each data point using appropriate sample weights.	

INDICATOR TITLE: Percent of households with legally recognized land tenure/rights

APPLICABILITY:

This indicator is applicable for HEARTH activities that have agriculture or land-related objectives and/or outcomes. Use of this indicator is encouraged for activities that seek to promote agricultural production and land tenure/security.

DEFINITION:

This indicator tracks the percent of households participating in a HEARTH activity who have legally recognized and documented tenure rights to land.

The indicator refers specifically to legally recognized tenure rights. Informal tenure systems are excluded. Importantly it does not limit tenure rights to individual ownership rights. Any legally recognized documentation of tenure rights counts under this indicator, regardless of

tenure type (e.g., individual, joint, communal, business, or other). Examples of legally recognized documentation may include certificates, titles, leases, or other recorded documentation issued by government institutions or traditional authorities at national or local levels. This indicator captures both statutory tenure rights and customary tenure rights that are legally recognized and also covers both tenure rights held by individuals (either alone or jointly) and tenure rights held by group members, such as members of communities or commercial entities. The indicator tracks the percent of households, not the number of titles issued. For example, if it is a joint title both parties would be counted.[199]

DATA COLLECTION:

Data collection for this indicator should begin by asking respondents whether they own any agricultural land (either alone or jointly with someone else). Respondents should then be asked whether they have any rights to use agricultural land (either alone or jointly with someone else) that they do not own.

Respondents will then be asked (i) whether they have a title deed or other government recognized document for any land the household owns or has use rights to, and (ii) whether their name appears on this document.

ADAPTATION:

[199] MacCartee, Julie, and Katie West. "Feed the Future Indicator Handbook." Agrilinks. Feed the Future, March 23, 2018. https://agrilinks.org/post/feed-future-indicator-handbook.

INDICATOR TITLE: Percent of households with legally recognized land tenure/rights	
HEARTHs should take into account considerations about local and national land tenure/rights for each activity. The framing of questions may need to be adjusted depending on land tenure systems in different countries or regions.	
UNIT: Percent	DISAGGREGATE BY: Sex
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Activity participants; primary adult and female decision-makers
REPORTING NOTES	
If a sample survey of activity participants is used to collect group membership data points, the sample weighted estimate of the total across all participants or the full population should be calculated for each data point using appropriate sample weights.	

INDICATOR TITLE: Percent of households with perceived tenure security

APPLICABILITY:

This indicator is applicable for HEARTH activities that have agriculture or land-related objectives and/or outcomes. Use of this indicator is encouraged for activities that seek to promote agricultural production and land tenure/security.

DEFINITION:

This indicator tracks the percent of households participating in a HEARTH activity who perceive their tenure rights as secure.

Tenure refers to how people have access to land, what they can do with the resources, and how long they have access to said resource. Tenure systems can range from individual property rights to collective rights, whether legally recognized or informal, and what is included in the bundle of rights within each system varies.[200]

Tenure security refers to land rights that are legitimate, enforced and recognized by others.

In alignment with the definition in the SDG indicator 1.4.2. Proportion of total adult population with secure tenure rights to land, with legally recognized documentation and who perceive their rights to land as secure, by sex and by type of tenure. tenure is perceived to be secure if an individual believes that he/she will not involuntarily lose their use or ownership rights to land due to actions by others (governments or other individuals).

DATA COLLECTION:

Data collection for this indicator should directly follow the questions described for the above indicator "Percent of households with legally recognized land tenure/rights."

Respondents should be asked how likely they are to involuntarily lose ownership or use rights to any of the agricultural land mentioned above within the next five years. Response options for this question are:

1. Not at all likely
2. Slightly likely
3. Moderately likely
4. Very likely
5. Extremely likely

[200] MacCartee, Julie, and Katie West. "Feed the Future Indicator Handbook." Agrilinks. Feed the Future, March 23, 2018. https://agrilinks.org/post/feed-future-indicator-handbook.

INDICATOR TITLE: Percent of households with perceived tenure security	
The percentage of households with perceived tenure security should be calculated as the total number of households that respond 'Not at all likely' or 'Slightly likely' divided by the total number of households with land ownership or use rights. Additionally, we recommend asking households the following: - Why they believe this could happen - Whether the possibility that someone could try to take their land has increased, decreased, or stayed the same in the last year	
ADAPTATION: HEARTHs should take into account considerations about local and national land tenure/rights for each activity. The framing of questions may need to be adjusted depending on land tenure systems in different countries or regions.	
UNIT: Percent	DISAGGREGATE BY: Sex
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Activity participants; primary adult and female decision-makers
REPORTING NOTES	
If a sample survey of activity participants is used to collect group membership data points, the sample weighted estimate of the total across all participants or the full population should be calculated for each data point using appropriate sample weights.	

Conservation Enterprise (CE) Benefits

Pathways To Change

All HEARTH activities include conservation enterprises as one of their strategic approaches, which should provide benefits both for those directly participating in them (employment, income) as well as community benefits (via using profits to invest in the community). It is also expected that households who participate in conservation enterprises or otherwise benefit from them will have increased conservation knowledge and/or perceptions of ecosystem benefits/services, and as a result will reduce behaviors that are threats to biodiversity, ecosystems, and climate.

Recommended Outcomes and Indicators

Outcome	Description	Recommended Indicator & Duration
Increased benefits from conservation enterprises	USAID's "The Nature of Conservation Enterprises"[201] identifies three types of monetary benefits: employment, payment for collection of inputs (like non-timber forest products [NTFPs]), and dividends. This indicator focuses on payment for collection of inputs measured via household surveys. Supplemental guidance is provided at the end of this chapter for collecting employment data from implementing partners (given that few beneficiaries will be directly employed by enterprises or along the supply chain), and dividend payments are unlikely based on the results chains reviewed to date and the 5-year timeline for HEARTH activities. Depending on the HEARTH Activity, the list of raw materials/wild products might overlap with those in the	**Indicator:** Average household income from environment products **Source:** Center for International Forestry Research (CIFOR) Poverty Environment Network (PEN) questionnaire, direct forest income (Section B) and non-forest

[201] Note that this document does not seem to consider sustainable agriculture activities as CEs. Nevertheless, the monetary benefits from sustainable agriculture interventions would be covered under the results discussed here or in the agriculture section: "The Nature of Conservation Enterprises: A 20-Year Retrospective Evaluation of the Theory of Change Behind This Widely Used Approach to Biodiversity Conservation." USAID BiodiversityLinks. United States Agency for International Development, 2018. https://biodiversitylinks.org/learning-evidence/conservation-enterprises/ce-documents/the-nature-of-conservation-enterprises-a-20-year-retrospective-evaluation-of-the-theory-of-change-behind-this-widely-used-approach-to-biodiversity-conservation/view.

Outcome	Description	Recommended Indicator & Duration
	"percent of households who engaged in unsustainable use of ecosystem resources" indicator from the conservation knowledge, attitudes, and practices module. If so, the list of materials/products should only be asked about once, followed by relevant questions. HEARTH activities should note that this survey module can become relatively long, depending on the number of products included and the number of seasons (if relevant).	environmental income (Section E)[202] **Duration:** 5-7 minutes per product/income source
	Given that non-cash/monetary benefits will be specific to each HEARTH, it is recommended that each activity develop a custom list of non-monetary services that households might benefit from due to the conservation enterprise (e.g., security, education, spiritual/cultural benefits). Then for each, questions would be asked about whether the household uses the benefit/service, how often, how important the service is for their well-being, and whether there is equitable access/use. This is a custom indicator, based on findings from the "The Nature of Conservation Enterprises" retrospective study related to non-monetary benefits from CE.[203]	**Indicator:** Percent of households that used or benefitted from any community services provided by the project Source: N/A **Duration:** 2-5 minutes (depending on how many services)
	Employment is one of the three primary types of monetary benefits identified by USAID[204] As relatively few individuals will be employed directly by conservation enterprises or along the supply chain, relative to the number of overall program participants and beneficiaries, it is not recommended to measure this indicator through household surveys. Instead, this indicator should be measured by collecting administrative data from private	**Indicator:** Number of full-time equivalent jobs created Source: N/A **Data Source:** Administrative data

[202] "A Comprehensive Global Analysis of Tropical Forests and Poverty." Poverty Environment Network, n.d. http://www.cifor.org/pen/.

[203] "The Nature of Conservation Enterprises: A 20-Year Retrospective Evaluation of the Theory of Change Behind This Widely Used Approach to Biodiversity Conservation." USAID BiodiversityLinks. United States Agency for International Development, 2018. https://biodiversitylinks.org/learning-evidence/conservation-enterprises/ce-documents/the-nature-of-conservation-enterprises-a-20-year-retrospective-evaluation-of-the-theory-of-change-behind-this-widely-used-approach-to-biodiversity-conservation/view.

[204] Note that this document does not seem to consider sustainable agriculture activities as CEs. Nevertheless, the monetary benefits from sustainable agriculture interventions would be covered under the results discussed here or in the agriculture section.

Outcome	Description	Recommended Indicator & Duration
	sector enterprises or implementer monitoring data. For more details on collecting information from private sector partners, please see the supplementary guidance at the end of this section.	collected from private sector enterprises

Performance Indicator Reference Sheets

INDICATOR TITLE: Average household income from environment products

DEFINITION:

Income from collection of inputs/resources will be measured by adapting the approach developed by the CIFOR as part of the PEN. PEN provides a standardized tool to measure environmental income across countries and contexts.[205] A custom list of raw-material forest products and/or wild products related to conservation enterprises for each HEARTH Activity should be developed, followed by up to 9 questions per product that the household collects; repeated for each product and each season.[206] These nine questions include (1) who in the household collected the product in season X, how much each household (2) used and (3) sold during season X, and if the household sold any of the product, (4) the price per unit, (5) what type of market the product was sold in, and total (6) transportation, (7) marketing, (8) inputs, and (9) labor costs in season X.

The HEARTH core questionnaire includes an example module with a seasonal recall period. Both the set of products and the recall period (or mix of recall periods) will need to be determined by each HEARTH. Once the adaptations are made, annual income from the CE can be calculated and reported consistently across HEARTHs.

It should be noted that measuring only income from conservation enterprises will not capture substitution between different sources of income, and therefore not be a reliable measure of socio-economic status overall. While measuring income from CEs can provide information about the CE theory of change, it is recommended to supplement this with other measures of household economic well-being, as described in the socio-economic status outcome section.

Income should be reported by respondents in the appropriate local currency and converted into USD for comparison across the HEARTH portfolio.[207] To convert LCU for the survey year (*t*) into 2020 USD, HEARTH activities should first adjust for inflation from 2020 to the year and month of the survey. In all cases, the official source for the Consumer Price Index (CPI) should be used. Then, the inflation adjusted LCU should be converted into 2020 USD using the 2020

[205] PEN research tools (the prototype questionnaires and the associated technical guidelines; the template for data entry; the code book; and the data cleaning procedures) can be downloaded from their website Prototype questionnaires are available in English, French, Spanish, Portuguese (Brazilian and Mozambican), Chinese (Mandarin), Nepalese, and Khmer: "A Comprehensive Global Analysis of Tropical Forests and Poverty." Poverty Environment Network, n.d. http://www.cifor.org/pen/.

[206] For a more detailed example, activities may consider adapting the baseline questionnaire from the Impact Evaluation of Hariyo Ban II Livelihood Interventions on Biodiversity Outcomes: Baseline Report (Nepal) – Section D, Forest Based Income: "Impact Evaluation of Hariyo Ban II Livelihood Interventions on Biodiversity Outcomes: Baseline Report." United States Agency for International Development, December 2019. https://pdf.usaid.gov/pdf_docs/PA00WZW2.pdf.

[207] For additional details on calculating interest rates and other conversions, please see the Feed the Future Survey Implementation Document: Guide to FTF Statistics section on guidelines for constructing poverty indicators.

purchasing power parity (PPP) conversion factor of private consumption based on the International Comparison Program.[208] The PPP 2020 conversion factors can be obtained from the World Development Indicator database.[209] The formula for this calculation is as follows, and reporting should include the CPI and PPP used in the calculation for full transparency.

$$USD_{2020} = LCU_t \times (\frac{CPI_{2020}}{CPI_t}) \times (PPP_{2020})$$

DATA COLLECTION:

It should be emphasized that income is difficult to accurately and reliably measure, in part due to high seasonal variability month to month, as well as biases related to recall periods.[210] Generally, longer recall periods lead to lower income estimates, and the magnitude of these impacts can be large – for example, one study using the PEN tool in Nepal found that differences in direct forest income were almost halved when reported over a 3 month recall period as opposed to 1 month.[211]

While best practice may be to collect forest income on a high-frequency (quarterly) basis to mitigate some of these data quality concerns, [212] this is likely not feasible for HEARTH activities given the significant resource requirements for quarterly data collection. Angelsen and Lund provide three options when high-frequency surveys cannot be conducted: "1. Ask about income for the last 12 months (appropriately decomposed, for example, by product). 2. Ask about income for, say, the last month or last three months, and multiply to get the annual income. 3. Divide the year into a few (normally two or three) distinct seasons and ask about income in each of these. Therefore, it is recommended that HEARTH activities assess the (1) frequency of collection and (2) seasonality for each product to determine the appropriate recall period:

[208] The International Comparison Program conducts comprehensive market surveys that are used to compute global PPP and real expenditures: "The International Comparison Program." World Bank, 2011. http://siteresources.worldbank.org/ICPEXT/Resources/ICP_2011.html.

[209] "World Development Indicators." Data Bank. World Bank, 2021. https://databank.worldbank.org/source/world-development-indicators.

[210] For more discussion, see: Poirier, M.J.P., Grépin, K.A. & Grignon, M. Approaches and Alternatives to the Wealth Index to Measure Socioeconomic Status Using Survey Data: A Critical Interpretive Synthesis. Soc Indic Res (2020). https://doi.org/10.1007/s11205-019-02187-9.

[211] See Box 7.2 "The importance of recall periods" in "Chapter 7: Designing the Household Questionnaire" by Angelsen, A., & Lund, J.F. (2011) in Measuring Livelihoods and Environmental Dependence: Methods for Research and Fieldwork. https://www.cifor.org/publications/pdf_files/Books/BAngelsen1102.pdf.

[212] Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., Hogarth, N. J., Bauch, S., ... & Wunder, S. (2014). Environmental income and rural livelihoods: a global-comparative analysis. World development, 64, S12-S28. https://www.sciencedirect.com/science/article/pii/S0305750X14000722?via%3Dihub#fn6.

INDICATOR TITLE: Average household income from environment products

- For any seasonal products, the year should be divided into locally relevant seasons, and income should be asked about for each. It is anticipated that most products will fall into this category.
- For any products that do not have much seasonal variation in availability/use:
    - Regularly collected products (e.g., collected daily or weekly) should use a one-month recall period, which can then be multiplied by 12 to estimate annual income
    - Infrequently collected products (e.g., collected once every few weeks, or less) should use a three-month recall period, which can then be multiplied by 4 to estimate annual income

HEARTH activities should note that this survey module can become relatively long, depending on the number of products included and the number of seasons (if relevant).

ADAPTATION:

Both the set of products and the recall period (or mix of recall periods) will need to be determined by each HEARTH. A custom list of raw-material forest products and/or wild products related to conservation enterprises for each HEARTH Activity should be developed. See above for suggested exceptions/adaptation based on the product relevant for each CE and the appropriate recall period(s). In addition, answer choices for all questions should be reviewed and adapted as relevant for the local context. For example, the question on types of markets should be adapted to reflect the markets available, and the type of costs should be adapted based on the type of enterprise. Finally, questionnaires should allow reporting in local currencies.

UNIT:	DISAGGREGATE BY:
Number (USD)	Sex of Primary Person who Collects the Product (if included): Female, Male Type of Product (if more than one) Season (if more than one)
TYPE:	DIRECTION OF CHANGE:
Outcome	Higher is better

INDICATOR TITLE: Average household income from environment products	
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary household decision-maker (male or female) from sample households. Ideally, this should be the person primarily responsible for decisions related to generating income from the products/resources of interest, or otherwise participating in the conservation enterprise. If this person is not available, another adult from the household may be used for reporting.
REPORTING NOTES	
In addition to reporting the average income from products/resources of interest across households, the number of participant households of the conservation enterprise activity must be reported, to allow a weighted average to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted). Finally, activities should also report on the standard deviation.	

INDICATOR TITLE: Percent of household that used or benefitted from any community services provided by the project

DEFINITION:

"The Nature of Conservation Enterprises" retrospective study[213] emphasizes the importance of community services as non-monetary benefits from conservation enterprises, and thus this indicator focuses on such services. Other non-cash benefits, such as increased provision of subsistence resources (fuelwood, fodder, timber, etc.) or general positive attitudes towards conservation and knowledge of ecosystem services, are covered in the conservation knowledge, attitudes, and practices module. Additionally, direct health and education outcomes from use of these services will be measured in their respective modules.

For this indicator, each HEARTH activity should develop a custom list of community services related to their conservation enterprises, followed by up to 4 questions per service that the household uses. A suggestive list of possible services includes water and sanitation infrastructure, energy infrastructure, roads, education/schools, and/or healthcare facilities.

Then for each service, questions would be asked about (1) whether the household uses the benefit/service, (2) how often, (3) how important the service is for their household's well-being, and (4) whether there is equitable access/use. The indicator will be constructed as the percentage of households who use any of the benefits/services provided.

ADAPTATION:

The list of community services provided above and in the core questionnaire is suggestive and should be adapted based on those provided by the conservation enterprise. Additionally, answer choices for Q4 regarding who might benefit most from services should be updated to include specific definitions for youth/elderly based on local context, as well as to include any marginalized groups which might not already be included.

UNIT:	DISAGGREGATE BY:
Percent	By benefit/service (if multiple)
TYPE:	DIRECTION OF CHANGE:
Outcome	Higher is better

[213] "The Nature of Conservation Enterprises: A 20-Year Retrospective Evaluation of the Theory of Change Behind This Widely Used Approach to Biodiversity Conservation." USAID BiodiversityLinks. United States Agency for International Development, 2018. https://biodiversitylinks.org/learning-evidence/conservation-enterprises/ce-documents/the-nature-of-conservation-enterprises-a-20-year-retrospective-evaluation-of-the-theory-of-change-behind-this-widely-used-approach-to-biodiversity-conservation/view.

INDICATOR TITLE: Percent of household that used or benefitted from any community services provided by the project	
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary household decision-maker (male or female) from sample households. If this person is not available, another adult from the household may be used for reporting.
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the conservation enterprise activity must be reported, to allow a weighted average to be calculated across HEARTH activities for reporting. Depending on the sampling strategy (i.e., if respondents are selected from the wider community and not just direct program participants), the total number of households in communities with conservation enterprises would also need to be reported. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

INDICATOR TITLE: Number of full-time equivalent jobs created	
DEFINITION: This indicator counts all types of employment held during the reporting year in agriculture or rural-related enterprises (including paid on-farm/fishery employment) that were created with U.S. Government assistance. It counts existing jobs that were created in the current or in previous reporting years. Jobs lasting less than one month (or less than 20 days excluding weekends) are not counted in order to emphasize those jobs that provide more stability through length. Jobs should be converted to FTF One FTE equals 260 days (excluding weekends) or 12 months. Thus, a job that lasts 4 months should be counted as 1/3 FTE and a job that lasts for 130 days (excluding weekends) should be counted as 1/2 FTE. Number of hours worked per day or per week is not restricted as work hours may vary greatly. "With U.S. Government assistance" includes farm and non-farm jobs where HEARTH investments are intentional in assisting in any way to expand employment and where an objective of the HEARTH activity is job creation.	
ADAPTATION:	
UNIT: FTEs	DISAGGREGATE BY: **Location:** Urban/peri-urban, Rural **Duration:** Continuing, New (the FTE held was newly created during the reporting year with U.S. Government assistance; Continuing—the FTE held during the reporting year was created in a previous reporting year with USG assistance) **Sex of Job-Holder:** Male, Female (if one FTE is evenly split by a male and a female, then it would be 0.5 FTE for females and 0.5 FTE for males)
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Activity-level, direct beneficiaries, attributed to U.S. Government programs

INDICATOR TITLE: Number of full-time equivalent jobs created
REPORTING NOTES
This is a direct measure of improved livelihoods, as it measures creation of employment and related income. However, HEARTH is concerned about creation of sustainable employment, not temporary employment (of short duration such as a period of less than one month).

Collecting Information from Implementing Partners and The Private Sector

HEARTH activities will be working with a diverse set of private sector partners alongside more traditional implementing partners such as international and local NGOs. Data obtained from implementing partners and the private sector for monitoring and evaluation purposes can help demonstrate the potential benefit of integrated programming (including the financial benefit for private sector enterprises), thereby strengthening and increasing sustainability of public-private relationships, and potentially stimulating further investment.

Ideally, HEARTH consortiums should discuss potential data sharing needs during procurement, so that data sharing requirements and protocols can be included in the award. For activities that have already been awarded, discussions should be had around options including developing separate data sharing agreements and/or finding a champion in the private sector enterprise who can facilitate getting access to the necessary information. In many cases, formal data sharing agreements may be required by private sector partners to protect against data misuse and set standards for data handling and use, especially considering that these data will likely be proprietary information. For more information on when to use data sharing agreements, and what they should include, please see Annex 5. Data Sharing Agreements.

Depending on the agreement reached with private sector enterprises and other implementing partners, there are different approaches for access to and use of data: (1) the company providing the data analyzes the data internally and then shares the relevant statistics with the agency; (2) the company transfers the data to the agency for the agency to compute the statistics; (3) the data are transferred to a trusted third party for analysis, and (4) the statistical agency's functions, including data collection and processing, are outsourced to the private firm.[214] Generally, (2) and (3) will allow for greater reporting transparency and may be preferred.

Agricultural Commodity Price Data. Data from the agriculture sector can be varied, including from small-holder farmers to commercially produced products within the agro-food chain. Relevant data may

[214] Innovations in Federal Statistics: Combining Data Sources While Protecting Privacy. (2017). National Academies Press (US). https://doi.org/10.17226/24652.

need to be collected from different sources including farmers, retailers, and corporate entities. Some types of agricultural data that may be of interest for HEARTH activities to monitor and may already be collected by implementing partners includes the following:[215]

- **Agronomic Data:** This includes crop and field information, such as planting data, seed type, yield, disease and pest management application, fertilization, and prescriptions. Household surveys are a likely source of this data; see more information in the Agriculture and Land section of this guidance document.
- **Land Data:** This includes soil and fertility data, topographical, elevation, watershed, and drainage data, geospatial information, and tillage and conservation data.
- **Farm Management Data:** This includes information related to financial, tax, employment, commodity price, regulatory compliance, supply chain, and other management data.
- **Machine Data:** This includes telematics information, machine health, fuel consumption, load, use, and other machine performance data.
- **Climate and Weather Data:** This includes precipitation, wind speed and direction, temperature, and other weather information.
- **Livestock Data:** This includes animal identification and pedigree, genetic and genomic information, feed consumption, and other data related to livestock.

Employment Data. Employment data requires adherence to more rigorous standards when it comes to data sharing agreements. This is due to the sensitivity and identifiability of the data; therefore, employment data demands strict compliance with laws and regulations related to data privacy and security. These data may include salaries, wage, pay per product, hours worked, benefits packages, number of employees, etc.

[215] AG Data Use Model Agreement. Ag Data Transparent. (n.d.). Retrieved from https://www.agdatatransparent.com/model-agreement.

Resilience

Pathways To Change

HEARTH activities might increase household resilience to shocks and stresses through several different pathways, including increased incomes/socio-economic well-being, increased access to finance, increased social capital/networks, and potentially increased use/availability of natural resources. Resilience is also a function of exposure to risk, access to resilience capacities, and resulting change in well-being, measured by indicators from other modules such as the FIES and CWI. Shocks and stresses might include climate and/or weather-related events such as too much or little rain, as well as the COVID-19 pandemic, conflicts, and economic shocks. Increased biophysical health of ecosystems might increase the availability of natural resources, thus providing greater opportunities for households to rely on them in times of stress. However, greater conservation knowledge/awareness might also lead households to shift to other coping mechanisms during these times, so the overall impact on use of natural resources might be higher or lower depending on the local context and HEARTH activity theory of change. Additionally, several HEARTHs include direct activities to promote changes to renewable/clean energy away from diesel or other fuel sources, thus reducing GhG emissions and therefore reducing the impact on climate.

Recommended Outcomes and Indicators

Outcome	Description	Recommended Indicator & Duration
Increased household resilience	The Ability to Recover from Shocks and Stresses Index (ARSSI) captures information on both the severity of different types of shocks as well as households' ability to recover. ARSSI acts as a proxy for actual recovery and is associated with positive coping behaviors in the face of shocks and stresses, which indicates that a household is resilient to shock and stresses and thus is in a much better position to recover from them. [216, 217]	**Indicator:** Average score on the ARSSI **Source:** FTF Indicator RESIL-a [ZOI-level] Ability to recover from shocks and stresses index[218] **Duration:** 10 minutes

[216] Jones, Lindsey, and Thomas Tanner. "'Subjective Resilience': Using Perceptions to Quantify Household Resilience to Climate Extremes and Disasters." Regional Environmental Change 17, no. 1 (2016): 229–43. https://doi.org/10.1007/s10113-016-0995-2.

[217] Constas, Maxwell D, M Frankenberger, T Klaus, and M Mock. "Qualitative Data and Subjective Indicators for Resilience Measurement." Resilience Measurement Technical Working Group. Technical Series No. 4. Food Security Information Network, 2015. https://www.fsnnetwork.org/sites/default/files/1_FSIN_TechnicalSeries_4.pdf.

[218] Feed the Future. "Feed the Future Indicator Handbook." US Government's Global Hunger and Food Security Initiative, September 2019. https://fr.fsnnetwork.org/sites/default/files/ftf_agriculture_guide_0.pdf.

Outcome	Description	Recommended Indicator & Duration
Use of natural resources to reduce effects of shocks and stresses	Households are expected to rely on natural resources and wild products to reduce the effects of shocks and stress. These questions will measure the overall level of reliance on natural resources and wild products for food or income during normal times and during times of stress, on a scale from 1-10. This approach will NOT measure the extent of reliance on *unsustainable use* of natural resources, so the desirable direction of change will depend on the local context. If HEARTH activities are interested in a more nuanced understanding of the reliance on specific types of activities or resources (e.g., hunting, gathering wild fruits/vegetables, etc.) during times of stress, these questions could be modified accordingly.[219]	**Indicator:** Average score measuring the extent that households rely on natural resources during times of stress **Source**: N/A **Duration:** 2 minutes
Increased use of renewable and clean energy sources	Use of fuel sources can be measured using questions adapted from the Living Standards Measurement Studies (LSMS) Fuel Sources Module related to fuel type, amounts, and source (purchased vs. collected). First, each household will be asked if they used a given fuel source in the past 30 days, and then if yes, a set of 5 follow-up questions would be asked regarding the amount and source(s). If energy is a key outcome for a given HEARTH activity, supplemental questions from the LSMS module may be added including price paid per unit/total cost, time and distance spent collecting (disaggregated by men and women), and % used for different purposes (lighting, cooking, heating, etc.). However, for most HEARTH activities it is expected that this level of detail will not be necessary. While grid connected electricity might not be from renewable sources, it is included in this indicator, as the	**Indicator:** Percent of households using renewable fuel sources or grid-connected electricity **Source:** LSMS Fuel Sources Module [220] **Duration:** 2-7 minutes (depending on the number of fuel sources used by the household)

[219] For example, instead of asking "to what extent does your household rely on wild products" activities could modify this to ask, "to what extent does your household rely on hunting", etc.

[220] O'Sullivan, Kyran, and Douglas F. Barnes. "Energy Policies and Multitopic Household Surveys." World Bank Working Papers, 2006. https://doi.org/10.1596/978-0-8213-6878-7.

Outcome	Description	Recommended Indicator & Duration
	primary intent is to measure increasing use of sources other than locally non-renewable sources.	

Performance Indicator Reference Sheets

INDICATOR TITLE: Average score on the ARSSI

DEFINITION:

The Ability to Recover from Shocks and Stresses Index is based on estimation of the ability of households to recover from the typical types of shocks and stressors that occur in the program areas, such as loss of a family member, loss of income, hunger, drought, flood, conflict or similar events, based on data regarding recovery from the shocks and stressors households experienced in the year prior to the survey and their perceived ability to meet food needs the following year.

The base "ability to recover" index is calculated based on the responses to two questions after the respondent is asked about his/her household exposure to and the severity of a series of 16 types of shocks and stressors that might have occurred during the previous year:

1. Would you say that right now, your household's ability to meet your food needs is:

- Better than before these difficult times? (Assigned a value of 3)
- The same as before these difficult times? (Assigned a value of 2)
- Or worse than before these difficult times? (Assigned a value of 1)

AND

2. Looking ahead over the next year, do you believe your household's ability to meet your food needs will be:

- Better than before these difficult times? (Assigned a value of 3)
- The same as before these difficult time s? (Assigned a value of 2)
- Or worse than before these difficult times? (Assigned a value of 1)

The responses to the two questions are combined (additive) into one variable that has a minimum value of 2 and a maximum value of 6.

The 16 shocks and stresses are: too much rain, too little rain, erosion of land, loss of land, sharp increase in the price of food, someone stealing or destroying belongings, not being able to access inputs for crops, disease affecting crops, pests affecting crops, theft of crops, not being able to access inputs for livestock, disease affecting livestock, someone stealing animals, not being able to sell crops, livestock or other products at a fair price, severe illness in the family, death in the household.

Since each survey household did not experience the same types of shocks/stressors of the same severity, it is necessary to create a "shock exposure corrected" index to measure ability to recover.

INDICATOR TITLE: Average score on the ARSSI

A measure of shock/stressor exposure and severity is created that takes into account the shocks or stressors to which a household is exposed out of the total number of shocks or stressors, and the perceived severity of the shock on household income and food consumption.

Perceived severity is measured using two variables: impact on income security and impact on food consumption. The variables are based on respondents' answers to the questions, "How severe was the impact on your household economic situation?" and "How severe was the impact on household food consumption?" which are asked of each shock or stressor experienced. The possible responses are:

- Not severe (assigned a value of 1)
- Somewhat Severe (assigned a value of 2)
- Severe (assigned a value of 3)
- Extremely Severe (assigned a value of 4)

The responses to the two questions are combined into one severity variable that has a minimum value of 2 and a maximum value of 8 for each shock and stressor.

The Shock Exposure Index (SEI) is then a weighted sum of the incidence of experience of each shock (a variable equal to one if the shock or stressor was experienced and zero otherwise), weighted by the perceived severity of the shock. The SEI ranges from 0 to 128 (if all 16 shocks/stressors were experienced by the households at the highest level of severity).

Finally, the shock exposure corrected ARSSI is calculated to create a measure of ability to recover that corrects for any differences between households in their shock exposure and is therefore comparable across them. To do so, a linear regression of the base ability-to-recover (ATR) index on the SEI is run, yielding the amount by which an increase of 1 in the shock exposure index can be expected to change the ability to recover index.

The estimated empirical equation is:

$$ATR = a + b * SEI$$

The coefficient on SEI, the "b", is expected to be a negative number such that the higher is shock exposure, the lower is the ability to recover.

The coefficient 'b' is then used to calculate the adjusted ARSSI for each household using the following equation:

$$ARSSI = ATR + b * (Y - SEI)$$

INDICATOR TITLE: Average score on the ARSSI	
where Y is the mean across households of the SEI. As such, the ATR index value of a household with shock exposure below the mean would have a downward adjustment of its value and the opposite for a household with shock exposure above the mean.	
ADAPTATION: The list of 16 shocks and stresses should be reviewed and adapted to the local context as relevant for each HEARTH activity. This includes removing shocks and stresses that are not relevant, adding shocks and stresses that might be relevant but not already included in the list, and/or adapting the language for the current shocks and stresses to be more specific to the local context.	
UNIT: Score ranging from 2-6	DISAGGREGATE BY: N/A
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary household decision-maker (male or female) from sample households. If this person is not available, another adult from the household may be used for reporting.
REPORTING NOTES	
In addition to reporting the average score, the number of participant households of the resilience-sensitive activity must be reported, to allow a weighted average to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted). Finally, activities should also report on the standard deviation.	

INDICATOR TITLE: Average score measuring the extent that households rely on natural resources during times of stress

DEFINITION:

A set of two questions will measure the overall level of reliance on natural resources and wild products for food or income during (1) normal times and (2) during times of stress, on a scale from 1-10. Wild products include wild fish and bushmeat, as well as wild fruits/vegetables and other products that might be foraged. The definition of natural resources from the forest excludes agroforestry, defined as the integration of trees and shrubs into agriculture, including trees on farms and in agricultural landscapes, farming in forests and along forest margins, and tree-crop production.[221]

Questions are asked over a recall period of 12 months to capture average reliance across all seasons, which will facilitate comparisons across HEARTHs (regardless of what season surveys take place in).

An additional question for households who do not rely heavily (i.e., who answer 1 - 4) on natural resources and/or wild products during difficult times or times of stress will gather explanatory information on why households do not rely on these resources/products, including the availability and accessibility of resources/products.

ADAPTATION:

If HEARTH activities are interested in a more nuanced understanding of the reliance on specific types of activities or resources (e.g., hunting, gathering wild fruits/vegetables, etc.) during times of stress, these questions could be modified accordingly. For example, instead of asking "to what extent does your household rely on natural resources and/or wild products" activities could modify this to ask, "to what extent does your household rely on hunting," etc.

Additionally, answer choices for why households might not rely heavily on natural resources and/or wild products should be adapted for the local context as appropriate.

UNIT:	DISAGGREGATE BY:
Score ranging from 1- 10	N/A
TYPE:	DIRECTION OF CHANGE:
Outcome	Higher or lower might be better depending on the local context and activity theory of change. This is because this indicator alone

[221] Definition adapted from ICRAF: "What Is Agroforestry?" World Agroforestry | Transforming Lives and Landscapes with Trees. ICRAF, n.d. https://www.worldagroforestry.org/about/agroforestry.

INDICATOR TITLE: Average score measuring the extent that households rely on natural resources during times of stress	
	does not measure the extent to which the reliance on natural resources/wild products is unsustainable.
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary household decision-maker (male or female) from sample households. If this person is not available, another adult from the household may be used for reporting.
REPORTING NOTES	
In addition to reporting the average score, the number of participant households of the resilience-sensitive activity must be reported, to allow a weighted average to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted). Finally, activities should also report on the standard deviation.	

INDICATOR TITLE: Percent of households using renewable fuel sources or grid-connected electricity

DEFINITION:

Use of fuel sources can be measured using questions adapted from the LSMS Fuel Sources Module related to fuel type, amounts, and source (purchased vs. collected). The purpose of these questions is to collect information on household access and consumption for all fuels used. First, each household will be asked if they used a given fuel source in the past 30 days, and then if yes, a set of 5 follow-up questions would be asked regarding the amount and source(s): the typical unit of measure, approximate weight of the typical unit, total number of units used in the last 30 days, and how many units were purchased versus collected from the forest. Different response options for typical units will be available for either biomass/candles or gas and liquid fuels.

Renewable and clean fuel sources should be defined by the local context but may include agricultural residue, dung, other traditional (sustainably harvested/collected) biomass, hydro, or solar. Generally, firewood would not be included as a renewable fuel source, unless it can be determined that the resource is harvested sustainably. A household will be counted if they report using any of these renewable sources or are grid connected.

While grid electricity is not always (or in some places, not at all) from renewable sources, the objective of this indicator is to measure whether households are increasingly using sources other than local non-renewable sources.

For further guidelines on implementing the LSMS Fuel Sources Module, including detailed notes on each question, please see Chapter 4 of *Energy Policies and Multitopic Household Surveys* available.[222]

ADAPTATION:

The list of household fuels in this module is suggestive and should be adapted for local contexts as appropriate. This includes removing and adding fuel sources that are/not available in the activity area, as well as further adapting or providing definitions for the existing fuel types.

UNIT:	DISAGGREGATE BY:
Percent	N/A
TYPE:	DIRECTION OF CHANGE:
Outcome	Higher is better.

[222] O'Sullivan, Kyran, and Douglas F. Barnes. "Energy Policies and Multitopic Household Surveys." World Bank Working Papers, 2006. https://doi.org/10.1596/978-0-8213-6878-7.

INDICATOR TITLE: Percent of households using renewable fuel sources or grid-connected electricity	
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary household decision-maker (male or female) from sample households. If this person is not available, another adult from the household may be used for reporting. Note that the household members that pay for or collect fuels are usually the best-informed respondents.
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the resilience-sensitive activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).	

Socio-economic Well-being

Pathways To Change

HEARTH activities might increase incomes and overall socio-economic well-being due to direct employment or participation in a conservation enterprise, as well as greater agricultural productivity/yields (thus leading to greater agricultural income, or greater consumption of self-produced food allowing household finances to be spent on other purchases). Improved socio-economic well-being should also contribute to greater household resilience to shocks and stressors. Relatedly, some HEARTH activities include approaches directly related to increasing access to credit/finance (e.g., savings groups, microfinance/credit). For others, increases in access to credit/finance might be an indirect outcome due to increased incomes, which might increase demand for such services.

Recommended Outcomes and Indicators

Outcome	Description	Recommended Indicator & Duration
Increased socio-economic well-being	Income and consumption are the foremost measures of socio-economic status, but each has serious limitations to their use. Wealth indices are often used as a proxy for socio-economic status when income or consumption cannot be directly measured accurately/reliably. The DHS asset-based wealth index[223] is an absolute wealth index (AWI), and includes questions on household members, land/housing, access to finance/banking, water and sanitation, dwelling materials, fuel, livestock, and assets/durable goods, among others.[224] The Comparative Wealth Index (CWI) is then constructed from the AWI to make indices comparable across surveys and time.[225] Methodologies for constructing these indices are well-described and widely accepted in the broader research	**Indicator:** Percent of households below the comparative threshold for the poorest quintile of the Asset-Based CWI **Source:** FTF Indicator EG-g [ZOI-level] Percent of households below the comparative threshold for the poorest quintile of the Asset-Based

[223] The Demographic and Health Surveys Program. Wealth index: "The DHS Wealth Index." The DHS Program - Research Topics. The Demographic and Health Surveys Program, 2016. https://dhsprogram.com/topics/wealth-index/Index.cfm.

[224] Rutstein, Shea O. "Steps to Constructing the New DHS Wealth Index." Programming Wealth Index. The Demographic and Health Surveys Program, 2014. https://dhsprogram.com/programming/wealth%20index/DHS_Wealth_Index_Files.pdf.

[225] Rutstein, Shea O., and Sarah Staveteig. "Making the Demographic and Health Surveys Wealth Index Comparable." Making the Demographic and Health Surveys Wealth Index Comparable (English). The Demographic and Health Surveys Program, February 1, 2014. https://preview.dhsprogram.com/publications/publication-mr9-methodological-reports.cfm.

Outcome	Description	Recommended Indicator & Duration
	community, and have been used by both USAID/Bureau for Global Health and USAID/Bureau for Resilience and Food Security. For more in-depth discussion on measuring SES, please see Annex 6. Socio-economic Status, which includes more details on the limitations and benefits of various approaches outlined here. In addition to providing a snapshot in time of how wealthy or poor a particular household is relative to a common wealth distribution, the number and type of assets a household owns is associated with household resilience across national contexts, indicating that asset accumulation can serve as a buffer against shocks (e.g., Jalan and Ravallion 2002,[226] Dercon 2004[227]). While asset-based indices are cognitively easier for respondents to provide accurate and precise data on, it is still somewhat time consuming to collect all the required data given the breadth of information covered, and so trade-offs with survey implementation costs should be considered.	Comparative Wealth Index[228] **Duration:** 15 minutes
Increased financial inclusion	Access to microfinance, lending programs and/or banking are some pathways to a household's financial inclusion. Access to financial services is important for households to diversify their livelihood strategies, protect well-being outcomes and manage risks, and women's access to finance and credit can be an important pathway for empowerment. This indicator will measure financial inclusion by collecting data on (1) those who took out a loan or borrowed cash/in-kind and (2) those with formal banking institution	**Indicator:** Percent of households participating in micro-finance, lending programs and/or banking **Source:** FTF Indicator EG.4.2-7 [IM-level] Number of individuals participating in USG-assisted group-based

[226] Jalan, Jyotsna, and Martin Ravallion. "Geographic Poverty Traps? A Micro Model of Consumption Growth in Rural China." Journal of Applied Econometrics 17, no. 4 (2002): 329–46. https://doi.org/10.1002/jae.645.

[227] Dercon, Stefan. "Growth and Shocks: Evidence from Rural Ethiopia." Journal of Development Economics 74, no. 2 (2004): 309–29. https://doi.org/10.1016/j.jdeveco.2004.01.001.

[228] Feed the Future. "Feed the Future Indicator Handbook." US Government's Global Hunger and Food Security Initiative, September 2019. https://fr.fsnnetwork.org/sites/default/files/ftf_agriculture_guide_0.pdf.

Outcome	Description	Recommended Indicator & Duration
	accounts. Additional information is also collected on financial access, for those who have not directly taken a loan or borrowed cash/in-kind, but who would have been able to if they wanted. Questions for (1) are adapted from the A-WEAI module of the FTF core questionnaire,[229] and for (2) from the DHS Household Survey.	savings, micro-finance, or lending programs; EG.4.2-a [ZOI-level] Percent of households participating in group-based savings, micro-finance, or lending programs[230] **Duration:** 5-10 minutes

[229] The module includes follow-up questions for each source on (1) who made the decision to borrow, and (2) who makes the decision about what to do with the money borrowed. These may be included if additional information is desired on intra-household decision-making dynamics related to access to finance.

[230] Feed the Future. "Feed the Future Indicator Handbook." US Government's Global Hunger and Food Security Initiative, September 2019. https://fr.fsnnetwork.org/sites/default/files/ftf_agriculture_guide_0.pdf.

Performance Indicator Reference Sheets

INDICATOR TITLE: Percent of households below the comparative threshold for the poorest quintile of the Asset-Based CWI

DEFINITION:

This indicator reflects the percentage of households whose ownership (or lack thereof) of selected assets places the household below a fixed threshold (with a value of -0.9080) that defines the poorest quintile (bottom 20 percent) in the cross-nationally, cross-temporally comparable asset-based CWI. Data from reference surveys are used to develop the reference values which allows the wealth index to be compared across countries and time.

The CWI is calculated according to the methodology specified in Rutstein and Stavetieg 2014[231] using the following standard household level asset variables, plus selected additional country-specific asset variables if any are specified: employment of domestic servants; ownership of agricultural land and size of land; number of people per sleeping room; house ownership; water source; toilet facility (type and shared status); floor material; roof material; wall material; cooking fuel; access to electricity; and possession of radio, television, mobile phone, non-mobile telephone, computer, refrigerator, watch, bicycle, motorcycle or scooter, animal-drawn cart, car or truck, boat with a motor, bank account, cows, other cattle, horses, donkeys, mules, goats, sheep, chicken or other poultry, or fish. It should be noted that not all of these items are material assets, but the list also includes some variables (such as land/home ownership, water source and sanitation facilities, etc.) to capture more multidimensional measures of poverty.

Constructing the CWI indicator involves seven key steps: (1) selection of a reference survey to serve as the point for comparison across all HEARTH activity surveys,[232] (2) calculation of the AWI for the selected reference survey, (3) calculation of a set of anchoring points for the reference survey, (4) calculation of the AWI for the HEARTH activity survey being analyzed, (5) calculation of a set of anchoring points for the HEARTH activity survey being analyzed, (6) conversion of the AWI scores for all sampled households in the HEARTH activity survey being analyzed into comparable scores using the anchoring points calculated in Steps 3 and 4, and (7) determination of the percentage of households below the comparative threshold for the poorest quintile of the reference survey.

[231] Rutstein, Shea O., and Sarah Staveteig. "Making the Demographic and Health Surveys Wealth Index Comparable." Making the Demographic and Health Surveys Wealth Index Comparable (English). The Demographic and Health Surveys Program, February 1, 2014. https://preview.dhsprogram.com/publications/publication-mr9-methodological-reports.cfm.

[232] Given the overlap between FTF and HEARTH countries, the FTF reference surveys/values for Steps 1 through 3 will be used for HEARTH. For additional details, please see the Feed the Future Survey Implementation Document: Guide to FTF Statistics section on guidelines to construct the CWI indicator.

INDICATOR TITLE: Percent of households below the comparative threshold for the poorest quintile of the Asset-Based CWI	
For further details on constructing the AWI and CWI, please see the Comparative Wealth Index Section of the Guide to Feed the Future Statistics.[233]	
ADAPTATION: In the interest of preserving data quality, it is important to minimize the number of questions in the household survey questionnaire for each HEARTH activity. However, teams may find that there are important country-specific assets that are not reflected in the core HEARTH survey questionnaire. For selecting country-specific assets, teams should consider whether there are assets typical of the country that, were they not included in the wealth index, would produce an inaccurate reflection of wealth ownership in the country. When identifying this small number (2-3) of country-specific assets, it is important to try to ensure that there is a balance in the extent to which those assets represent both urban and rural types of wealth and are accessible to both urban and rural populations (e.g., a watch), and to avoid including assets that are dependent on infrastructure requirements that are already captured in the core assets (like electricity). However, one can also consider achieving balance in asset selection by choosing two important assets that represent distinctly rural (e.g., camel ownership) and urban (e.g., in-home WiFi access) types of wealth.	
UNIT: Percent	DISAGGREGATE BY: N/A
TYPE: Outcome	DIRECTION OF CHANGE: Lower is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Primary adult decision-maker for the household, who would be most knowledgeable about overall household management.

[233] Last revised October 2020: "Guide to Feed the Future Statistics Zone of Influence Survey." Feed the Future. United States Agency for International Development, October 2020. https://docs.google.com/document/d/1v1xeQ2z5f7QfiHeubHaeeh9o5JBMmYEi/edit#heading=h.i17xr6.

INDICATOR TITLE: Percent of households below the comparative threshold for the poorest quintile of the Asset-Based CWI
REPORTING NOTES
In addition to reporting the percent value, the number of participant households of the activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted).

INDICATOR TITLE: Percent of households participating in micro-finance, lending programs and/or banking

DEFINITION:

This indicator tracks financial inclusion through individual participation in microfinance, lending programs and/or banking. The benefits of financial inclusion include lower transaction costs of day-to-day interactions (e.g., Mobile Money) and access to credit to invest in Micro, Small and Medium enterprises. According to the World Bank, microfinance can be defined as approaches to provide financial services to households and microenterprises that are excluded from traditional commercial banking services. Typically, these are low-income, self-employed, or informally employed individuals, with no formalized ownership titles on their assets and with limited formal identification papers.[234]

It should be noted that the indicator captures the numbers who are participating but does not say anything about the intensity of participation.

A household is participating in micro-finance, lending programs, and/or banking if any member of the household took a loan or borrowed cash or in-kind from, or has an account with, a micro-finance or lending program in the past 12 months.

- The numerator is the sample-weighted number of households that participated in micro-finance, lending programs and/or banking in the previous 12 months
- The denominator is the sample-weighted number of households with micro-finance, lending program and/or banking participation data

This indicator will be disaggregated by product type (credit, including microfinance, or banking) and type of institution (formal or informal). Formal institutions include NGO, formal lender (bank/financial institution), and government lender, and informal institutions include informal lender, group-based microfinance (although this may need to be assessed in each local context), friends or relatives, and informal credit/savings groups.

DATA COLLECTION:

Data on increased financial inclusion is measured by collecting data on (1) those who took out a loan or borrowed cash/in-kind and (2) those with formal banking institution accounts. Additional information is also collected on financial access, for those who have not directly taken a loan or borrowed cash/in-kind but who would have been able to if they wanted.

Participation with credit is measured by asking if anyone in the household has taken any loans or borrowed cash/in-kind from 7 different sources in the past 12 months: NGO, informal lender, formal lender (bank/financial institution), friends or relatives, group-based microfinance or lending,

[234] For more on microfinance please see the World Bank FINDEX: "The Global Findex Database." World Bank Programs. World Bank, 2017. http://www.worldbank.org/en/programs/globalfindex.

INDICATOR TITLE: Percent of households participating in micro-finance, lending programs and/or banking	
informal credit/savings groups, or government lender. This is followed up by a question regarding whether anyone in your household would be able to take a loan or borrow cash/in-kind if they wanted to.[235] Finally, access to banking is measured by asking if any member of the household has an account in a bank or other financial institution, and whether any member of the household uses a mobile phone to make financial transactions such as sending or receiving money, paying bills, purchasing goods or services, or receiving wages.[236]	
ADAPTATION: To adapt to the country context, locally relevant examples may be given within lending source categories. Additionally, not all types of lending sources might be available in all areas (e.g., government lenders) and therefore sources should only be included, as relevant. If of interest or directly relevant for HEARTH activities, teams may include similar questions (not to be aggregated into this indicator) on savings.	
UNIT: Percent	DISAGGREGATE BY: Sex of Respondent: Female, Male Product Type: Credit (including microfinance), Banking Type of Institution: Formal, Informal
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
MEASUREMENT NOTES	
INTENDED RESPONDENT:	Ideally, this set of questions should be asked both to the primary adult male and female decision-makers in each household. This is

[235] The recommended questions on access to credit come from the Abbreviated Women's Empowerment in Agriculture Index Questionnaire (Module 6.3b): "Feed the Future Zone of Influence Survey Methods - Questionnaire." Feed the Future, 2020. https://docs.google.com/spreadsheets/d/18drihQ1qe39L1Qj9qXSA0M3Yf7E4MXrR/edit#gid=1928718979.

[236] The recommended questions on access to banking come from the DHS Household Survey (Questions 134 and 135): "Demographic and Health Survey Module Household Questionnaire." Demographic and Health Survey. United States Agency for International Development, June 19, 2020.

INDICATOR TITLE: Percent of households participating in micro-finance, lending programs and/or banking	
	because women's access to finance and credit is a critical pathway for empowerment (and indeed, A-WEAI questions were designed to be asked to men and women).
REPORTING NOTES	
In addition to reporting the percent value, the number of participant households of the activity must be reported, to allow a weighted average percent to be calculated across HEARTH activities for reporting. Additionally, activities should report on the total sample size (including any disaggregation for participant households vs. comparison/control households if an evaluation is being conducted). If a household participates in credit programs and formal banking, they should be counted for each of the product type disaggregates, but only once for the sex disaggregates and overall financial inclusion.	

Governance

Pathways To Change

Many HEARTH activities include strategic approaches related to improved governance including community participation, rights/security, resolution mechanisms, and monitoring/enforcement. These improvements in governance and natural resource management are important intermediary links for other outcomes, particularly biophysical. To better measure the role of various stakeholder groups in governance, it is recommended that this set of outcomes be measured through a community-level assessment tool as opposed to the core HEARTH household survey questionnaire.

Recommended Outcomes and Indicators

Outcome	Description	Recommended Indicator & Duration
Increased community participation in resource governance Increase in rights and/or security Strengthened resolution mechanisms Monitoring and enforcement	SAGE is a participatory assessment methodology, developed to measure a variety of governance outcomes including the following: • Participation in decision-making • Recognition of rights • Transparency and accountability • Access to justice including effective dispute resolution • Fair and effective law enforcement • Benefits sharing • Achievement of conservation and other related objectives • Effective intersectoral coordination and collaboration This participatory approach is in line with HEARTH's commitment to engaging with beneficiaries throughout the Program Cycle. If of interest, HEARTH activities may add governance related questions to the household-level survey as well.	**Indicator:** Average score across SAGE outcome areas **Source:** International Institute of Environment and Development (IIED)[237] **Duration:** 4-6 weeks in total including 1-2 days of facilitated data collection for each site-level assessment

[237] "State-Level Governance, U.S." The SAGE Encyclopedia of Higher Education, 2020. https://doi.org/10.4135/9781529714395.n522. https://www.iied.org/site-level-assessment-governance-equity-sage.

Outcome	Description	Recommended Indicator & Duration
	This would be in addition to existing questions on participation in farmer, water, and forest user groups in the Agriculture and Land module.	

Performance Indicator Reference Sheets

INDICATOR TITLE: Average score across SAGE outcome areas

DEFINITION:

SAGE[238] is a stakeholder-led assessment conducted at the community level to enable site-level actors to improve the governance and equity of their conservation and related work to improve both social and conservation outcomes. SAGE also generates information for actors at higher levels for management oversight, improving governance of area-based conservation measures. This approach was developed by the IIED and has been pilot tested in nine countries. The SAGE methodology measures program outcomes both quantitatively and qualitatively, provides a shared learning experience across stakeholders, and generates learning and ideas for adaptive management.

SAGE tracks outcomes based on 10 principles of governance and equity, which overlap with relevant outcomes areas for HEARTH. As a practical matter, SAGE recommends limiting the assessment to eight outcomes. For HEARTH, these should include:

1. Full and effective participation of all relevant actors in decision-making
2. Recognition of rights of community members
3. Transparency, information sharing, and accountability
4. Access to justice including effective dispute resolution processes
5. Fair and effective law enforcement
6. Benefits equitably shared among relevant actors
7. Achievement of conservation and other related objectives
8. Effective intersectoral coordination and collaboration between actors, sectors, and levels

The last of these—effective intersectoral collaboration—is especially important for HEARTH, given the co-creation of its activities by the private sector, communities, government, and civil society partners. The participatory assessment methodology of SAGE includes all of these stakeholders, including specific mechanisms to ensure the full participation of women and marginalized groups.

The SAGE manual (April 2021 PDF) provides additional details for reporting and survey questions.

DATA COLLECTION:

Individuals from each stakeholder group are convened and led in a facilitated assessment over the course of 1-2 days. Each stakeholder group scores each outcome area on a scale of 0-3 based on

[238] ibid

INDICATOR TITLE: Average score across SAGE outcome areas

questions that SAGE has prepared (questions can be tailored as appropriate for each HEARTH site). Group members are asked to provide evidence for their opinions and to offer any specific ideas for action. These responses are recorded.

This is followed the next day by a synthesis workshop that brings together the stakeholder groups and shares their respective governance and equity assessment results. This discussion explains any differences of opinion, narrowing those differences where possible based on additional information exchanged by the participants. A summary table and graphic show the average score for each outcome, taking account of any changes in responses that may have been made as a result of the discussion. In addition to the scores, the summary table for each outcome includes identification of key issues, questions reflecting large differences in groups' scores, and ideas for action to improve divergent responses.

SAGE assessments are intended to be done after two years of operation of program management and governance systems, with options for using qualitative outcome harvesting measurement techniques in between full SAGE assessments. However, it is also recommended to conduct assessments at project start-up to both provide a comparison for change over time, as well as potentially inform programming needs.

ADAPTATION:

While eight outcomes are recommended, it is possible that HEARTH activities may add or remove outcomes as relevant for their theories of change. For example, law enforcement might be more relevant for activities that have strategic approaches focusing on improvements to monitoring and enforcement systems, but not others.

In addition, the questions that are asked to each stakeholder group to score each outcome area should also be tailored as appropriate for each HEARTH activity. For example, one of the questions for the respect for rights outcome is "What proportion of adults in the community are aware of their right to [insert a relevant right]?" which would need to be adapted to the local context.

COST CONSIDERATIONS:

For each site-level assessment, one experienced facilitator and two to four less experienced facilitators are required, along with a few local note takers. Including the preparatory stakeholder analysis and site profile, the assessment takes 4-6 weeks. In areas with multiple sites, the assessment may be conducted in a central location or may be based on representative sampling. IIED estimates that the range of costs for an assessment is USD 2,000-10,000, with recent experiences in the range of approximately USD 6,000-7,000.

INDICATOR TITLE: Average score across SAGE outcome areas	
While there are several IIED-certified SAGE facilitators and more are currently being trained across multiple countries, there may be a need for training additional facilitators. This would only take a day or two and add some modest cost, but the key consideration is to ensure quality control for the facilitation process.	
UNIT: Score ranging from 0 to 3	DISAGGREGATE BY: Each outcome area included in the assessment
TYPE: Outcome	DIRECTION OF CHANGE: Higher is better
REPORTING NOTES	
See additional details in the SAGE manual (April 2021 PDF) regarding reporting	

Private Sector Engagement

Pathways To Change

Partnerships with the private sector are central to the HEARTH model to advance integrated investments in conservation, agriculture, health, governance, and other sectors. Measuring the number of USAID engagements jointly undertaken with the private sector and the number of private sector enterprises engaged with USAID to support U.S. foreign assistance objectives will allow the HEARTH portfolio to report on its success building these public-private partnerships. Measuring the amount of investment leveraged from the private sector, when combined with metrics on the number of joint engagements and number of enterprises engaged, will provide an indication of the depth of investments made across HEARTH.

Recommended Outcomes and Indicators

Outcome	Description	Recommended Indicator
Increased private sector engagement	This indicator measures the breadth of USAID engagement with the private sector for the reporting year. An engagement is defined as a "strategic approach to planning and programming through which [the USG] consults, strategizes, aligns, collaborates, and implements with the private sector for greater scale, sustainability, and effectiveness of development or humanitarian outcome". Engagements "affect the approach or programmatic strategy or objective in achieving the desired U.S. foreign assistance objective." An engagement is purpose oriented and can be a convening of private sector actors or a series of interactions with the private sector actor(s). For more details, please see USAID's Private Sector Engagement Policy and Standard Indicator Reference Sheet.[239]	**Indicator:** Number of USG engagements jointly undertaken with the private sector[240]
	This indicator sums the total number of private sector enterprises worked with in the reporting year. A private	**Indicator:** Number of private sector

[239] "Private-Sector Engagement Policy." United States Agency for International Development, 2018. https://www.usaid.gov/sites/default/files/documents/1865/usaid_psepolicy_final.pdf.

[240] Fact Sheet Collaborating, Learning and Adapting at USAID. Number of Engagements, n.d. https://prod.usaidlearninglab.org/sites/default/files/resource/files/110117_usaid_fact_sheets_final.pdf.

Outcome	Description	Recommended Indicator
	sector enterprise is defined as "For-profit, commercial entities and their affiliated foundations; financial enterprises, investors and intermediaries; business associations and cooperatives". Private Sector enterprises can vary in size and origin. For more details, please see USAID's Private Sector Engagement Policy.	enterprises that engaged with the USG[241]
	This indicator measures the amount of investment in USD leveraged through USAID engagement with the private sector for the reporting year. Investment leveraged is defined as the total amount in USD that private sector enterprises have spent through USAID joint engagements.	**Indicator:** Investment leveraged from private sector engagements with the USG to support U.S. Foreign Assistance objectives (in USD)

[241] Fact Sheet Collaborating, Learning and Adapting at USAID. Number of Private Sector Enterprises, n.d. https://usaidlearninglab.org/sites/default/files/resource/files/pse_2_-_number_of_ps_enterprises.pdf.

Performance Indicator Reference Sheets

For the number of USG engagements jointly undertaken with the private sector and the number of private sector enterprises that engaged with the USG, please see the USAID **Standard Agency PSE Indicators and Harmonizing Indicator Tool**,[242] which includes PIRS for each indicator and a template for data collection. A PIRS for the custom indicator on the amount of investment leveraged is included below.

INDICATOR TITLE: Number of USG engagements jointly undertaken with the private sector to achieve a U.S. foreign assistance objective

DEFINITION:

This indicator measures the breadth of USAID engagement with the private sector for the reporting year. An engagement is defined as a "strategic approach to planning and programming through which [the USG] consults, strategizes, aligns, collaborates, and implements with the private sector for greater scale, sustainability, and effectiveness of development or humanitarian outcome" (see USAID Private Sector Engagement Policy).[243]

An engagement can be tangible/formal with a documented arrangement (e.g., financial assistance, materials, provision of goods and services) or informational/informal (e.g., convenings, facilitation, strategy development) exchange between a private sector actor and the USG or USG implementer. An engagement counts towards this indicator if the interactions between the USG and the private sector result in a documented exchange (e.g., memorandum of understanding, strategy, activity design documentation) that affects the approach or programmatic strategy or objective in achieving the desired U.S. foreign assistance objective.

An engagement can be one convening of private sector actors or a series of interactions with the private sector actor(s). An informational meeting with a business that does not yield documented changes to either the business or the USG's strategic or programmatic approaches would not count. A Memorandum of Understanding that does not yield changes in the behavior of either the USG or the private sector actor in their approach to the MOU's stated objective does not count as an engagement.

An engagement can have multiple documented purposes:

- Strategic Alignment, Project Design and Planning: engagements that advance development of complementary strategies and project design in line with U.S. foreign assistance objective(s)

[242] Lab, Learning. "PSE MEL: Standard Agency PSE Indicators and Harmonizing Indicator Tool." USAID Learning Lab. United States Agency for International Development, September 24, 2021. https://usaidlearninglab.org/library/pse-mel-standard-agency-pse-indicators-and-harmonizing-indicator-tool.

[243] "Private-Sector Engagement Policy." United States Agency for International Development, 2018. https://www.usaid.gov/sites/default/files/documents/1865/usaid_psepolicy_final.pdf.

INDICATOR TITLE: Number of USG engagements jointly undertaken with the private sector to achieve a U.S. foreign assistance objective

- Advocacy/Strengthening the Enabling Environment: engagements that address regulatory, legislative, and rule of law bottlenecks in a country's business enabling environment
- Harnessing Private Sector Expertise and Innovation: engagements that harnesses innovation, technology, research and development, industry expertise, and/or entrepreneurial skills to achieve development outcomes with or without USG financial commitments
- Mobilizing Private Sector Financial Resources: engagements that leverage private-sector funding – including corporate social responsibility and philanthropy assets – or increase access to markets –such as through foreign direct investment or credit guarantees-- to address a U.S. foreign assistance objective with or without USG financial commitments
- Technical Assistance to Local Private Sector Actors – engagements that provide capacity building services-- such as training or mentoring/coaching-- to local private sector actors. Engagements with local or international private sector actors that only provide capacity building support to the local private sector is not counted

Multiple USG engagements can occur within an implementing mechanism carrying out an activity. USG engagements can also occur outside any formal procurement process such as actions that aim to identify shared interests or jointly advocate for regulatory reforms and other enabling environment actions.

The private sector is defined as "For-profit, commercial entities and their affiliated foundations; financial institutions, investors and intermediaries; business associations and cooperatives; micro, small, medium and large enterprises that operate in the formal and informal sectors; American, local, regional, and multinational businesses; and For-profit approaches that generate sustainable income (e.g., a venture fund run by a non-governmental organization (NGO) or a social enterprise)" (See USAID's Private Sector Engagement Policy)

"Jointly undertaken" is defined as an engagement between the USG, or a USG implementer, and the private sector that results in a coordinated action that can be implemented jointly, or separately in parallel.

U.S. foreign assistance objective refers to strategic, development, and humanitarian assistance objectives as identified in the Department of State-USAID Joint Strategic Plan and USAID Country Development and Cooperation Strategies.

Under the "purpose of joint engagement" and "U.S. foreign assistance objective addressed" disaggregates, count all purposes and objectives that apply to the engagement. These disaggregates do not need to aggregate to the total result reported under the parent indicator.

Report the engagement only once under the "market-based engagement" disaggregate. A market-based approach is defined as the use of business models and leveraging of market forces to solve development and humanitarian challenges without beyond the life of the engagement and without

INDICATOR TITLE: Number of USG engagements jointly undertaken with the private sector to achieve a U.S. foreign assistance objective	
USG assistance. Proof of concept is not needed for an engagement to count toward this disaggregate. To be counted, documentation must exist that either market forces were addressed, or a business model developed as part of the engagement development process with private enterprise(s). This documentation is typically found in implementation plans, strategy design, or MERL frameworks. Corporate or Private Philanthropies and Foundation engagement with the USG that use business models and leveraging of market forces in the design and implementation of the engagement count as a market-based engagement. A market-based approach can engage low-income people as customers and supply them with products and services they can afford; or, as business associates (suppliers, agents, or distributors), to provide them with improved incomes.	
UNIT: Number (USD)	DISAGGREGATE BY: **Purpose of Joint Engagement:** Strategic Alignment/Planning; Advocacy/Strengthening the Enabling Environment; Harnessing Private Sector Expertise & Innovation; Mobilizing private sector financial resources; Provided Technical Assistance to the Local Private Sector; Other **U.S. Foreign Assistance Objective:** Peace and Security; Democracy and Governance; Health; Education; Economic Growth; Climate Change; Environment; Food Security, Nutrition Resilience Water, Hygiene, and Sanitation; Other **Type of Engagement:** Market-Based; Non-Market Based
TYPE: Output	DIRECTION OF CHANGE: Higher is better
FREQUENCY: Annual	DATA SOURCE: Operating Units and Implementing Partners records
REPORTING NOTES	
This indicator is a snapshot indicator and cannot be summed across reporting years to calculate a total for the life of an activity. Engagements that continue beyond the reporting year should be counted for each reporting year that it is active.	

INDICATOR TITLE: Number of private sector enterprises that engaged with the USG to support U.S. Foreign Assistance objectives

DEFINITION:

This indicator sums the total number of private sector enterprises worked with in the reporting year. A private sector enterprise is defined as "For-profit, commercial entities and their affiliated foundations; financial enterprises, investors and intermediaries; business associations and cooperatives" (See USAID's Private Sector Engagement Policy).[244] Private Sector enterprises can vary in size and origin.

An engagement is defined as a tangible/formal with documented arrangement (e.g., financial assistance, materials, provision of goods and services) or informational/informal (e.g., convenings, facilitation, strategy development) exchange between a private sector enterprise and the USG or USG implementer. An engagement counts towards this indicator if the interactions between the USG and the private sector result in a documented exchange (tangible or informational) that affects the approach or programmatic strategy or objective in achieving the desired U.S. foreign assistance objective.

An engagement can be one convening of private sector actors or a series of interactions with the private sector actor(s). An informational meeting with a business that does not yield documented changes to either the business or the USG's strategic or programmatic approaches would not count. A Memorandum of Understanding that does not yield changes in the behavior of either the USG or the private sector actor in their approach to the MOU's stated objective does not count as an engagement.

U.S. foreign assistance objective refers to strategic, development, and humanitarian assistance objectives as identified in the Department of State-USAID Joint Strategic Plan and USAID Country Development and Cooperation Strategies.

There are four disaggregate types: U.S. Foreign Assistance Objective(s) Addressed, type of private sector enterprise, origin of private sector enterprise, and the size of the private sector enterprise. Count the private sector enterprise only once under the "Type of Private Sector enterprise," "Origin of Private Sector enterprise," and "Size of Private Sector enterprise." You can select all the disaggregate types that apply to the private sector enterprise under the "U.S. Foreign Assistance Objective(s) Addressed."

UNIT:	DISAGGREGATE BY:
Number (USD)	**U.S. Foreign Assistance Objective:** Peace and Security; Democracy and Governance; Health; Education; Economic Growth; Climate Change;

[244] "Private-Sector Engagement Policy." United States Agency for International Development, 2018. https://www.usaid.gov/sites/default/files/documents/1865/usaid_psepolicy_final.pdf.

INDICATOR TITLE: Number of private sector enterprises that engaged with the USG to support U.S. Foreign Assistance objectives	
	Environment; Food Security, Nutrition Resilience Water, Hygiene, and Sanitation; Other **Type of Private Sector enterprise:** For-profit commercial entities (excluding financial enterprises and social enterprises); Private financial enterprises (excluding social enterprises); Private social enterprises; Corporate foundations and corporate philanthropic entities; Private grant-making foundations Business, Trade and Industry Associations (including Chambers of Commerce); Private Cooperatives; Other **Origin of Private Sector enterprise:** US-Based; Host Country-Based; Third Country-Based
TYPE: Output	DIRECTION OF CHANGE: Higher is better
FREQUENCY: Annual	DATA SOURCE: Operating Units and Implementing Partners records
REPORTING NOTES	
This indicator is a snapshot indicator and cannot be summed across reporting years to calculate a total for the life of an activity. Engagements that continue beyond the reporting year should be counted for each reporting year that it is active. **PPR REPORTING NOTE**: list all private enterprise names in the indicator narrative when reporting for the PPR. USAID will be responsible for analyzing data and cleaning any double counting as data are aggregated to reflect Agency-level results for the fiscal year.	

INDICATOR TITLE: Investment leveraged from private sector engagements with the USG to support U.S. Foreign Assistance objectives (in USD)

DEFINITION:

This indicator measures the amount of investment in USD leveraged through USAID engagement with the private sector for the reporting year. **Investment leveraged** is defined as the total amount in USD that private sector partners bring to the HEARTH activities (the portion not contributed by USAID) and should include both cash and in-kind resources.

A **private sector enterprise** is defined as "For-profit, commercial entities and their affiliated foundations; financial enterprises, investors and intermediaries; business associations and cooperatives" (See USAID's Private Sector Engagement Policy).[245] Private Sector enterprises can vary in size and origin.

An **engagement** is defined as a tangible/formal with documented arrangement (e.g., financial assistance, materials, provision of goods and services) or informational/informal (e.g., convenings, facilitation, strategy development) exchange between a private sector enterprise and the USG or USG implementer. An engagement counts towards this indicator if the interactions between the USG and the private sector result in a documented exchange (tangible or informational) that affects the approach or programmatic strategy or objective in achieving the desired U.S. foreign assistance objective.

An engagement can be one convening of private sector enterprises or a series of interactions with the private sector enterprise(s). An informational meeting with a business that does not yield documented changes to either the business or the USG's strategic or programmatic approaches would not count. A Memorandum of Understanding that does not yield changes in the behavior of either the USG or the private sector enterprise in their approach to the MOU's stated objective does not count as an engagement.

U.S. foreign assistance objective refers to strategic, development, and humanitarian assistance objectives as identified in the Department of State-USAID Joint Strategic Plan and USAID Country Development and Cooperation Strategies.

UNIT:	DISAGGREGATE BY:
Number (USD)	**U.S. Foreign Assistance Objective:** Peace and Security; Democracy and Governance; Health; Education; Economic Growth; Climate Change; Environment; Food Security, Nutrition; Resilience; Water, Hygiene, and Sanitation; Other **Type of Private Sector enterprise:** For-profit commercial entities (excluding financial enterprises and social enterprises);

[245] ibid

INDICATOR TITLE: Investment leveraged from private sector engagements with the USG to support U.S. Foreign Assistance objectives (in USD)	
	Private financial enterprises (excluding social enterprises); Private social enterprises; Corporate foundations and corporate philanthropic entities; Private grant-making foundations; Business, Trade, and Industry Associations (including Chambers of Commerce); Private Cooperatives; Other **Origin of Private Sector enterprise:** US-Based; Host Country-Based; Third Country-Based
TYPE: Output	DIRECTION OF CHANGE: Higher is better
FREQUENCY: Annual	DATA SOURCE: Operating Units and Implementing Partners records
REPORTING NOTES	
Count the private sector enterprise only once under the "Type of Private Sector enterprise," and "Origin of Private Sector enterprise." You can select all the disaggregate types that apply to the private sector enterprise under the "U.S. Foreign Assistance Objective(s) Addressed." Please list all private enterprise names in the indicator narrative when reporting. USAID will be responsible for analyzing data and cleaning any double counting as data are aggregated to reflect Agency-level results for the fiscal year.	

Annexes

Annex 1. Time Use

Background

SDG 5 Target 5.4, calls for recognizing, reducing, and redistributing unpaid care work as a condition for achieving gender equality.[246] One way to measure unpaid care is through time use surveys, which attempt to quantify the differences between work, care, and leisure. Time use surveys have been used by a variety of actors, including donors like the World Bank and USAID, national statistics agencies, and public health organizations. Time use surveys are popular in developed countries, such as the American Time Use Survey run by the U.S. Census Bureau and the Multinational Time Use Study at the University of Oxford, but their administration in developing countries, and Africa specifically, has been limited. The World Bank found that 135 counties had no data from 2000-2015 on the proportion of time spent on unpaid domestic and care work.[247]

Common Limitations

- Frequently, time use surveys have only allowed respondents to select their primary activity and do not account for simultaneous activities, such as cooking and caring for children, which underestimates unpaid domestic/care work. Offering a secondary activity option is one method to take simultaneous activities into account; another option is to ask respondents to answer *with whom* they are doing the activity.
- Time use diaries are subject to social desirability biases and other social norms, such as women not considering childcare as a responsibility to be noted. When designing a time use survey, it is important to consider social norms, household structures, types of employment, and other contextual variables.[248]

[246] "SDG Indicators - SDG Indicators." United Nations. United Nations, n.d. https://unstats.un.org/sdgs/metadata?Text=and;Goal=5and;Target=5.4.

[247] Rubiano, Eliana, and Haruna Kaswase. "Why Time Use Data Matters for Gender Equality-and Why It's Hard to Find." World Bank Blogs, April 18, 2018. https://blogs.worldbank.org/opendata/why-time-use-data-matters-gender-equality-and-why-it-s-hard-find.

[248] "Human Development Reports." How to strengthen the usefulness of time use surveys for policymaking | Human Development Reports, June 12, 2018. http://hdr.undp.org/en/content/how-strengthen-usefulness-time-use-surveys-policymaking.

- Surveys can either ask respondents to list their activity at a certain time or select from a list of activities. List-based surveys face trade-offs between level of activity detail and list length. Differences in activity options can also make data difficult to harmonize across surveys.
- Many surveys are one-time data collection events and do not capture seasonal time use differences.

Best Practices

The International Classification of Activities for Time-Use Statistics, within the United Nations Statistic Divisions, leads time-use research and has created nine major divisions of time to standardize across time use surveys: employment and related activities; production of goods for own final use; unpaid domestic services; unpaid caregiving services; unpaid volunteer, trainee, and other unpaid work; learning; socializing and communication/religious practice; culture, leisure, sports, mass-media; and self-care and maintenance.

Survey Options

Time use diaries are considered the "gold standard" of time use data collection and involve giving the respondent a physical diary or a phone/tablet where they document all of their activities for a designated time period in designated intervals.[249] The most common time period is one 24-hour period, but studies have done 48-hour periods or multiple, non-consecutive 24-hour periods, such as during a weekday and a weekend. Most designated intervals are 10-15 minutes, or, in some surveys, respondents were able to list their own start and end activity times. A survey in the United Kingdom successfully utilized a web-based diary and a smartphone app to collect time-use data, instead of a traditional paper diary; however, this approach would be challenging to implement in the HEARTH context as part of a monitoring system.[250] Time use diaries are traditionally standalone surveys, whereas the following two options can be individual modules within a broader household survey.

Recall questionnaires are similar to time use diaries in that respondents are asked to note all of their activities over a specified time period; however, respondents must give all activities at once to an enumerator instead of noting them in a diary. Recall questionnaires, like the AWEAI time use module, are subject to recall bias. Recall questionnaires are less expensive than time use diaries, but they have a higher degree of error and can still be lengthy in duration.

Stylized questionnaires are the least time-intensive time use option and are the recommended approach, as noted in the GESI Recommended Indicators & Outcomes memo. Instead of asking a respondent to recount all of their activities over a set period, the enumerator asks questions such as the following:

[249] Rubiano-Matulevich, Eliana, and Mariana Viollaz. "Gender Differences in Time Use: Allocating Time between the Market and the Household," 2019. https://doi.org/10.1596/1813-9450-8981.

[250] Chatzitheochari, Stella, Kimberly Fisher, Emily Gilbert, Lisa Calderwood, Tom Huskinson, Andrew Cleary, and Jonathan Gershuny. "Using New Technologies for Time Diary Data Collection: Instrument Design and Data Quality Findings from a Mixed-Mode Pilot Survey." Social Indicators Research 137, no. 1 (2017): 379–90. https://doi.org/10.1007/s11205-017-1569-5.

- How often do you engage in [pre-defined activity]?
- "How much time did you spend in [pre-defined activity] in the past 7 days?"
- "Who usually does the [various routine items of domestic work] in your household?"

Stylized questionnaires can be especially useful in countries with lower literacy rates or where informal market activities are common and clocks/watches are limited, as it could be difficult for respondents to state the precise amount of time they spend on certain activities to complete a time diary or time recall.[251] This method could also limit the primary versus secondary activity challenge by directly asking about each activity. However, stylized questionnaires are also subject to recall bias and require respondents to average time in their heads, which could lead to measurement error. Stylized questions also do not inquire about the time of day that different activities are performed, which limits analysis of the interaction between unpaid care work and economic activities.

[251] "Invisible No More? - data2x." Data 2x, March 2018. https://data2x.org/wp-content/uploads/2019/05/Data2X-Invisible-No-More-Volume-1.pdf.

Annex 2. Guidance For Using Global Forest Watch Data

Data collected, stored, and analyzed in support of USAID activities should comply with the guidance in ADS Chapter 579 (USAID, 2021a). Spatial data must also comply with the guidance included in "Geographic Data Collection and Submission Standards. An Additional Help for ADS 579" (USAID, 2021b). The latter covers important points about managing data risk, geographic data collection standards, and geographic data asset submission standards. All HEARTH implementing partners collecting and analyzing data (including spatial data) must be familiar with the contents of these Agency documents and implement actions to ensure that data collection and submission comply with their guidance.

Estimating Forest Extent

The GLAD dataset allows for a definition of forest cover as an estimated percentage of tree canopy closure for all vegetation taller than 5 meters and is encoded as a percentage per output grid cell, in the range 0 – 100. That is, each cell is attributed with a value between 0 (no canopy cover of vegetation taller than 5 meters) and 100 (complete cover of vegetation taller than 5 meters). Users can select thresholds appropriate for specific definitions of forest cover. The suggested default for HEARTH MERL is 30%, meaning that cells with a value greater than 30 are considered forested. In GFW, users can define the threshold percentage in the web interface and can select a threshold between 0 and 75 in the tabular data; in GLAD, the threshold selection needs to be implemented through map algebra.

In the GLAD dataset, layers labeled *treecover2000* (plus a convention for specific 10 x 10-degree granules) contain tree cover in the year 2000. Layers labeled *lossyear* (plus a convention for specific 10 x 10-degree granules)[252] contain forest loss during the period 2000 – X,[253] defined as a stand-replacement disturbance, or a change from a forest to non-forest state; it is encoded as either 0 (no loss) or else a value in the range 1–X, representing loss detected primarily in a year ranging from 2001 to X.[254]

[252] For example, forest extent in the year 2000 for southern Madagascar is in the layer treecover2000_20S_040E.tif and forest loss per year is in the layer lossyear_20S_040E.tif.

[253] At the time of writing the data ranged from 1 to 20.

[254] For example, a cell of value 18 represents an area where forest loss was detected in 2018.

Annex 3. Conservation Valuation

Background

Over the last few decades, economists and environmentalists have turned to several different methods to measure the value of ecosystem services – which includes a wide variety of services such as (1) provisioning goods and services such as food, fuel, etc., (2) regulating services such as flood protection or climate regulation, (3) cultural services, including spiritual or recreational benefits, and (4) supporting services necessary for other ecosystem services, such as crop pollination or photosynthesis.[255] The valuation of these biodiversity and ecosystem services is challenging as these services are often "non-market goods" – meaning that most resulting products or goods are not bought/sold in markets, and the underlying services are not often commercialized.[256]

Because the value of these ecosystem services is not captured completely by market prices, approaches such as revealed and stated preferences are often used to infer or estimate the value of ecosystem services.[257] **Revealed preference valuation**, while the more rigorous, is limited in that it does not measure "non-use values" which are either ethically or intrinsically based - for example, "the value that people assign to the survival of endangered species or the preservation of inaccessible landscapes may have nothing to do with uses they might make of them, the possibility that they might see them, or the possibility that their descendants or other people might use or see them."[258] **Stated preference valuation**, while limited in that it is not based on real choices people make, allow for estimating non-use values and are (relatively) less time consuming/less costly to implement.[259]

Attitudes towards conservation and behavioral intention are important intermediate outcomes in the HEARTH results chains, which might explain why activities do or do not see changes in conservation or threat reduction behaviors, but attitudes and intentions are not perfect predictors of behavior.[260] Survey

[255] Kashi, B., Simpson, D., Simón, C., Higgins, M., Manion, N., & Bruner, A. (2018). Integrating Ecosystem Values into Cost-Benefit Analysis: Recommendations for USAID and Practitioners. USAID. https://biodiversitylinks.org/projects/completed-projects/bridge/bridge-resources/integrating-ecosystem-values-cost-benefit-analysis

[256] Ibid.

[257] Benefit transfer is not discussed here given that it is very unlikely that activities can identify estimates of value derived at one place/time to be used to estimate value elsewhere/at another time, which are in any way standard or reasonably applicable across the HEARTH portfolio given the variety of ecosystem services and country contexts covered.

[258] Ibid.

[259] For a more in-depth discussion on ecosystem services and market failures, and ecosystem service valuation, please see "Annex 1: Key Concepts" in Kashi, et al. (2018).

[260] Hagger, Martin S. "The Reasoned Action Approach and the Theories of Reasoned Action and Planned Behavior." Psychology, 2019. https://doi.org/10.1093/obo/9780199828340-0240.

methods to measure willingness and behavioral intention and thereby stated preference valuation include **contingent valuation surveys and discrete choice experiments**. However, it is ultimately not recommended for HEARTHs to use these methods given their site-specific nature and that they are costly and time consuming to implement accurately. Instead, HEARTH activities are recommended to use direct questions on attitudes and practices related to conservation. Although these approaches may be less rigorous and more prone to bias, they are much more feasible to implement, particularly in the context of a multi-sector, global initiative.

Stated Preference Survey Options

Contingent valuation surveys ask the respondent a series of yes-or-no questions regarding the delivery of an environmental service for a specific price. They are useful when the researcher does not need information on actual behavior and when trying to price non-market goods. Contingent valuation surveys are intended to reveal willingness-to-pay for provisions of a non-market ecosystem service, such as environmental services and they are "useful for assessing impacts of program design and implementation."[261] However, contingent valuation study instruments have complex designs and can be costly compared to other survey methods. The Environmental Values Reference Inventory, maintained by Environment Canada and the US EPA, catalogs environment-related contingent valuation studies, but the willingness-to-pay estimates are very context specific (e.g., estimating farmer willingness-to-pay for ecosystem services in Lake Naivasha watershed, Kenya).[262]

With choice experiments survey respondents are asked to make choices between varying, often randomly assigned, bundles of attributes and statistical methods are used to value marginal changes in attributes based on respondents' choices. For example, choice experiments have been used to assess farmer preferences for the design of agri-environmental programs, including agreement length, conservation practices, and level of paperwork.[263] Choice experiments can overcome some of the weaknesses of contingent valuation studies as they can value marginal changes or trade-offs that are more difficult to assess with revealed preference approaches and generally capture more information. Designers of choice experiments have flexibility in the number of alternatives and attributes assessed in each survey, which can be very extensive.

Common Limitations

- The largest and most significant limitation to contingent valuation and choice experiment surveys is they are intended to be specific to the context of an individual intervention and are generally not

[261] Floress et al. Measuring farmer conservation behaviors: Challenges and best practices. *Land Use Policy* 70 (2018). https://www.fs.fed.us/nrs/pubs/jrnl/2018/nrs_2018_floress_001.pdf

[262] "Evri." Environmental Valuation Reference Inventory, n.d. https://www.evri.ca/en.

[263] Ruto, E., & Garrod, G. (2009). Investigating farmers' preferences for the design of agri-environment schemes: a choice experiment approach. Journal of Environmental Planning and Management, 52(5), 631-647. https://doi.org/10.1080/09640560902958172.

intended for comparison across contexts. Given the variety of environmental services targeted by different HEARTH activities, different scenarios would need to be set up for each, rather than being able to set up a generic set of scenarios that could be used across the portfolio.

- Survey design and analysis can be time-consuming and challenging. Effective contingent value survey designs usually required an extensive development process with cognitive interviews, pretests, and pilot studies, and the analysis of choice experiments is also complex.[264] Optimal sample sizes for choice experiments can also be difficult to calculate, as it depends on the true value of unknown parameters.[265]

Choice experiment and contingent valuation studies are best used for program *development,* compared to program *evaluation,* as intentions do not always translate into behavior. If using these methods for evaluation, researchers should consider other data sources (such as observations) for triangulation to overcome potential measurement error and social desirability bias.

[264] Carson, Richard. Contingent valuation: A practical alternative when prices aren't available. *Journal of Economic Perspectives* 26 (4): 2012, pp. 27-42.

[265] Hoyos, David. The state of the art of environmental valuation with discrete choice experiments. *Ecological Economics*. 69 (2010): pp. 15959-1603.

Annex 4. Land Measurement

The following presents details on considerations and assumptions underlying the recommendations for land-related target respondents, level (household vs. plot), and land type (agricultural vs. non-agricultural vs. combined). An option for community land ownership, if relevant given the context of HEARTH activities, is also presented.

Recommendations

Target Respondents The international best practice to capture accurate land-related information is to interview all adults about their personal land ownership and rights. It is recognized that the "business-as-usual approach of interviewing the most knowledgeable household member(s) ownership and rights leads to (1) higher rates of exclusive reported and economic ownership of agricultural land among men, and (2) lower rates of joint reported and economic ownership among women."[266] It is therefore recommended to ask questions to both the primary male and female decision-maker in the household. This will allow HEARTH activities to collect more accurate land information, as well as to disaggregate ownership, tenure formality, and security by sex.

Household vs. Plot level RECOGNIZING that best practice is to collect plot-level information on land tenure and security,[267] it is recommended for HEARTH to ask questions at the household level. This is because changes in land-related outcomes are not expected to be of primary interest based on the HEARTH activities reviewed to date, and therefore the more time consuming and costly plot-level data collection would not justify the relatively small benefit (in comparison to having more time for other more important indicators).

Agricultural vs. Non-Agricultural Land It is recommended that land questions focus on agricultural land tenure and security, given that this will be the focus of most HEARTH activities' land-related impacts. Alternatively, questions could be rephrased to ask about (1) any land (agricultural or non-agricultural), or (2) to ask the same set of questions once for agricultural land, and again for non-agricultural land. Asking about any land would not allow for disaggregation by land type (e.g., disaggregating land ownership for women by land type), while asking questions separately for agricultural and nonagricultural would add survey time (which could otherwise be given to other indicators). While asking only about agricultural land would exclude non-agricultural land related impacts, these would not be expected as a primary outcome.

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[266] Kilic, T., Moylan, H., and Joolwal, G. (2020). Getting the (Gender-Disaggregated) Lay of the Land: Impact of Survey Respondent Selection on Measuring Land Ownership and Rights. World Bank Policy Research Working Paper 9151. https://documents1.worldbank.org/curated/en/737001582039166195/pdf/Getting-the-Gender-Disaggregated-Lay-of-the-Land-Impact-of-Survey-Respondent-Selection-on-Measuring-Land-Ownership-and-Rights.pdf.

[267] Plot-level data collection allows researchers and evaluators to answer more detailed questions – for example, whether plots with formal rights or greater security have more/less investment than those without – than aggregate data at the household level.

Of additional consideration might be HEARTH activities' ability to compare results to the SDGs on land rights:

- Indicator 1.4.2 "Proportion of total adult population with secure tenure rights to land, with (a) legally recognized documentation; and (b) who perceive their rights to land as secure, by sex and by type of tenure." – Would only be possible if expanded questions to include any land, or asked for both agricultural/non-agricultural land
- Indicator 5.a.1 "(a) Proportion of total agricultural population with ownership or secure rights over agricultural land by sex; and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure." This would be possible, as the suggested core questionnaire includes amended DHS questions (which are also part of the gender indicator for household decision-making) to ask about agricultural land only (originally, they asked about agricultural or non-agricultural land combined, which would not allow for this disaggregation).[268]

Community Land Ownership

UN-Habitat through Global Land Tool Network's Global Land Indicators Initiative developed data collection tools for monitoring tenure security, including a community land ownership questionnaire.[269] The questionnaire includes 13 questions focusing on what type of land is owned collectively by the community, what guarantees ownership rights, perceptions of security, and whether there have been issues or disputes related to the land. This module would be asked to a community leader from each area, and so would require additional respondent selection and separate survey administration. It is not expected that this will be common, and therefore do not recommend collecting data on community land ownership at this time.

[268] See questions 928 – 930 from the Demographic and Health Surveys (DHS) Women's module: "Demographic and Health Survey Module Woman's Questionnaire." Demographic and Health Survey. United States Agency for International Development, June 19, 2020. https://www.dhsprogram.com/pubs/pdf/DHSQ8/DHS8_Womans_QRE_EN_19Jun2020_DHSQ8.pdf.

[269] "Monitoring Tenure Security, Data Collection Questionnaire Modules and Manual." Global Land Tool Network. GILL Working Paper No 6, n.d. https://gltn.net/tag/land-monitoring/.

Annex 5. Data Sharing Agreements

When to use data sharing agreements:[270]

- Proprietary data are being shared across organizations
- There is a need to document which organization will be responsible for releasing data and what role the other organization(s) should take in assisting with that release
- There is a need to document the acceptable use of preliminary or provisional data by a partner or collaborator
- One or more of the organizations require a data sharing agreement

What should be addressed in a data sharing agreement:[271]

- Period of agreement
    - Clearly define when the provider will give the data to the receiver and how long the receiver will be able to use the data.
    - Once the receiver agency no longer has the right to use the data, what will happen?
        - Will the data be returned to the provider, or will it be destroyed (deleted from hard drives, shredded, burned, etc.)?
- Intended use of the data
    - State as specifically as possible how the receiver will use the data.
    - What studies will be performed, what questions will be asked and what are the expected outcomes?
    - Can the receiver use the data to explore additional research questions without the approval or consent of the provider?
- Constraints on use of the data
    - List any restrictions on how the data or data findings can be used.
    - Is the receiver required to document how the data are used?
    - Can the receiver share, publish or disseminate data findings and reports without the approval or review of the provider?

[270] USGS. (n.d.). Data Management. Data Sharing Agreements. Retrieved from https://www.usgs.gov/products/data-and-tools/data-management/data-sharing-agreements.

[271] The University of Chicago. (n.d.). University Research Administration. Data-sharing Agreements. Retrieved from https://ura.uchicago.edu/page/data-sharing-agreements.

    - If the receiver generates a report based on the data, does the report belong to the receiver or the provider?
    - Can the receiver share, sell or distribute data findings or any part of the database to another agency?
- Data confidentiality
    - Describe the required processes that the receiver must use to ensure that data remain confidential.
    - Because some data may contain information that can be linked to individuals, it is important to put safeguards in place to ensure that sensitive information (e.g., salaries, exam results) remains private.
    - Personal data should remain confidential and should not be disclosed verbally or in writing to an unauthorized third party, by accident or otherwise.
    - Will the receiver report information that identifies individuals?
    - What safeguards are in place to prevent sensitive information from becoming public?
- Data security
    - Describe the methods that the receiver must use to maintain data security.
    - Hard copies of data should be kept in a locked cabinet or room and electronic copies of data should be password protected or kept on a secure disk.
    - Will everyone at the receiver agency have the same level of access to data, or will some people have restricted access?
    - What kind of password protections need to be put in place?
    - Who will have physical access to the data, including the servers and the paper files?
    - What will happen to the data after the data-sharing period ends?
- Methods of data-sharing
    - Identify the way in which data will be transferred from the provider to the receiver.
    - Will data be transferred physically or electronically?
    - If data are to be sent over the Internet, how can a secure connection be guaranteed?
    - Will the data be encrypted before being transferred?
- Financial costs of data-sharing
    - Clarify who will cover the monetary costs of sharing the data (if any)
    - Will there be expenses related to sharing the data?
    - Will the provider or the receiver share the costs, or will one agency pay for all data-sharing expenses

Annex 6. Socioeconomic Status

The following presents limitations to traditional measures of socioeconomic status (SES) including income, consumption, wealth indices, and poverty predictions.

Income and Consumption

Income and consumption are the foremost measures of SES, but each has serious limitations to their use. As summarized by Poirier et al. (2020), "there are challenges in using income or consumption measures in many LMICs, since income can be highly variable from month to month or difficult to accurately measure. Alternatively, consumption data, such as that measured by the Living Standards and Measurement Studies, can be extremely time consuming and expensive to collect."[272]

While consumption is considered the "gold standard" to measure SES (and indeed, is used by Feed the Future and other USAID programs), the cost and time to collect detailed consumption data can be prohibitive, with standard approaches taking well over an hour. This alone may make it impractical for HEARTH, but it also raises questions about data accuracy as survey duration increases. While one cost-effective approach is to aggregate items into 10-20 high level categories, these approaches come with a large cost in terms of accuracy,[273] as "efforts to aggregate categories or skip less frequently consumed items are consistently biased to underestimate consumption and therefore overestimate poverty."[274] Some more innovative approaches, such as the Rapid Consumption Survey[275] which relies on a core module and then each household completing one of several optional modules, still take on average 45-60 minutes.

[272] For more discussion, see: Poirier, M.J.P., Grépin, K.A. & Grignon, M. Approaches and Alternatives to the Wealth Index to Measure Socioeconomic Status Using Survey Data: A Critical Interpretive Synthesis. Soc Indic Res (2020). https://doi.org/10.1007/s11205-019-02187-9.

[273] Beegle, K., De Weerdt, J., Friedman, J., & Gibson, J. Methods of household consumption measurement through surveys: Experimental results from Tanzania. Journal of Development Economics, (2012). https://doi.org/10.1016/j.jdeveco.2011.11.001.

[274] Pape, Utz, and Johan Mistiaen. "Measuring Poverty in 60 Minutes." World Bank Blogs. Nasikiliza, May 12, 2017. https://blogs.worldbank.org/nasikiliza/measuring-poverty-in-60-minutes.

[275] Pape, Utz, and Johan Mistiaen. "Measuring Household Consumption and Poverty in 60 Minutes: The Mogadishu High Frequency Survey." Berkeley, January 28, 2015. http://cega.berkeley.edu/assets/miscellaneous_files/82-ABCA_-PapeMistiaen.pdf

Wealth Indices

Wealth indices are often used as a proxy for SES when income or consumption cannot be measured directly. There are several examples of established wealth indices developed to allow for cross-country comparisons which include the following:[276]

- CWI[277] – Used by Feed the Future and other USAID programs, the CWI calculates wealth indexes that are comparable across surveys and time, and that allow for direct comparison of levels of economic status. Feed the Future survey method guidance for constructing CWI is based on more than 40 questions, covering housing characteristics, asset ownership, and access to basic services, and takes about 5 -10 minutes on average.
- International Wealth Index (IWI)[278] – Similar to CWI but based on a shorter set of questions (7 assets, 3 housing characteristics, and 2 access to basic services questions). There are some drawbacks to this approach, including (1) the loss of information on the full spectrum of assets, and (2) as computations are done at one point in time, there is a risk that the weights in the index will become less meaningful over time.[279]

While wealth indices are more cost-effective to implement than consumption measures, there are concerns about the time scale over which activities would be able to measure change. While impacts to income/consumption could be expected to occur in the short term, the accumulation of assets is likely to occur more slowly, so there is a likelihood that effects on consumption would not necessarily be picked up by changes in wealth indices. Additionally, wealth indices can still be quite lengthy, with some asking questions about more than 40 different assets.

Poverty Probability Index

The Poverty Probability Index (PPI®), managed by Innovations for Poverty Action, is a poverty measurement tool that is statistically-sound, yet simple to use: the answers to 10 questions about a

[276] Note that there have been other approaches not listed here, such as Chakraborty et al. (2016) which developed simplified asset indices that go down to 6 – 18 questions per country, compared to 25 to 47 in the original DHS wealth index. This is not listed due to the smaller geographic coverage (16 countries) and because it seems to be less widely utilized. Source: Chakraborty, Nirali M, Kenzo Fry, Rasika Behl, and Kim Longfield. "Simplified Asset Indices to Measure Wealth and Equity in Health Programs: A Reliability and Validity Analysis Using Survey Data from 16 Countries." Global Health: Science and Practice 4, no. 1 (2016): 141–54. https://doi.org/10.9745/ghsp-d-15-00384.

[277] Rutstein, Shea O., and Sarah Staveteig. "Making the Demographic and Health Surveys Wealth Index Comparable." Making the Demographic and Health Surveys Wealth Index Comparable (English). The Demographic and Health Surveys Program, February 1, 2014. https://www.dhsprogram.com/pubs/pdf/MR9/MR9.pdf.

[278] Source: https://www.ru.nl/publish/pages/516298/nice_12107.pdf.

[279] Rutstein, Shea O., and Sarah Staveteig. "Making the Demographic and Health Surveys Wealth Index Comparable." Making the Demographic and Health Surveys Wealth Index Comparable (English). The Demographic and Health Surveys Program, February 1, 2014. https://www.dhsprogram.com/pubs/pdf/MR9/MR9.pdf.

household's characteristics and asset ownership are scored to compute the likelihood that the household is living below the poverty line.[280]

The PII is an established tool used by nearly 600 organizations around the world, with scorecards currently available for 60 countries. It is accurate - when tested, the difference between scorecard estimates of groups' poverty rates and the true rates at a point in time for the national poverty line is –1.7 percentage points.[281] Since it is "off-the-shelf", it would be relatively cost-effective to implement. Using just 10 questions to predict poverty would also significantly reduce data collection costs compared to other approaches and allow more time in the household surveys to measure additional outcome indicators.

However, existing PPIs are limited in that they are not available for all countries in the HEARTH portfolio, namely the Democratic Republic of Congo, Liberia, and Papua New Guinea. Additionally, for some countries, they are based on data that is not the most up-to-date available (e.g., 2010 data for Madagascar). Depending on when the PPIs were constructed, they also use out-of-date poverty lines (e.g., 2005 PPP for the international poverty lines, instead of 2011 PPP). Finally, more up-to-date methods based on machine learning (cross-validation and parameter regularization) have been used to construct the more recent PPI scorecards, but most use an outdated methodology that is less-able to account for sub-national variation.

[280] "The International Wealth Index (IWI)," n.d. https://www.povertyindex.org/about-ppi

[281] See paper on methods underlying the construction of the PPI and validation here: Kshirsagar, Varun, Jerzy Wieczorek, Sharada Ramanathan, and Rachel Wells. "Household Poverty Classification in Data-Scarce Environments: A Machine Learning Approach." arXiv.org, November 18, 2017. https://arxiv.org/abs/1711.06813.