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SCOPING STATEMENT FOR COSECHA: A RAINWATER HARVEST PROJECT IN SOUTHERN REGION OF HONDURAS

OCTOBER 14, 2015
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Cover photos: A pilot reservoir in Community Moracito, Valle, Honduras. Photo credit: Kathleen Hurley, The Cadmus Group.

SCOPING STATEMENT FOR COSECHA: A RAINWATER HARVEST PROJECT IN SOUTHERN REGION OF HONDURAS

OCTOBER 14, 2015

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Development Innovation Ventures

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CLEARANCE PAGE

Daniel M. Evans, Bureau Environmental Officer, USAID Global Development Lab

October 22, 2015

Date

EXECUTIVE SUMMARY

This Scoping Statement was prepared as part of an Environmental Assessment (EA) process for Cosecha: A Rainwater Harvest Project in Southern Region of Honduras (Cosecha). The intent of Cosecha is to evaluate potential rainwater harvesting for storing water and its impact on agricultural production and nutrition. The project will evaluate effectiveness of rainwater harvesting technology at 10 candidate sites (**Table 1**). If the project provides compelling evidence that the rainwater harvest and drip irrigation systems help the target population of Honduran farmers achieve higher agricultural productivity, then the design approach and technology used at the 10 sites could provide information on best practices for design of rainwater harvesting projects within the country and region.

The project is an activity of Global Communities (GC), the Honduras Ministry of Agriculture (MoA), the International Center for Tropical Agriculture (CIAT), and two Honduran partners, with partial funding from the USAID Global Development Lab (USAID/GDL). The Scoping Statement was prepared to comply with the Environmental Procedures of the U.S. Agency for International Development (USAID).

The Scoping Statement identifies the potentially significant impacts to be evaluated further in the EA and provides justification for eliminating non-significant impacts from the scope of the EA. The Government of Honduras has plans to develop rainwater harvesting technology to be scaled-up and implemented country-wide separate from this project; it is important to note that the analysis is limited to the 10 candidate sites of the Proposed Action. While the impacts likely to be associated with scaling-up are indicative of what may be identified as issues with rainwater harvesting in general, the sites reviewed are not necessarily representative of conditions country-wide. The Scoping Statement describes the methodology for conducting the EA, including the expertise required and the timeline.

Table 1. Ten Candidate Sites Evaluated in the Scoping Statement

DEPARTMENT	MUNICIPALITY	COMMUNITY
Choluteca	Namasigue	La Constancia
Choluteca	Namasigue	San Rafael 2
Choluteca	Namasigue	Las Pilitas 2
Choluteca	Namasigue	Vuelta del Cerro 2
Choluteca	El Triunfo	Altos de Doña Julia
Choluteca	Namasigue	Santa Irene 1
Valle	Nacaome	Altos El Estiquirin 2
Valle	Nacaome	El Tamarindo 2
Valle	Nacaome	Chaguite
Choluteca	Apacilagua	El Tamarindo 3[1]

[1] The scoping team was unable to visit El Tamarindo 3 as the landowner decided against participating in the project while the team was in Honduras.

Each of the proposed sites will use communal reservoirs linked to gravity-fed, ultra-low drip irrigation systems in combination with improved agronomic practices and technical assistance to grow both subsistence and higher-value horticultural crops. In addition to the sites listed above, the Scoping Team visited one example site with a reservoir, Moracito in Nacaome, Valle, a Global Communities pilot project. The Scoping Team observed the infrastructure required for rainwater harvesting and interviewed the project beneficiaries regarding the operation, management, and early benefits of the project. The beneficiaries indicated the water provided by the reservoir allowed them to cultivate watermelon as a cash crop, whereas previously, they were not able to cultivate crops other than subsistence crops, such as rice and beans.

The Scoping Team identified the following aspects of the project with potential significant adverse impacts (discussed in detail in Section 6) to be evaluated in the EA:

1. Maintenance of environmental water flow in the stream channels below the reservoirs;
2. Factors related to construction and design of the reservoirs for long-term sustainability, including: assessment of soil type; patterns of precipitation, including long-term patterns influenced by climate change; water volume; slope; evapotranspiration potential, specifically the surface-area-to-volume ratio; and the condition of the watershed;
3. Plans for management of cattle and/or other livestock near the reservoir sites, including exclusion of livestock and provision of other water sources for the livestock;
4. Technical assistance for the following:
    a. Planning and implementation of reforestation in the reservoir watersheds (including cultivating saplings, species selection, planting, maintenance, etc.)
    b. Managing tilapia in the reservoirs where project implementers introduce tilapia to control mosquitos;
5. Community outreach and training to reduce and mitigate unintended and unsustainable impacts on wildlife, including unsustainable levels of hunting, as wildlife may be attracted to the reservoirs as a water source;
6. Micro-watershed management for long-term sustainability of the water source and reservoir; and
7. Community management of the reservoirs, especially adding new beneficiaries to the producer group.

From stakeholder consultations, field visits, and document reviews, the Scoping Team identified eight additional concerns (listed below) that can be eliminated from detailed study in the EA. Section 6 discusses these concerns and provides justification for eliminating them:

1. Construction-related noise impacts;
2. Impacts on air quality;
3. Loss of habitat for native plants and animals within the area that will be inundated at each reservoir site;
4. Contamination of the reservoirs by agro-chemicals;
5. Impacts on vegetation within the area that will be inundated at each reservoir site;
6. Impacts related to poor management of solid and liquid waste and excrements;
7. Closing and abandonment of the project;
8. Construction-related access to reservoir sites.

The Scoping Team proposes the following expertise for inclusion on the EA Team; in some cases one team member may possess more than one of the skills below:

- Environmental Impact assessment specialist
- Hydrological/irrigation management specialist
- Climate change specialist
- Agro-forestry expert

The EA for the Cosecha project will follow the format required by the U.S. Agency for International Development in 22 CFR 216.6. The project has already received approval from the MoA and other relevant agencies. Thus, the purpose of this Scoping Statement is to fulfill the environmental compliance requirements of 22 CFR 216.

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LIST OF ACRONYMS

BEO	Bureau Environmental Officer
CAAM	Central American Atlantic Moist Forests
CAMF	Central American Montane Forests
CAPD	Central American Pacific Dry Forests
CAPO	Central American Pine-Oak Forests
CFR	Code of Federal Regulations
CIAT	International Center for Tropical Agriculture
CIIU	International Uniform Industrial Classification
DIV	Development Innovation Ventures
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EOS	Earth Observing System
FAO	Food and Agriculture Organization (of the United Nations)
FOSDEH	Foro Social de la Deuda Externa de Honduras y Desarollo
GC	Global Communities (formerly CHF International)
GDP	Gross domestic product
GHFSI	Global Hunger and Food Security Initiative
GIS	Geographic information system
HDI	Human Development Index
HTH	Calcium hypochlorite
INE	National Institute of Statistics
IPCC	Intergovernmental Panel on Climate Change
MFI	Microfinance institutions
MoA	Honduras Ministry of Agriculture
MPF	Mosquitia (Meskito) Pine Forests
masl	Meters above sea level
NGO	Non-governmental organization
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
RCT	Randomized control trial
ROI	Return on Investment
SERNA	Secretaría de Energía, Recursos Naturales, Ambiente, y Minas
SINEIA	National System for Environmental Impact Evaluation Agreement
TOR	Terms of Reference
UNDP	United Nations Development Program
USAID	United States Agency for International Development

USAID/GDL	USAID Global Development Lab
USG	United States Government

1. BACKGROUND

1.1 USAID/GLOBAL DEVELOPMENT LAB (GDL)

USAID's Global Development Lab (USAID/GDL) is a new bureau within USAID that seeks to increase the application of science, technology, innovation, and partnerships to extend the Agency's development impact in helping to end extreme poverty.

USAID/GDL aims to:

- Produce breakthrough development innovations by sourcing, testing, and scaling proven solutions to reach hundreds of millions of people.
- Accelerate the transformation of the development enterprise by opening development to people everywhere with good ideas, promoting new and deepening existing partnerships, bringing data and evidence to bear, and harnessing scientific and technological advances.

USAID/GDL's Center for Development Innovation develops new breakthroughs by supporting the discovery, incubation, and testing of solutions to specific problem areas, as well as open platforms for innovation. The Development Innovation Ventures (DIV) team was launched in 2010; it is a GDL grant-making program to find, test, and scale ideas that could radically improve global prosperity. DIV is part of the Lab's Center for Development Innovation.

DIV holds a year-round grant competition for innovative ideas, pilots and tests them using cutting-edge analytical methods, and scales solutions that demonstrate widespread impact and cost-effectiveness. DIV's tiered-funding model, inspired by the venture capital experience, invests comparatively small amounts in relatively unproven concepts and continues to support only those that prove they work. The approach consists of a three-tiered staged finance model to maximize cost-effectiveness and minimize the risk of testing new ideas. Applicants can apply at any stage:

- **Stage 1: Proof of Concept/Initial Testing**
  Stage 1 grants support the introduction of a solution in a developing country context to gain an early, real-world assessment of the solution. This includes testing for technical, organization, distribution, and financial viability. Key activities could include assessing user demand, willingness to pay, and correct usage of products and services, as well as documenting social outcomes and real world costs to implement the solution. Stage 1 funding levels range from $25,000 to $150,000 per project and can support activities for up to two years.
- **Stage 2: Testing and Positioning for Scale**
  Stage 2 grants support testing for social impact, improved outcomes and/or market viability, as well as operational refinement to build paths to sustainability and scale. Stage 2 applicants should have already met all the requirements of a Stage 1 project described above. Stage 2 funding levels range from $150,000 to $1,500,000 and can support activities for up to three years.
- **Stage 3: Transitioning Proven Solutions to Scale**
  Stage 3 grants support transitioning proven approaches to scale, which could include adaptation to new contexts and geographies. Operational challenges for scaling should be identified and addressed as a way to refine the scaling-up process. Stage 3 applicants must explain how they will use DIV funds in a catalytic fashion and demonstrate ability to obtain necessary resources outside of DIV funds. Stage 3 funding and support provides a platform for applicants to grow while engaging additional partners who will help scale the project beyond DIV support but for project applicants for whom more evidence of success and track record are needed. Stage 3 funding levels range from $1,500,000 to $15,000,000 and can support activities for up to five years.

DIV selects projects to fund based on:

- ***Cost Effectiveness***—DIV seeks applications that have the potential to deliver greater development impacts per dollar than standard practice.
- ***Rigorous Testing***—The DIV model emphasizes testing potential solutions and evaluating impacts to identify what works and what does not, and to help scale only those proven solutions.
- ***Pathways to Scal***e—Innovations are expected to eventually be scaled up through both the public and private sectors, or in some cases a combination of the two. Public sector scaling plans demonstrate that grantees are likely to compel host country governments, multilateral donors, or other public sector players to scale the innovation. Grantees who expect to scale through the private sector will plan to achieve commercial viability themselves, or convincingly demonstrate that other businesses will scale their innovation, or a combination of both.

This Scoping Statement, commissioned by USAID/GDL to begin and inform an EA, focuses on Cosecha: A Rainwater Harvest Project in Southern Region of Honduras, which is in the "testing and positioning for scale" phase (a DIV Stage 2 funded project). This Scoping Statement is limited to the proposed 10 research sites in the target region in southern Honduras.

1.2 OVERVIEW OF ENVIRONMENTAL AND DEMOGRAPHIC DATA IN PROJECT AREA

Much of Honduras' extreme poverty and chronic poor nutrition is located in the Corredor Seco ("Dry Corridor"), which extends from sea level to around 800 m.a.s.l. and consists of two zones: flat coastal plains and hilly inland areas. Commercial agriculture (mainly sugar cane and melons) and cattle pasture are the primary land uses in the coastal plain, while the hilly inland areas are heavily used by thousands of subsistence farmers whose primary crops are staple grains such as maize and beans, typically grown on parcels less than 2 ha. The area is largely defined by dry and variable climatic conditions, extending from the border of Guatemala to Nicaragua. Its geographic variability is increasing due to climate change and land use change. The findings of the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment predict a long-term drying trend across Central America, which is expected to be acute in western and southern Honduras. Increasing dryness coupled with increasing temperature and greater variability in precipitation indicate that this region is particularly vulnerable to climate change.

The Corredor Seco is a desert-like environment; desertification is increasing due to loss of vegetation, soil erosion, and increasing deforestation. These factors, coupled with reduced availability of water, irregular precipitation, and progressive loss of soil fertility, significantly impact crop production and ecosystems in the region. During intense rainy seasons, runoff causes flooding and erosion of lands lacking vegetation. Additionally, there is minimal irrigation of agriculture in this region due to the scarce availability of surface water.

The Corredor Seco includes many of the poorest municipalities in Honduras. Nearly all of the people in the region (92 percent; 650,000 people) earn less than the national extreme poverty level ($1.81 per person per day). About half (55 percent) are estimated to suffer from stunting due to malnutrition. Agricultural productivity is also very low. For example, maize yields are 14.8 quintals per manzana (qq/mz); the national average is 26.6 qq/mz, and high-technology yields are 70 qq/mz. Bean yields are 6.7 qq/mz; the national average is 10.9 qq/mz, and high-technology yields are 23.75 qq/mz.

Honduran farmers in the Corredor Seco face significant challenges, including increasing temperatures, variability in precipitation, and soil erosion; the Cosecha project is intended as one strategy to improve resiliency to these conditions in the context of predicted climate change. Farmers in the region are experiencing higher temperature variability and increased water deficit, affecting the ability of farmers to grow sustenance crops. During El Niño years, precipitation in southern Honduras decreased between 30-40 percent (FAO 2012), which significantly impacted rainfed agricultural production in the region. In 2015, the

FAO estimated a 60 percent loss of maize production in the Corredor Seco of Honduras and El Salvador due to irregular rainfall earlier this year.[1] In August 2015, the Government of Honduras declared an emergency in the Corredor Seco as a result of the prolonged drought in the region,[2] and, according to the UN Office for the Coordination of Humanitarian Affairs (UN OCHA), the drought has affected over 160,000 families in 2015. The combination of extreme poverty, undernutrition, desertification, and climate change creates an economic, environmental, and social dynamic that calls for integrated food security investment.

Social and environmental stressors in the Corredor Seco also impact other development outcomes. The United Nations Development Program Human Development Index (HDI) ranks development levels of countries throughout the world. It characterizes a country's economic status and its ability to provide citizens with an environment in which they can develop and improve their quality of life. The HDI is calculated using three criteria:

- **Life Expectancy**—average age of death.
- **Education**—Adult literacy rate and highest level of schooling achieved (primary, secondary, higher education).
- **GDP per Capita (at purchasing power parity)**—Considers the per capita GDP and evaluates access to economic resources that are necessary to achieve an appropriate standard of living.

Based on the above criteria, HDI ranks countries between 0 and 1 and classifies them into three general groups:

- HDI above 0.80 = Countries with "High Human Development"
- HDI between 0.50 and 0.80 = Countries with "Medium Human Development"
- HDI under 0.50 = Countries with "Low Human Development"

Based on these criteria and ranking system, the Cosecha project intervention area has a medium score on the Human Development Index (0.534 to 0.628 HDI) (National Institute of Statistics [INE]-Honduras Development Index, 2001).

1.3 PROJECT PURPOSE AND NEED

The Corredor Seco of Honduras is characterized by irregular precipitation and prolonged periods of extreme heat, called the "canícula" (SERNA, 2014). During El Niño events, precipitation decreases by 30-40 percent in southern Honduras, resulting in drought and loss of crops (SERNA, 2014). The targeted departments in the Cosecha project are considered particularly vulnerable to both drought and flooding, which disproportionately impacts those with few economic resources, such as smallholder farmers. Therefore, there is a **need** to improve agricultural production, decrease malnutrition, and enhance the region's resilience to the impacts of climate change by harvesting water for use in drier periods of the year.

Rainwater harvesting projects have the potential to enhance resiliency to drought and other climate variability. The **purpose** of the project is to empirically test the effectiveness of rainwater harvesting in southern Honduras by conducting a study of the impact of rainwater harvesting on agricultural production in the region and demonstrating the feasibility for larger-scale implementation. As an empirical test, the project will use a methodology that selects a representative sample of potential reservoir sites, captures costs and benefits (in terms of farmer income), and evaluates broader social and environmental benefits by using separate treatment groups to quantify the benefits to a rainwater harvesting technology intervention package plus technical assistance; technical assistance only; and the baseline (e.g., the control, or no technology or technical

[1] FAO. 2015. Major Crop Losses in Central America due to El Nino. http://www.fao.org/news/story/en/item/328614/icode/

[2] 48% of municipalities in Honduras are impacted by drought. ReliefWeb, 2015.

assistance). As a result, information from this project may provide valuable insight for future rainwater harvesting projects from design to implementation, operation, and maintenance.

1.4 PROJECT DESCRIPTION AND PROPOSED SITES

Lack of access to water is a global development challenge. The World Bank has estimated that world food needs will double by 2030, 60 percent of which will need to be met by irrigated agricultural crops. However, access to fresh water globally is limited, and management of these water resources is a global challenge (SEI 2009). In the context of increased demand for food and increased water scarcity, one recommended approach to improving agricultural production is to increase crop yields on existing lands, rather than clearing more land for food production (FAO 2009). Irrigation can support increased production on croplands, but access to irrigation in Latin America is limited. Without irrigation, farmers typically only produce one crop per year, which can fail due to unpredictable rainfall and/or drought. Over a million smallholder farmers in Honduras, El Salvador, Guatemala, and Nicaragua produce 70 percent of the maize and 100 percent of beans consumed locally (Eitzinger et al 2012). Many of these smallholder farmers live in the Corredor Seco of Central America[3], and more than 60% of Hondurans live in poverty; they are mostly concentrated in western and southern Honduras.

The Cosecha project aims to measure the impact of small-scale reservoirs and ultra-low drip irrigation systems on the incomes and food security of smallholder farmers in southern Honduras. In coordination with the Honduran Ministry of Agriculture (MoA), the International Center for Tropical Agriculture (CIAT), and the Agrolibano Foundation, Global Communities will develop 10 small-scale reservoir sites to evaluate how the jointly-owned and -managed reservoirs—combined with technical assistance to improve agronomic practices—drive producer group formation, increase yields and household incomes, and provide social and environmental benefits. The project partners' individual responsibilities include:

- **Global Communities:** General project coordination; assessment of baseline conditions; technical assistance in infrastructure and irrigation; site selection, design, and construction of the reservoirs; follow-on support for management of the reservoirs.
- **Ministry of Agriculture**: Secretary of Agriculture and Livestock: Provision of ultra-low drip irrigation for 200 parcels of ¼ ha; technical assistance for production and access to markets.
- **International Tropical Agriculture Center (CIAT):** Experimental design; baseline condition analysis; data collection, analysis, and dissemination of results; GIS analysis support.
- **Agrolibano Foundation:** Provision of heavy equipment for reservoir construction; technical assistance and support for community group formation; on-going technical assistance for reservoir operation and maintenance.

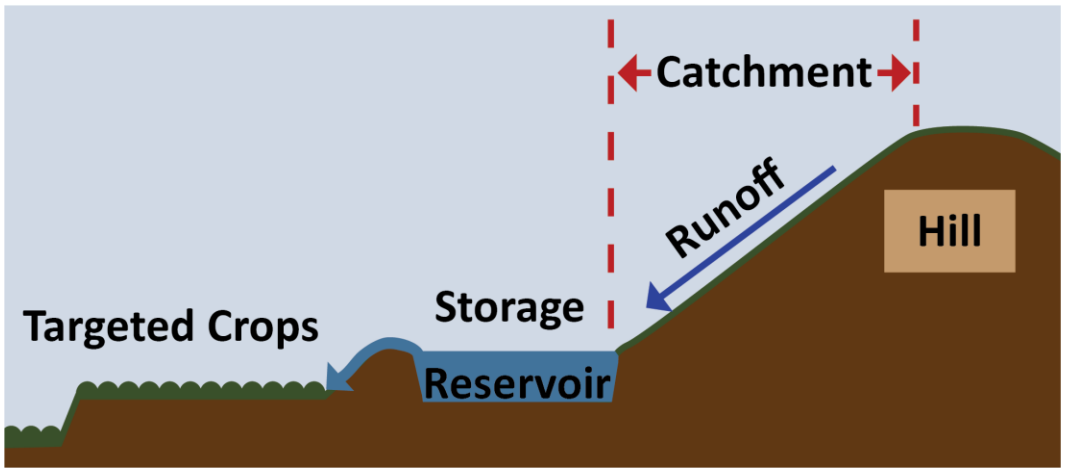
METHODOLOGY

The Cosecha project uses a randomized controlled trial (RCT) methodology to evaluate whether and how small-scale reservoir sites and technical assistance improve agronomic practices, drive producer group formation, increase yields and household incomes, and provide social and environmental benefits. The project aims to measure: 1) impacts of water harvesting interventions on crop yields, farm profits, poverty, food security, employment generation, gender inequality, group empowerment, and environmental outcomes; and 2) impacts of improved agronomic practices on the same outcomes. The sites for the 10 reservoirs were selected from a group of 40 to 50 potentially suitable sites within the five target departments where the Government of Honduras committed counterpart funding via the EmprendeSur program.

[3] The Dry Corridor (Corredor Seco) encompasses about 30% of the landmass of Central America, ranging from south of Chiapas, Mexico extending to northwestern Costa Rica, and is highly susceptible to drought.

Water harvesting is the collection of rainwater from winter streams or surface runoff that is directed to a storage reservoir for later use in agricultural production. The water harvesting system consists of a runoff area, usually an existing stream channel that collects in a storage area (the small reservoir), with overflow running off into the downstream streambed (Figure 1). This is made possible through the construction of simple water catchment and irrigation infrastructure, combined with the development of complementary irrigation systems at the smallholder farm level. Based on the Global Communities experience with the original nine pilot reservoirs (one of which was visited by the Scoping Team)—the estimated water storage capacity of the ten research sites of the Cosecha project will be between 6,000 to 35,000 m^3.

Figure 1. General Design for the Rainwater Harvesting Project



Source: Global Communities

In addition to the ten farmer communities that will receive drip irrigation services with water supplied by the ten reservoirs, two treatment groups of 200 households each will also purchase directly—or receive logistical support from non-USG sources (such as Foundation Agrolibano, FAO, the MoA or international NGOs) to purchase directly—a standard set of inputs including improved seeds for maize, beans, papaya and watermelon; access to fertilizer; and training in improved agronomic practices.

The Cosecha team will also experiment with loan products to finance reservoirs and drip kits and survey farmers from the pilot reservoirs to measure spillover effects, long-term profitability, and sustainability. While Global Communities' activities take place in vulnerable communities throughout southern Honduras, the reservoir project focuses on 39 communities specifically, 30 of which are included in the research phase (10 reservoir and 20 comparison sites). The 10 reservoirs in the research phase are the focus of the Scoping Statement. Additionally, the project design includes policy dialogue and learning exchanges with key stakeholders from Mexico, Central America, Bolivia, Colombia, Ecuador, and Peru. The Cosecha team will evaluate the impacts of the rainwater harvesting project and summarize key lessons and best practices for other organizations to replicate the methodology. The Cosecha team will analyze how best to mainstream the solution into public policy, select appropriate sites, and apply targeted subsidies to stimulate private investment in water harvesting and drip irrigation based on project's high return on investment (ROI). Finally, the Cosecha team will disseminate key lessons and best practices for others to scale the project on a national level, while also working with networks of microfinance institutions (MFIs), input distributors, business associations, research institutes, donors, and development practitioners to promote the project internationally to attract both public and private sector buy-in and investment.

SITE SELECTION

Global Communities and Agrolibano Foundation technical staff were responsible for selecting the participating communities and rainwater harvest reservoir sites. Information relevant to selecting communities and reservoir sites was obtained through consultations with local leaders, municipal authorities,

and direct beneficiaries, and this information complemented information gathered from interviews with other programs working in the region. The ten sites were selected based on the following criteria:

Table 2. Criteria used to identify potential rainwater harvesting sites

CATEGORY	CRITERIA
Topography	*Suitable sites occur where rain flows between two natural ridges and converge in a low and narrow area.*
Specific requirements:	• Lengthwise and traversing slope should be between 2-4% (the longer the lengthwise pitch, the lower the volume of the reservoir) • Length of the reservoir should be twice the length of the dam • Reservoir should be located above the cultivated land
Reservoir and Recharge zone	*The filling of the reservoir depends on the recharge zone. The larger the area from which the reservoir draws the rain runoff (recharge area), the faster the reservoir is filled*
Specific requirements:	• Land area ratio of the water source area (micro watershed) to cultivated land is 10:1 • Slope of the water discharge to the dam is at least 5% • Runoff should run down land with good plant cover, thus minimizing erosion potential • If the recharge zone does not have sufficient vegetation cover, erosion prevention measures such as construction of canals, rock walls, and live barriers may be developed
Earthen dam	*To decrease costs, the reservoir dam will be constructed using locally available materials*
Specific requirements:	• Soils should have a high clay content and should be compactable, non-permeable, and structurally stable • There should be silt or mud on the site or nearby so that it may be used in the cut-off trench, to avoid leakage through the bottom • A minimum of 50% of the construction materials should be sourced from within the reservoir and the remaining material may be sourced from the surrounding area • Maximize the height of the dam to increase water depth so as to minimize losses of evaporation. The larger the reservoir area, the greater potential water loss due to evaporation
Terrain inside the reservoir	*To minimize loss of habitat or forests, the sites were evaluated for existing plant cover.*
Specific requirements:	• High clay and silt content in the soils • Few trees • Little to no exposed rock (preference is for no rock) • Plant size exceeding 60 cm • Less than 2% soil infiltration

Other Criteria:

CATEGORY	CRITERIA
Topographical analysis	*After a potential site has been identified, a topographical analysis was undertaken to measure:*
	• Length of the earthen dam • Height of the dam • Maximum water level • Area of the reservoir • Volume of soil needed for the earthen dam • Volume of the reservoir • Efficiency index • Wall stability • Number of farmers that will benefit from the system

CATEGORY	CRITERIA
Farmer Eligibility	*Socio-economic criteria for the potential users of the irrigation systems*
Requirements for inclusion in irrigation system	• Small farmers, experienced in cultivation • Good with teamwork • Proactive, assertive attitude • Follow the norms of use such as: care of the irrigation system, efficient water use, environmental sustainability • Potential for in-kind labor contribution by the farmers • Potential for third-party co-financing (for example, from village banks) • Clear land tenure of both the reservoir site as well as the producer plots

The 10 reservoir sites included in the Cosecha project and this Scoping Statement are listed in Table 3.

Table 3. Reservoir Sites and Municipalities

DEPARTMENT	MUNICIPALITY	COMMUNITY	# FAMILIES
Choluteca	Namasigue	La Constancia	20
Choluteca	Namasigue	San Rafael 2	20
Choluteca	Namasigue	Las Pilitas 2	20
Choluteca	Namasigue	Vuelta del Cerro 2	20
Choluteca	El Triunfo	Altos de Doña Julia	10
Choluteca	Namasigue	Santa Irene 1	13
Valle	Nacaome	Altos El Estiquirin 2	12
Valle	Nacaome	El Tamarindo 2	5
Valle	Nacaome	Chaguite	4
Choluteca	Apacilagua	El Tamarindo 3*	na

* El Tamarindo 3 is no longer participating in the program. Global Communities will identify an alternate site.

2. USAID'S ENVIRONMENTAL PROCEDURES

2.1 SUMMARY OF 22 CFR 216 REQUIREMENTS

USAID's Environmental Procedures, 22 CFR 216 (also known as *Reg. 216*), govern the environmental review process for all projects, programs, or activities supported by USAID. In accordance with 22 CFR 216.2(d), the following are among the *Classes of Actions Normally Having a Significant Effect on the Environment* and require an Environmental Assessment (EA):

- Programs of river basin development;
- Irrigation or water management projects, including dams and impoundments;
- Agricultural land leveling; and
- Drainage projects.

The proposed rainwater harvesting scheme falls within the irrigation or water management category.

In accordance with Reg. 216, the first phase of the EA process—scoping—begins with the identification of potentially significant issues related to the proposed action and the determination of the scope of the issues to be addressed in the follow-on EA. To determine the scope of the EA, Reg. 216 encourages a participatory approach. As stated in 22 CFR 216.3(a)(4), persons having expertise relevant to the environmental aspects of the proposed action shall participate in the scoping process.

The scoping process results in a written statement—the Scoping Statement—that must include:

- A determination of the scope and significance of issues to be analyzed in the EA, including direct and indirect effects on the environment.
- Identification and elimination from detailed study of issues not significant or covered in earlier environmental review.
- A description of: (i) the timing of EA analyses; (ii) variations required in the format of the EA; (iii) tentative planning and decision-making schedule; and
- A description of how the analysis will be conducted, including expertise needed for the EA.

Once the Scoping Statement is completed, the presiding USAID Bureau Environmental Officer (BEO) may circulate copies to select federal agencies and request comments. Any comments received during scoping will be considered in the preparation of the EA and in the design and implementation of the project. The BEO must approve the Scoping Statement prior to preparation of the EA.

3. HONDURAS' POLICY AND INSTITUTIONAL FRAMEWORK

3.1 HONDURAS' POLICY AND REGULATORY FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT

Honduras has an extensive policy and regulatory framework for environmental management, including water management and use. The potentially applicable legislative and regulatory instruments related to use and management of water in Honduras are listed in **Error! Reference source not found.**. Given that the Honduran government has already approved the project, this section will focus on key policies that address the design and implementation of the project. Based on the Honduran Government's review of the project, the Scoping Statement and subsequent EA required by USAID are evaluations that are above and beyond the Honduran government requirements.

Table 4. Legislation and Regulation Related to Use and Management of Water in Honduras

LAW/REGULATION	DECREE/AGREEMENT NUMBER
General Water Law	Decree 181-2009
Land Use Law	Decree 180-2003
4.1.1.1 Reforms to the General Law of Public Administration	4.1.1.2 218-96
4.1.1.3 Law of National Use of Water	4.1.1.4 137
4.1.1.5 General Environmental Law	4.1.1.6 104-93
4.1.1.7 Health Code	4.1.1.8 65-91
4.1.1.9 National Technical Standard for Drinking Water Quality	4.1.1.10 84-95
4.1.1.11 Law of SANAA	4.1.1.12 91
4.1.1.13 Fishing Law	4.1.1.14 154
4.1.1.15 Law of Organic Marine Merchants	4.1.1.16 167-94
4.1.1.17 Forestry Law	4.1.1.18 85
4.1.1.19 Civil Code	4.1.1.20 76
4.1.1.21 Municipality Law	4.1.1.22 134-90
4.1.1.23 Law for the Modernization and Development of the Agricultural Sector	4.1.1.24 31-92
4.1.1.25 Law of COHDEFOR (now called the Institute for Conservation of Protected Forest Areas and Wildlife)	4.1.1.26 103 (Decree Law)
4.1.1.27 Law of the Honduran Institute of Tourism	4.1.1.28 103-93
4.1.1.29 Law of ENEE	4.1.1.30 48
4.1.1.35 Constitutive Act for Marine and Freshwater Projects	4.1.1.36 656
4.1.1.37 United Nations Framework Convention on Climate Change	4.1.1.38 26-95
4.1.1.39 Environmental Health and Sanitation Regulations	4.1.1.40 Agreement 470
4.1.1.41 Regulations of the General Environmental Law	4.1.1.42 Agreement 109-93
4.1.1.43 Regulations of the Municipality Law	4.1.1.44 Agreement 18-93
4.1.1.45 General Forestry Regulations	4.1.1.46 Agreement 634-84
4.1.1.47 General Environmental Health Regulations	4.1.1.48 Agreement 94, Gazette N° 28,593
4.1.1.49 Technical Standards for Wastewater Discharges to Receptors and Sewage	4.1.1.50 Agreement N° 058 Gazette December 13, 1997
4.1.1.51 Regulation of Land Use	4.1.1.52 Agreement 25-2004
Law for the Modernization and Development of the Agricultural Sector	Agreement 31-92
Law patronage and community association	Decree 253-2013

Source: Center for Information on Legislative Studies (CIEL); Compendium of Environmental Legislation, Honduras 2011, Compiled by Attorney Edwin Natanael Sanchez Navas

HONDURAS GENERAL ENVIRONMENTAL LAW (DECREE N° 104-93, LA GACETA JUNE 30, 1993)

The policy and regulatory framework governing environmental management in Honduras is described in the Honduras General Environmental Law (Decree Nº 104-93, La Gaceta June 30, 1993).

Article 5. Projects, industrial installations, or any other public or private activity, which could contaminate or degrade the environment, natural resources, or cultural heritage of the nation, will proceed with an obligatory environmental impact evaluation that will prevent possible negative effects.

As such, measures to protect the environment or natural resources resulting from such assessments shall be binding on all parties in the implementation phase and during the lifetime of the works or installations. For this purpose the Secretary of State for the Environment will create a national system of environmental impact assessment. Existing works or installations will be governed by the provisions in the Chapter of Final Provisions.

Article 28. In the application of this law and the respective sectoral laws for the Executive Branch through the Ministry of State for the Environment and other competent State Secretaries and decentralized institutions, the following conditions govern:

a) Execution of general environmental policy, proposed by the Ministry of Environment and approved by the President;

b) Planning the rational use of natural resources, considering their uses, alternatives and natural interplay in the ecosystem;

c) Comprehensive land use planning that considers environmental and economic issues and demographic and social factors;

d) Administration of protected natural areas;

e) Issuance and administration of technical standards to prevent and control the subject matter of this Act;

f) Control of the emission of any contaminant and registration of pesticides, fertilizers and other potentially polluting chemicals or biological or radioactive products requiring authorization for import or manufacture in accordance with the laws on the subject; and ensure that legal prohibitions apply to the introduction or manufacture of such products, which have been duly proven detrimental;

g) Control of activities considered highly risky as a result of their negative effects on health and the environment, as determined by this and other laws and regulations;

h) The prevention and control of disasters, emergencies, and other environmental contingencies that negatively impact all or part of the national territory;

i) The preparation of inventories of natural resources at the national level;

j) The ranking of watersheds;

k) The implementation of the System of National Watersheds, considering natural resources in general; and

l) Any other actions that this and other laws reserve for the Executive Power.

Article 30. The State and municipalities will have their respective jurisdiction on management, protection, and conservation of watersheds and natural water reservoirs, including the preservation of natural elements involved in the hydrological process.

Water users, regardless of the purpose for which it is intended, are obliged to use it rationally, preventing waste and ensuring reuse where possible.

Article 34. In order to regulate the water regime; avoid solid drag; and help protect reservoirs, dams, roads, agricultural lands and populations against the harmful effects of water projects, a hydrological management system will be developed.

These projects will consider watersheds as the unit of operation and management.

All hydropower, irrigation, or other projects that leverage large-scale surface water or groundwater within the country, will begin with a hydrological system plan and an EA.

Article 78. Natural or legal persons, public or private, wishing to perform any work or activity likely to seriously alter or impair the environment or natural resources is obligated to report the matter to the competent authorities and prepare an environmental impact assessment in accordance with the provisions of Article 5 of this Law.

This includes the following activities: chemical industry, petroleum chemicals, production of steel, petroleum, tannery, paper, sugar, cement, beer, shrimp, liquor, coffee and agriculture in general; the generation and transmission of electricity, mining, construction and administration of oil and gas pipelines, transport, disposal, treatment and elimination of toxic waste and dangerous substances; projects in the sectors of tourism, recreation, urbanization, forestry, human settlements, and whichever other activities could cause harm to ecologic equilibriums.

REGULATION OF THE NATIONAL SYSTEM FOR ENVIRONMENTAL IMPACT EVALUATION (SINEIA) AGREEMENT Nº 189-2009

The policy and regulatory framework governing environmental management in Honduras is further articulated in the Regulation of the National System for Environmental Impact Evaluation Agreement (SINEIA) Nº 189-2009. The Environmental License process for project Categories is as follows:

Article 30. The projects, works, or activities are categorized into four different categories taking into account relevant factors or conditions in terms of their characteristics, nature, and potential environmental impacts or environmental risk.

- Category 1 corresponds to projects, works, or activities considered low potential environmental impact or environmental risk.
- Category 2 corresponds to projects, works, or activities considered moderate potential environmental impact or environmental risk.
- Category 3 corresponds to projects, works, or activities considered high potential environmental impact or environmental risk.
- Category 4 corresponds to projects, works, or activities considered extremely high potential environmental impact or environmental risk.

All Category 1 projects, works, or activities will not be subjected to Environmental License processing. However, they will be subject to compliance with applicable environmental laws and, where applicable, the Code of Good Environmental Practices of Honduras.

Article 32. Projects, works, or activities, classified as Category 1 or 2 because of their low potential environmental impact, will comply with the following steps to obtain the environmental license:

1. Submittal of the Environmental License Application, SINEIA Form F-01
2. Submittal of technical and legal documents to indicate to SINEIA that all appropriate actions have been taken.

ACT FOR THE MODERNIZATION AND DEVELOPMENT OF THE AGRICULTURAL SECTOR

The producer associations participating in the Cosecha project already are or will be members of rural credit unions called "Caja Rurales." The rural credit unions often provide short-term loans for agricultural inputs and other necessary financial support. As the producer associations become formalized, they will need to conform to the legal and institutional framework for the operation of Rural Credit Unions Act for Modernization and Development of the Agricultural Sector (LMDSA, Decree Number 31-92). Chapter V, Article 44 of the law promotes the creation of private rural credit unions to provide more timely and flexible financial services, and states that each rural credit union will establish specific regulations for organization and operation.

3.2 STATUS OF THE PROPOSED PROJECT IN RELATION TO HONDURAS' REQUIREMENTS

The Scoping Statement and subsequent EA required by USAID are evaluations that are above and beyond the Honduran government requirements.

The Cosecha project was classified by the Honduran authorities (formerly SERNA, now Mi Ambiente) as a Category 1 project. Category 1 projects include activities, projects, or work that are considered to have potentially low environmental impact or risk. Under Honduran law, scoping processes, public participation, and/or EIA are not required for Category 1 projects. Category 1 projects, though, still must comply with all environmental laws and policies as well as any monitoring requirements. The regulatory framework of Honduras' National EIA system indicates that the public must be informed at the inception of all EIA processes. Given that the Cosecha project is not required by the Government of Honduras to prepare an EIA, the public notice requirement is not applicable to the project. Furthermore, if the project were subject to an EIA, Honduran law does not require a scoping process, but rather directs the project proponent to directly develop the EIA. Since a high level of community support and investment are required for the Cosecha project, Global Communities has already undertaken extensive outreach with the affected communities.

4. METHODOLOGY OF THE SCOPING PROCESS

The Scoping Team consisted of a four-person team (see Annex A for bio-sketches of Team members) consisting of:

- Kathleen Hurley, Team Co-Leader/EIA Specialist (The Cadmus Group)
- Michelle Rodriguez, Team Co-Leader/Climate Change Adaptation and Agroforestry Specialist (Sun Mountain)
- Charles Hernick, Quality Assurance/Quality Control (The Cadmus Group)
- Home Office Support (The Cadmus Group)/Technical Advisor

The methodology employed to carry out this scoping study involved the following:

- A review of reports that relate to the proposed rainwater harvesting projects and environment and development of the area, including the recently conducted FAA 118/119 assessment for Honduras,

relevant sectoral technical/best practices in Central America, a detailed review of the April 2015 EA (see References section), and the National Plan for Desertification and Drought (SERNA 2014, Honduras);

- A review of legislation and regulations relevant to the policy and regulatory framework of agriculture irrigation, water resources, and related issues in Honduras;

- A one-week field visit by the two team co-leaders to conduct additional research to supplement the April 2015 EA, including:
    - In-briefing with USAID/Honduras Mission staff and Global Communities staff;
    - Consultation with selected stakeholders (Section 4.1);
    - Meetings with communities that will benefit or be affected directly by the proposed irrigation schemes (Section 4.2);
    - Observation of sites of proposed irrigation schemes and water resources (Section 4.2);
    - Exit briefing with key staff members at Global Communities.

- Drafting the scoping statement;

- Finalizing the scoping statement based on comments received from USAID and Global Communities.

4.1 IDENTIFICATION OF STAKEHOLDER GROUPS

The Cosecha project collaborates with the residents, existing informal service providers, local leaders, partner organizations, and the government to ultimately improve the agricultural productivity of smallholder farmers in the southern region of Honduras. As the project is intended to benefit small groups of farmers and will ultimately be self-managed by the groups, the success of the project depends, in part, on the cohesiveness of the producer groups and their willingness to participate in the process. Thus, the Global Communities team has spent significant amounts of time consulting with communities, producer groups, and municipalities to identify sites where community support is strong and has strong potential to provide continued involvement in the project.

Global Communities and Agrolibano Foundation technical staff selected the candidate communities and sites for constructing rainwater harvest reservoirs. Information relevant to selecting communities and reservoir sites was obtained through site visits, consultations with local leaders, municipal authorities, and direct beneficiaries; this information complemented information gathered from interviews with other programs working in the region.

4.2 CONSULTATIONS AND FIELDWORK

Affected residents, civil society groups, local leaders, and relevant private and public sector providers have been involved in a series of discussions and interviews to assist in identifying significant issues and to gather local information related to the project. The regional public authorities, local and municipal sectors of organized civil society, and the private sector that were consulted include the Ministry of Natural Resources (Mi Ambiente, formerly SERNA), Ministry of Agriculture and Livestock (SAG), Ministry of Public Health (SSP), Ministry of Education (SE), Forest Conservation Institute (ICF), Foundation Agrolibano (FA), Municipal City Hall/Municipal Environmental Unit (UMA), Community Boards (PC), Water Management Boards (JAA), Rural Savings and Credit (CRAC), and Technical Community Health (TSC).

In late 2014, Global Communities organized 11 community forums (Table 5**Error! Reference source not found.**) to generate awareness and receive feedback on the current state of water resources, agriculture, and the proposed project in the first phase of the scoping process. In August 2015, the Scoping Team visited nine communities (Table 6).

Table 5. Community Forums Conducted in 2014 for Initial EA (Submitted to USAID in April 2015)

DEPARTMENT	COMMUNITY	MUNICIPALITY	DATE
Choluteca	La Constancia	Namasigue	1 December 2014
Namasigue	El Tajo	Namasigue	20 November 2014
Choluteca	La Danta	Namasigue	3 December 2014
Choluteca	La Vuelta del Cerro	Namasigue	3 November 2014
Choluteca	San Agustin	Namasigue	2 December 2014
Choluteca	San Francisco	Namasigue	27 November 2014
Choluteca	San Rafael Centro	Namasigue	3 December 2014
Choluteca	La Laurelada	El Corpus	2 December 2014
Choluteca	Guanacaste Abajo	Concepcion de Maria	1 December 2014
Choluteca	El Tamarindo	Apacilagua	18 November 2014
Valle	Altos del Estiquirin	Nacaome	2 December 2014

Table 6. Communities Visited During the August 2015 Scoping Statement Field Visit

DEPARTMENT	COMMUNITY	MUNICIPALITY	DATE
Choluteca	La Constancia	Namasigue	15 August 2015
Choluteca	San Rafael 2	Namasigue	15 August 2015
Choluteca	Las Pilitas 2	Namasigue	16 August 2015
Choluteca	Vuelta al Cerro 2	Namasigue	16 August 2015
Choluteca	Altos de Dona Julia	Namasigue	17 August 2015
Choluteca	Santa Irene 1	Namasigue	17 August 2015
Valle	Altos de Estiquirin 2	Namasigue	18 August 2015
Valle	El Tamarindo 2	Nacaome	18 August 2015
Valle	Chaguite	Nacaome	18 August 2015

[1] A tenth site, El Tamarindo 3, originally was scheduled, but the owner decided against participating while the Scoping Team was in the field.

Annex B contains a list of people consulted in the August 2015 scoping visit and Annex G includes a list of communities visited and consulted during the August 2015 scoping visit. Summaries of stakeholder consultations are included as Annex C. Photographs of the community meetings (taken in November and December 2014) and proposed reservoir sites (taken in August 2015) are in Annex D and E, respectively.

Overall, community members expressed positive attitudes and hopes for the success of the rainwater harvesting project. The community members identified a few general concerns about the project during the August 2015 meetings, including:

- The dam failing and losing water resources and/or potentially affecting downstream communities.

- The reservoirs becoming a breeding ground for mosquitos and thus, vectors of disease, such as dengue or chikungunya. Some communities expressed concern as to how mosquitos will be adequately managed to decrease the risk of disease transmission.
- Climate change and impacts on precipitation patterns as it relates to the reservoir integrity (i.e., if it does not rain, the reservoirs will not fill) and capacity of the reservoir to cultivate crops in the context of changing precipitation patterns.
- Reforestation plans: The communities generally were interested in reforestation as a way to protect water resources, but they expressed a need for training on species and site selection as well as development of reforestation plans.
- Timeline for reservoir construction and use of water for cultivating crops. This concern was common across all communities given the ongoing drought in the region.
- Management and allocation of water resources amongst beneficiaries, as well as members outside the beneficiary group, to avoid social conflict and provide benefits to as many community members as possible.

5. AFFECTED ENVIRONMENT

Below is a brief discussion of the affected environment of the selected project sites, including country and regional information in Sections 5.1-5.12 and site-specific information for the 10 reservoir sites in Section 5.13. Additional information will be gathered during the EA phase.

5.1 POPULATION

Honduras's estimated population is 8.6 million, comprised predominantly (90 percent) by Mestizos (mixed Amerindian and white), 7 percent Amerindians, 2 percent Afro-descendants, and 1 percent of people of European origin (CIA, 2014). These racial groups can be further divided into seven different ethnic groups: (1) Spanish-speaking ladinos, (2) English-speaking criollos, (3) Garifuna (Afro-Antilleans composed of four indigenous groups); (4) Chorti (Mayan descendants), (5) Macro Chibcha (composed of four indigenous groups), (6) Uto Azteca or Nahua, and (7) Hokan-Sioux or Tolupan (Hansen and Flórez, 2008). For 2014, the population growth rate was about 2 percent per year, which translates to an average of three children per woman, with birth rates higher in rural areas. In 2011, 52 percent of the country lived in urban areas, with urbanization rates reaching over 3 percent (CIA, 2014).

The vast majority of urbanization in Honduras is due to a geographic shift in employment opportunities, primarily on or near the Caribbean coast and Tegucigalpa. Unemployment is a larger issue in these regions, which are under constant pressure from the influx of new laborers. The rural population of Honduras has a 72 percent poverty rate, of which 16 percent are extremely poor (<$1.81/day). For the urban populations, 60 percent live in poverty, 54 percent of which live in extreme poverty. Other departments experiencing a rising population growth rate are La Ceiba on the Caribbean coast and El Progreso in the agricultural valley of the Ulua River.

This population shift has caused negative environmental impacts as a result of increased depletion of natural resources and inadequate infrastructure (Tabora et al., 2011).

In 2013, there were approximately 3.5 million people in Honduras' workforce (14 percent in agriculture, 28 percent in industry, 58 percent in services). The primary agricultural products in Honduras are bananas, coffee, citrus, corn, African palm, beef, timber, shrimp, tilapia, and lobster (CIA, 2014).

5.2 HONDURAS POVERTY DIAGNOSTIC

Indicators such as high levels of poverty, high inequality, and uneven access to social services and economic opportunities have contributed to the stagnation of Honduras's HDI level, categorized as medium. Honduras has gradually improved its HDI, and in 2014 its HDI reached 0.617, ranking it 129 out of 187 countries.

However, since 2012 the country's HDI has decreased slightly likely due to natural disasters, security concerns, and an unstable political climate (UNDP, 2013). Honduras ranks third among Latin American countries for education inequality, an indicator of income inequality, and has not improved literacy rates or achieved school enrollment rates greater than 53 percent.

Life expectancy (73.8 years at birth) in Honduras has slowly improved since 1980 (UNDP HDI, 2014), but it remains low compared to other countries in the region largely due to poor health coverage and quality. In 2004, 79 percent of children between ages 3 and 59 months suffered from moderate malnutrition, 48 percent suffered from severe malnutrition, and over 29 percent of the total population did not have access to quality water. Economic reform and policy measures taken by various governments did not result in substantial improvements; thus, poverty, unemployment, social inequality, low quality of jobs, and lack of basic infrastructure persist in the country.

- Approximately 50 percent of the population in Honduras are adolescents under age 18. An estimated54 percent live in rural areas, and 51 percent are female. It is estimated that in 2015, 60 percent of the population will live in urban areas.
- The average number of persons per household is five, a number that is slightly larger in rural areas.
- The population of children between 5 and 14 years of age is 1,750,000. About 360,000 children under age 5 are chronically malnourished, and 20 percent of people over the age of 15 cannot read or write. Of adults older than 60 (7 percent of the population), 49 percent cannot read or write.
- According to the UNDP HDI (2014), the migration rate is -1.2 per 1000 people.

5.2.1 SOUTHERN REGION POVERTY DIAGNOSTIC

Historically, the southern region has been one of the most important economic zones in the country, as agricultural production contributes significantly to the region's economy. The National Development Plan 1979 to 1983 targeted increased agricultural production in the region via diversification of crops, introduction of irrigation techniques, and implementation of policies intended to change the current structure of land tenure with the aim of incorporating unused production areas. Thus, in the early 1980s, the region emphasized agricultural development focused on production both on subsistence smallholding farms and large working farms, which produced for export.

The crops that have been historically cultivated in the region are cotton, sugarcane, sorghum, watermelon, cantaloupe, and sesame. From the early 1960s through the mid-1980s, cotton production in the region represented 59 percent of national production (at its peak in 1977) and was concentrated in the Choluteca and Nacaome valleys. Sugarcane cultivation comprised 31 percent of national production in the early 1980s and was based primarily in the Choluteca Valley and Marcovia municipality. Both cotton and sugarcane were generally produced for export. Cotton production began to decrease precipitously after 1981[4] and now is generally no longer farmed.

In the 1980s, livestock farming grew to represent 16 percent of the national total, only slightly less than the central region of Tegucigalpa, which represented 16.2 percent of the national total.

5.2.2 SOCIO-DEMOGRAPHIC CHARACTERIZATION IN SOUTHERN HONDURAS

The southern region has a population of 610, 000, which represents approximately 8 percent of the national population. In particular, the Choluteca Department has the highest concentration of the population, 60 percent of the region's total (**Error! Reference source not found.**), and several of the municipalities where

[4] IndexMundi. Honduras Cotton Production by Year.
http://www.indexmundi.com/agriculture/?country=hn&commodity=cotton&graph=production

the proposed rainwater harvesting program will occur represent a large portion of the region's population (Table 8).

Table 7. Population by Department as Related to the Total Population of Southern Honduras

DEPARTMENT	TOTAL POPULATION IN 2001	% OF TOTAL REGIONAL POPULATION
Choluteca	364,684	60
Valle	141,811	23
Sur de Francisco Morazan	36,071	6
Sur de el Paraiso	65,512	11
Total	610,078	100

Source: Government of Honduras, 2001.

Table 8. Ten municipalities with over half of the region's total population

MUNICIPALITY	POPULATION*
Choluteca	120,791
Nacaome**	46,780
Triunfo	35,830
San Lorenzo	28,586
Marcovia	37,824
Namasigue**	25,144
Concepción de María**	24,406
Pespire	23,332
El Corpus**	21,856
San Marcos de Colón	20,493
Total	385,042 (63%)

* Population by department in relation to total population of southern Honduras
** 4 of the 5 municipalities where proposed project will be implemented.

The ratio of men to women in southern Honduras is about equal at the municipal levels (Table 9).

Table 9. Socio-demographic Characteristics in the Southern Region by Principal Municipality

MUNICIPALITY	POPULATION	WOMEN	MEN	% LITERACY	HDI	% ACCESS TO WATER
Apacilagua	8,954	4,377	4,577	63.5	0.542	54.5
Concepcion de Maria	24,406	12,009	12,397	62.1	0.534	61.8
El Corpus	21,856	10,761	11,095	65.8	0.564	52.3
Namasigue	25,144	12,391	12,753	65.6	0.581	73.4
Nacaome	46,780	23,738	23,042	76.2	0.628	79.7

Sources: INE, National Census on Population and Housing 2001; UNDP: Human Development Report 2003; UNAT, Ministry of the Presidency

The weak economy in the southern region, characterized by the agricultural sector and a subsistence economy, has caused migration to other areas of the country with greater employment opportunities. The Choluteca region has a Human Development Index (HDI) of 0.600, lower than the national Index of 0.617. Alianza has the highest HDI in the region (0.671), and San Lucas has the lowers (0.483). Migration from the south is directed to the capital, Tegucigalpa, and the Valle de Sula zone in the north, which has the largest

industrial area in the country, principally in the San Pedro Sula, Choloma, Villanueva, and La Lima municipalities of the Cortes department.

The historical rate of migration has a direct impact on regional development, including:

- Loss of human resources necessary to support development in the region;
- Abandonment of rural productive base;
- Increasing dependence on remittances from family members who live and work elsewhere;
- Increased social vulnerability; and
- Drain of intellect and talent from the region towards other regions and/or countries as a result of lack of internal opportunities.

Motivated by job instability, low salaries, low education levels, low agricultural production, deficient infrastructure, lack of employment opportunities, and lack of access to land, migration from southern Honduras can be seen as forced migration.

Illiteracy also impacts economic development. About 68 percent of the total population in the region has full literacy, compared to the national rate of 85 percent[5] (rates for individual municipalities are listed in Table 10). The literacy rate by municipality varies, from 52 percent in Liure to 81 percent in the Caridad and San Lorenzo municipalities in the Valle department.

Water availability further impacts the economic potential of the region. The southern region has a marked seasonal drought for six months out of the year. In general, the weather is warm, and average temperatures fluctuate between 27° C and 38° C. Unpredictable precipitation coupled with a steady demand for water for both agricultural production and household usage impacts economic development in the region. About 67 percent of total number of homes have potable water, and these conditions have resulted in deteriorating quality of life for a large part of the population, especially in regions where weak management and administration of services cannot provide adequate quality and quantity of water.

5.2.3 POVERTY SITUATION IN MUNICIPALITIES IN SOUTHERN HONDURAS

Southern Honduras has higher rates of poverty than other areas of the country. In southern Honduras, 76 percent of the population lives below the poverty level (rates for individual municipalities are listed in **Error! Reference source not found.**). In the rest of Honduras, 60 percent of the population lives below the poverty line, and in the southern region, municipalities are equally poor as the poorest municipalities found in other regions. Poverty is measured based on the ability of a family to purchase a basket of basic goods, which includes food, rent, and education for a family of five; the average annual cost for the basket of goods is about US$643/year.[6] UNICEF defines extreme poverty in Honduras as living on less than US$1.25/day.[7]

[5] UNDP- HDI Honduras Country Profile. http://hdr.undp.org/en/countries/profiles/HND

[6] La pobreza en Honduras. http://www.resistenciahonduras.net/index.php?option=com_content&view=article&id=1339:la-pobreza-en-honduras&Itemid=249

[7] ODM1. Eradicar la pobreza y el hambre. http://www.unicef.org/honduras/ODM1.pdf

Table 10. Southern Region Poverty in Terms of Unsatisfied Basic Needs

MUNICIPALITY	POPULATION (2001)	% IN POVERTY	% IN RELATIVE POVERTY	% IN EXTREME POVERTY	% TOTAL IN POVERTY
Apacilagua	8,954	14	23	63	86
Concepcion de Maria	24,406	29	34	37	71
El Corpus	21,856	22	33	45	78
Namasigue	25,144	24	30	46	76
Nacaome	46,780	19	29	52	81

Source: INF, National Census on Housing and Population 2001

5.3 BASIC INFRASTRUCTURE IN MUNICIPALITIES

Infrastructure in southern Honduras varies in quality and ability to deliver services outside of population centers. Access to basic infrastructure, such as roads, electricity, and potable water, varies amongst the targeted communities. Housing is generally basic and constructed of adobe and tile and/or wood or concrete block. Poor quality of construction materials, lack of maintenance, natural disasters in the region, and/or aging buildings all contribute to the poor infrastructure in the region.

5.3.1 ROADWAYS

The main road to southern Honduras is in good condition but historically has not been regularly maintained, and secondary and tertiary roads receive little maintenance. The roads are generally constructed with inadequate specifications for tread, culverts, and sewage. Ultimately, this results in rapid deterioration of the roads, increasing sediment flow to waterways. Furthermore, poor construction causes the roads to become impassable in the rainy season, which may limit access to some sites in the rainy season. The access roads to the proposed sites are generally unmaintained dirt roads, with the exception of a few sites, which are located near main arterials.

5.3.2 HOUSING

Most houses are constructed with adobe and tile, have one or two rooms with an average of four to five people per room, and have little sanitation. Of these, 59 percent of homes were deemed inadequate by FOSDEH for sanitation, and in 80 percent of homes, firewood is used to cook all meals. The construction materials of the houses are mostly made of mud and adobe with tile roofs, and some houses—located mainly in the urban part of municipalities—are built of brick block with asbestos roofs.

5.3.3 NETWORK OF POTABLE WATER

In the Choluteca region in southern Honduras, water does not meet standards for consumption; according to bacterial analysis studies carried out by Public Health, Municipal Environment Units, and the USAID Forest and Water Project, watersheds that supply areas surrounding Guanacaure Peak in Choluteca were found to have fecal contamination in the main water system. Thus, water is treated with HTH (calcium hypochlorite) for consumption. Approximately 44 percent of households within the region are without potable drinking water.

Table 11. Populations that Use Hydrological Resources in the Choluteca Region

VALLEY	COMMUNITY WITH WATER SUPPLY	MUNICIPALITY
Los Amates	Choluteca, Tablones Arriba, La Fortuna, Los Tubos, Las Lomas, El Carreto, Los Chagüites.	Choluteca, Santa Ana de Yusguare and El Corpus
Seca	Namacigüe Centro, Santa Isabel, La Danta , San Agustín, La Constancia, El Carrizal, La Montaña	Namacigüe and El Corpus
Santa Teresa	Bijagual, Las Playitas, Los Cocos, El Tríunfo and	El Corpus and El Tríunfo

VALLEY	COMMUNITY WITH WATER SUPPLY	MUNICIPALITY
	Matapalos	
Tierra Blanca	La Fortunita, La Tajeada, Tierra Blanca, Jocomico, Las Marías, Tipurín, Espabeles	El Corpus, Santa Ana de Yusguare and Namacigüe
San Juan	San Juan Arriba, Linda Vista, San Juan Abajo	El Corpus
Tiscagua	Agua Fría, El Aguaje, Pueblito, Quebrachito, La Cuchilla and Tiscagua	El Corpus

Source: UMA Choluteca, PBA Diagnostic

5.3.4 SOLID WASTE MANAGEMENT

Solid waste is managed at the household level and is generally burned or buried. There is not a solid waste collection system in the rural areas. Inadequate waste management mainly is due to a lack of financial and managerial capacity of municipalities to supply the services and poor application of standards and laws to control waste disposal.

Unmanaged waste may impact the health and quality of life of those in direct contact with uncollected solid waste and informal dumps in streets and ravines. The sites may contain hazardous waste, which is a threat to human health.

5.3.5 SEWAGE SANITATION

Water waste management infrastructure, specifically septic tanks and latrines, is available in most urban parts of municipalities. However, the majority of rural residences manage human waste with latrines that are constructed with the support of NGOs, public health agencies, and the municipalities.

5.3.6 EDUCATION

The majority of the population has limited access to education and relies on agriculture for economic livelihood. Furthermore, the lack of qualified instructors impacts the quality of education, and up to four grade levels will often be a part of the same class. According to the PMA Choluteca Diagnostic study, 23 percent of children ages 7 to 12 either do not attend school or are often absent as a result of working to contribute to family income. Though the number of schools that exist in the Choluteca region (22) may be sufficient, they lack sufficient staff and teaching materials and the buildings are often inadequate often lack electricity.

5.3.7 ACCESS TO HEALTH SERVICES

There are four Rural Health Centers (CESAR) in the project area, located in the Agua Fría, Los Cocos, La Fortuna, and Playitas communities in the El Corpus municipality. These centers serve approximately 19 communities. There are two CESARs, located in Tablones Arriba and La Tajeada communities, which serve the Santa Ana de Yusguare municipality. In the Namasigüe municipality, the majority of residents of the Santa Isabel, San Agustín, La Constancia, and La Danta communities go to the CESAR of San Rafael Arriba, and others go to CESAMO of Namasigüe Center.

5.4 LOCATION

Honduras, the second largest Central American country (after Nicaragua), is located at the widest part of the isthmus of Central America (

Figure **2**). The country's total area is 112,500 km² and includes borders with Guatemala (250 km), Nicaragua (900 km), and El Salvador (340km). The country is also bordered to the south by the Gulf of Fonseca between El Salvador and Nicaragua and the Caribbean Sea to the north (CIA, 2014).

5.5 TOPOGRAPHY

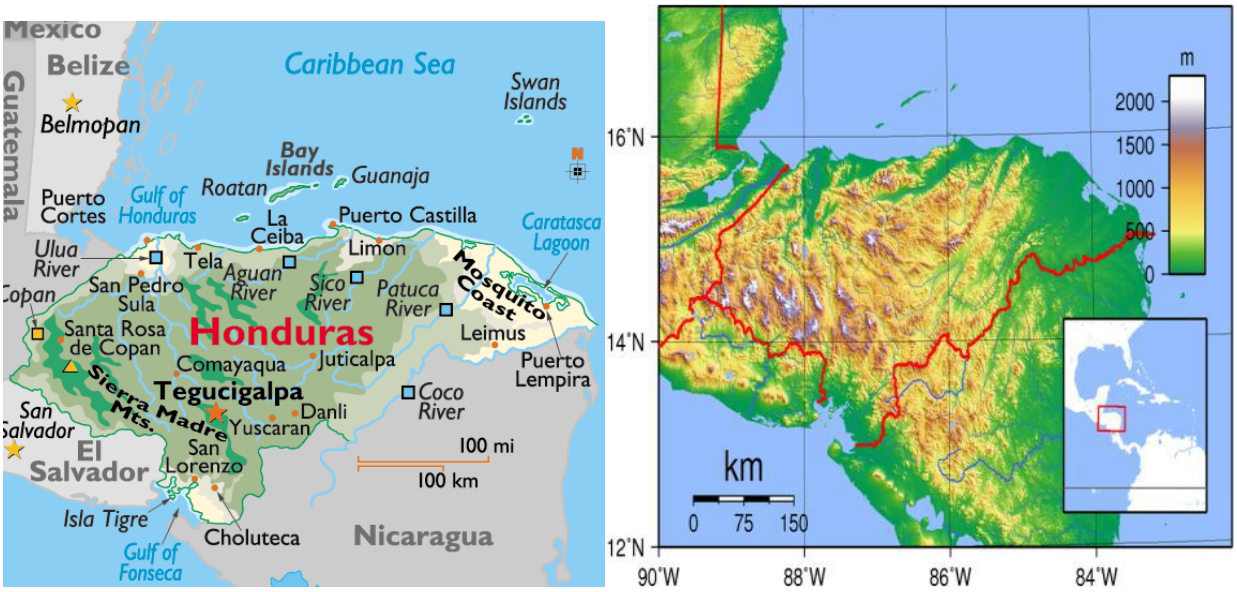
Honduras has three distinct topographical regions: (1) the interior highlands, (2) the Caribbean lowlands, which are characterized by alluvial plains in the north, and (3) the Pacific lowlands bordering the Fonseca Gulf Figure 2 -Location.

The interior highlands are mostly mountainous and cover 82 percent of the country's terrain. This region is formed by the Central, Northern, and Southern mountain chains.

The northern Caribbean lowland covers 16 percent of the country's territory and consists of river valleys and coastal plains. This region is hot and humid, receiving about 2,000 mm/yr rainfall with temperatures reaching 24° C. To the east and west, the Caribbean lowlands contain broad river valleys.

The country's smallest topographical region, the Pacific lowland in the south, includes the coastal plains and the Gulf of Fonseca; it covers 2 percent of the country's territory. The coastal plain is mostly flat and composed of alluvial soils washed from the mountains, creating swampy terrain near the gulf. The Gulf of Fonseca includes Zacata Grande Island, Tiger Island, and numerous smaller islands.

Figure 2. Location (left) and Topography (right) of Honduras



Source: Merrill, 1995

5.6 HONDURAN ECOREGIONS

There are seven ecoregions (Churchill & Dobrowolski, 2002) in Honduras, including two types of mangrove forest and five terrestrial types of forest (Figure 3):

Caribbean and Pacific Mangroves stretch over 2,500 km², occupying all of the country's coasts. They serve as a buffer between marine and terrestrial regions by protecting the marine environment from terrestrial sediment run-off and protecting the terrestrial environment from erosion, salinity, and tropical storms and hurricanes. These areas are marked as 1 and 6 in Figure 3.

Central American Atlantic Moist Forests (CAAM) are lush, diverse tropical forests. They serve as a major route for birds migrating between North and South America as well as between lowland and montane forests. In Honduras, this ecoregion comprises the bulk of the northeast coastal lowlands (43,250 km²). These areas are marked as 2 in Figure 3.

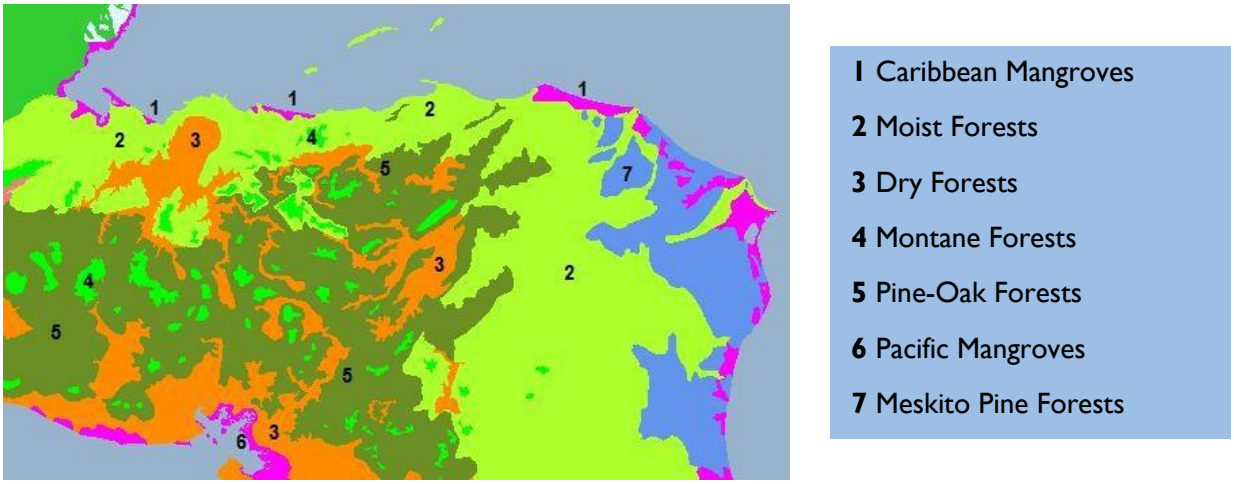
Central American Pacific Dry Forests (CAPD) are characterized by an extensive (five to eight months) dry season and a semi-deciduous, two-story forest structure. CAPD serve as an inter-continental migratory route for many endemic species of fauna of the region. This ecoregion in Honduras comprises an area of 5,703 km^2. These areas are marked as 3 in Figure 3.

Central American Montane Forests (CAMF) occur in isolated patches on the peaks and slopes of the highest mountains. Their forest profile is comprised of a mosaic of conifers and tropical broadleaf cloud forest vegetation. CAMF serve the intercontinental and altitudinal migrations of birds and butterflies migrating into the surrounding Pine-Oak forests. These forests also house a mixture of North and South American flora and fauna, of which approximately 70 percent are endemic. In Honduras, these forests exist as isolated habitats and are found in the interior highland area with a total area of 3,085 km^2. These areas are marked as 4 in Figure 3.

Central American Pine-Oak Forests (CAPO) comprise the largest ecoregion in the country covering 51,161 km^2, and are located between the broad-leafed, evergreen montane forests at higher elevations and the tropical Atlantic moist forests. This is the largest ecoregion in Honduras. These forests serve as the wintering grounds for many migratory bird species and contain endangered populations of various lucrative fauna. These areas are marked as 5 in Figure 3.

Mosquitia (Meskito) Pine Forests (MPF) are characterized by lowland tropical pine-savanna vegetation comprised of a mix of pine stands and open savanna areas. This ecoregion occupies 6,793 km^2 on the eastern coast of Honduras. These areas are marked as 7 in Figure 3.

Figure 3. Honduran Ecoregions (see description of ecoregions and corresponding zones in narrative above).



Source: World Wildlife Fund, N.D.

5.7 CLIMATE AND WEATHER

Honduras has three main climatic regions that are associated with the topographic regions. The Caribbean lowlands have a tropical wet climate with consistently high temperatures and humidity and evenly distributed annual rainfall. The Pacific lowlands have a tropical wet climate with high temperatures and a distinct dry season (November through April). The interior highlands have a distinct dry season with cooler temperatures as elevation increases.

Temperatures in the tropics vary primarily with elevation. Areas described as "hot zones" are located below 1,000 m elevation, temperate zones are located between 1,000 and 2,000 m, and cold zones are above 2,000 m. The Caribbean and Pacific lowlands are "tierra caliente" with daytime highs averaging between 28°C and 32°C and higher humidity during the rainy season. The interior highlands range from temperate temperatures

to cold temperatures with an average high temperature ranging from 25°C to 30°C in January, the coolest month. In the cold zone, temperatures tend to fall near freezing at night.

Overall, the country's coldest month is December, when temperatures vary between 8°C in the highlands and 28°C in the Pacific lowlands. The country's hottest month is April, with temperatures varying between 10°C in the highlands and 31°C in the Pacific lowlands. Annual precipitation in Honduras is extremely variable across regions, between 900 and 3,300 mm (Servicio Meteorológico Nacional, 2014). Usually there are two rainy seasons per year, the "primera" from May to August and the "postrera" from September to December. January to April is usually a dry period (Merrill, 1995).

The average precipitation per rainy season is shown in Maps 3 and 4 in Annex F.

5.8 RESOURCE PRESSURES

The primary resource issue in Honduras is a negative feedback loop that includes land stressed by extreme weather events (droughts and flooding), agricultural expansion, deforestation, and high levels of poverty. These factors combined exert significant pressure on natural resources and ecosystem services. Despite these factors, economic forces and unsustainable patterns of agricultural development are the root causes of erosion and land degradation (SERNA, 2014). The Action Plan against Desertification and Drought (SERNA 2014) classifies current land degradation according to five general themes: soil, water, biosphere, socio-economic, and the dry climate. It further lists causes that contribute to degradation in these areas and the effects of those causes (e.g., poor management of watersheds is listed as a primary cause of degradation of soils, water, and the biosphere).

5.8.1 LAND USE PATTERNS

Though Honduras is well suited for agriculture, as recently as the mid-1980s, less than half of the country's arable land was planted with crops. Most was used for pastures or was forested and owned by the government or banana corporations. Meanwhile, much of the land has been significantly deforested for commercial and subsistence agriculture (Churchill and Dobrowolski, 2002).

The percentage of land used for agriculture in Honduras is currently 13 percent of the total surface area of the country. This percentage is divided into arable land (9 percent) and permanent crops (4 percent). Irrigated land in Honduras covers an area of 875 km^2, while lands used for other purposes represent 87 percent of the country's area (CIA, 2014).

5.8.2 POVERTY AND RURAL MARGINALIZATION

Most agricultural lands are farmed by smallholder rural farmers who typically fall under the poverty line. Their crops are used either for personal consumption or sale in regional or national markets. They face higher production risks as they do not have access to modern agricultural practices and technologies. These factors force rural farmers to expand into new areas as cultivated lands lose productivity with consequent deterioration of soil, forest, and water resources. Reduced soil productive capacity affects a large sector of the population, especially subsistence farmers. The negative effects include crop failure, cyclic food shortages, and malnutrition of the population, mainly in rural areas.

5.8.3 LACK OF STRATEGIC PLANNING PRACTICES FOR LAND USE

The high basins of major rivers in the country are significantly deforested as a result of concentrated agricultural activities and generally inappropriate land use. The high rate of deforestation contributes to the systematic alteration of the hydrological regime, resulting in floods, droughts, and high levels of erosion; the consequent siltation of rivers, lakes, and other wetlands; and reduction or deepening of aquifers.

Furthermore, the primary cultivated areas are located on land with slopes greater than 30 percent where few soil conservation practices are implemented. The combination of deforestation, steep slopes, and poor soil conservation creates high potential for erosion, causing loss of topsoil and negative impacts on water quality.

The continued use of traditional farming methods, combined with the fragmentation of land, causes an accelerated deterioration of soil, forests, and watersheds. Additionally, the low coverage and poor maintenance for irrigation systems suggest that water and land resources are currently not being used efficiently. As such, expansion of micro-drip irrigation could increase productivity on cultivated lands, while potentially minimizing pressures on forests.

Public and private assistance services directed to small and medium sized farmers have not resulted in improvement in cost or sustainability of production systems. Additionally, limited access to credit restricts small farmers from applying technological, environmental, and economic practices.

5.8.4 CLIMATE CHANGE

Climate change is affecting agriculture in Honduras. According to the International Hydrological Programme of UNESCO, Honduras is the third most vulnerable country in the world to extreme weather events such as droughts and floods caused by climate change (IHP, 2014). Droughts and floods threaten food security and agricultural yields. As agriculture contributes to 14 percent of the GDP and 40 percent of the labor force in the country, droughts and floods that compromise crop-yields for farmers will affect broad swaths of the economy (CIA, 2014).

Honduras has created various agencies to respond to climate change-related events. In 2010, the Climate Change National Office published the National Strategy for Climate Change, offering guidelines and measures to adapt to and mitigate climate change in seven sectors: water resources, forests and biodiversity, marine-coastal ecosystems, human health, risk management and infrastructure, hydroelectric energy, and agriculture (PHI, 2012).

5.9 GENERAL CHARACTERIZATION OF SOIL RESOURCES

Major soil differences occur between mountainous/hilly areas and low-lying deltas. Delta soils are typically derived from fertile alluvial deposits capable of supporting intensive agriculture with appropriate water management. The maintenance of soil fertility in alluvial areas hinges on the maintenance of natural flood regimes. Delta soils tend to be saline in areas affected by saltwater intrusion. This is particularly true where there is an absence of regular freshwater floods. Unlike delta soils, the soils of the interior highland tend to be poor as this region lacks the volcanic ash deposits found in other Central American highland regions.

In the southern, central, and western zones of the country—where slopes are usually above 15 percent, the soil is shallow but fertile, precipitation is low, and the predominant use is clean crops (corn, beans, and millet)—the soil is highly deteriorated. Although there is deep and fertile soil in flat areas, the dry climate limits soil quality and resources. In the Atlantic and eastern zones—with land mainly above a 30 percent slope, deep soil, high levels of precipitation, and low fertility—the soil is susceptible to water erosion when it is not vegetated, or when it is cultivated without soil conservation measures.

In general, soil degradation is occurring rapidly throughout the country, but soil losses are particularly acute in the north of Honduras due to intensive agriculture with crop commodities, such as coffee and African palm, as well as livestock mismanagement (Blanco-Sepulveda and Nieuwenhuyse, 2011).

5.10 CURRENT STATUS OF FOREST RESOURCES

Satellite image analysis estimated the country's forest cover at 6,600,000 ha (59 percent of the country's surface area), of which 57 percent is broadleaf forest (3,700,000 ha), 38 percent coniferous forest (2,500,000 ha), 2 percent mixed forest (160,000 ha), 2 percent mangrove forest (121,000 ha), and 1 percent dry forest (41,000 ha) (INE, 2013).

The lack of updated inventories has limited the precise knowledge of the current forest cover, but forest inventories at regional offices organized by AFE/COHDEFOR (currently Institute of Protected Forest Area and Wildlife Conservation ICF) and German government have allowed for projects at the national level. The preliminary forestry map of 1995 indicated that forest cover in Honduras is mainly located in the departments

of Olancho and Gracias a Dios, with a greater relative density in the department of Gracias a Dios (72 percent) and a greater extension in the department of Olancho. Forest cover has decreased over time due to pressures for use as timber and firewood.

In the period between 1990 and 1996 the share of the forestry sector in GDP showed a downward trend, with an average contribution of 3.1 percent, distributed among forest-related activities and industry. The participation of the wood, paper, and cardboard industries remained stable over the period, although their relative contribution to total industrial GDP was in decline as other industries expanded (e.g., factories in free-trade zones).

The forests provide habitat for approximately 1,100 species of fauna (between birds, mammals, and reptiles) and 5,000 species of flora in Honduras. Forests also provide high-value ecosystem services, particularly regulation of watershed hydrological cycles dedicated to the production of drinking water, irrigation, industrial, and hydrological uses. Although the contribution of forests to water production is not precisely known, its value as part of the water production system is growing, as evidenced by community (primarily rural) efforts to conserve land with forest cover. In the period between 1988 and 1996, 146 micro water sources and forest sites were declared protected (Honduras Environmental Profile. 1997).

5.11 WATER RESOURCES AND WATERSHED MANAGEMENT

As a tropical country, Honduras generally has abundant water resources. There are 19 watersheds in Honduras, five on the Pacific slope and 14 on the Atlantic slope (FAO, 2014). The Ulua and Chamelecon Rivers are economically important for their use as waterways for the transport of goods. Numerous other rivers drain northwards from the interior highlands to the Caribbean, and these are critical for ecological maintenance of the broad fertile valleys on the north coast. In 2013, the total storage capacity of the country's reservoirs was 5,805 km^3. The largest reservoir is El Cajon, on the Comayagua river, with a total storage capacity of 5.7 km^3 (FAO, 2014). Lake Yojoa, with a surface area of approximately 90 km^2, is the one large lake in the country (FAO, 2014).

Although Honduras has abundant water resources overall, the geographic distribution of precipitation is very irregular. The basins with higher rainfall are found in areas on the Atlantic side, such as the Cangrejal and Lean River. These receive an average yearly rainfall between 2,700 and 2,500 mm. The basin with the least precipitation is the Choluteca River in the southwest, with an average rainfall of 1,100 mm per year. This rainfall is predicted to decrease 30 to 40 percent during El Niño events (SERNA 2014).

For the past decade, Honduras has conducted research on how to increase hydroelectric power to meet energy demand, and has made modest advances towards achieving this goal. The country has a total hydropower potential of 1,542 m^3/s, designating 13.5 m^3/sec for domestic and industrial use; 75 m^3/s for irrigation; and 242 m^3/s for electricity. As of 2010, the country was exploiting 9 percent of its hydroelectric power potential, an increase from 5 percent in 2005. This is due to the development of several hydroelectric projects during that five-year time period (Tabora et al., 2011).

The latest official data on water use in Honduras are from 2009 and indicate that the agricultural sector uses the greatest amount of water, followed by domestic use. Total water demand in 2009 was 2200 hm^3/year, distributed among sectors as follows (Tabora et al., 2011):

- Domestic use: 315 hm^3
- Industrial: 114.03 hm^3
- Agriculture: 1,153 hm^3
- Hydroelectric: 300 hm^3
- Mining: 0.23 hm^3
- Other : 318 hm^3

Most problems associated with the country's water resources can be directly linked to human activities, which have degraded, overexploited, and polluted these sources. In response, Honduras initiated the 2010-2038 Country Vision and the 2010-2022 National Plan, which defined 16 Development Regions according to the main watershed boundaries and existing water resources. Protected Areas in Honduras currently comprise a key component of water source management strategies.

The 2014 Evaluation of Natural Hydrological Resources indicates that western Honduras generally experiences low surface water and groundwater recharge rates, and a high evapotranspiration potential (SERNA, 2014). Furthermore, studies indicate groundwater is only abundantly available in lowlands in the north of the country, where the water table generally is not significantly reduced, although it may drop a few meters in the dry season. In the central and southern zones, the water table may drop several meters between November and April. The absolute level of water table reduction increases as one moves further south, significantly decreasing the yield of the wells. In hilly and mountainous regions, scattered springs dry seasonally (Environmental Status Report of Honduras, 2000).

5.12 CHARACTERISTICS OF THE 10 SITES SELECTED FOR RAINWATER HARVEST AND IRRIGATION SYSTEM STRUCTURES

The 10 sites selected for the project (listed in Table 1) are described below. Photographs from each site are located in Annex E. Following visits and interviews with community members, the following six considerations emerged as needs for the project at all sites:

(1) The earthen dam and newly excavated slopes of the reservoir should be stabilized with a fast-growing native grass, such as the native star grass and/or a legume to enrich the soil;

(2) The community and technical consultants providing guidance at the reservoir site will need to ensure that the dam and reservoir do not significantly interfere with downstream environmental water flows;

(3) The community will need technical assistance/training to ensure that they do not engage in unsustainable hunting of wildlife that is attracted to the reservoir;

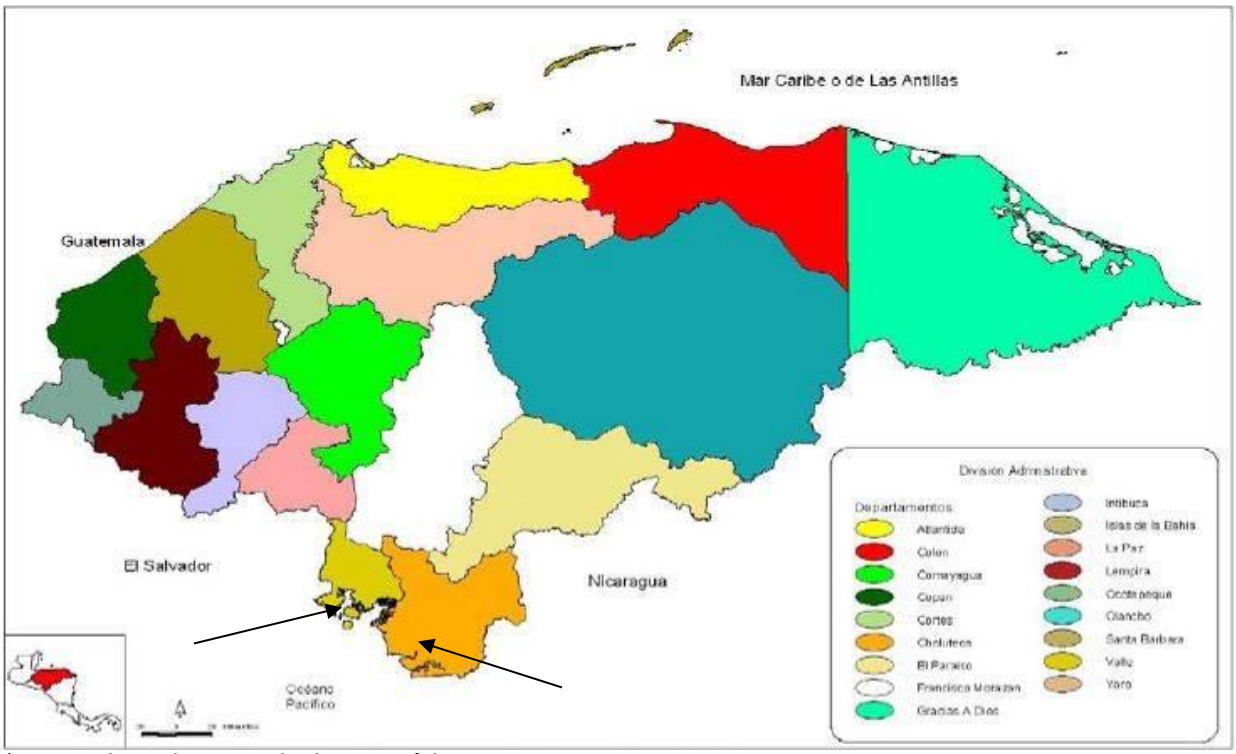
(4) The community will need a plan to keep cattle and other domestic animals out of the reservoir (e.g., fencing around the reservoir, creating a separate watering area that may be fed by the reservoir, etc.);

(5) If the community intends to reforest the watershed, the community group would benefit from technical assistance for the entire process of reforestation, from species selection to cultivation and site selection for reforestation efforts;

(6) If the community intends to farm tilapia as a method of mosquito management, the community group would benefit from technical assistance for managing the fish.

Several of the sites had small areas that represented potential habitat for wildlife, and community members reported observing wildlife species—including threatened and/or endangered species—in the surrounding areas. Data on wildlife presence/absence is limited to anecdotal accounts as publicly available information on these species is not available on a site-specific or regional basis. A list of threatened and endangered species for southern Honduras can be found in Annex H.

Figure 4. General Location Map for Project Area



*Arrows indicate the geographic location of the project area.

5.12.1 LA CONSTANCIA, NAMASIGUE, CHOLUTECA

The proposed site of La Constancia is located in the Namasigue Municipality, Choluteca Department. The projected volume of the reservoir is 5,833 m^3; the reservoir site is a shallow basin with uniform sloping sides that will capture water from an ephemeral stream. The stream channel is characterized by a rocky streambed with incised and eroded banks and with limited riparian vegetation. The water catchment area above the reservoir is lightly forested and grazed by cows. The community members indicated a desire to participate in reforestation efforts.

Generally, the reservoir site is a wide field covered in grasses. The site was previously excavated by community members in an unsuccessful attempt to harvest rainwater and runoff, and the previously excavated area is surrounded by a berm and filled with grasses. Immediately surrounding the proposed site is grazed and cultivated land and a few houses near the proposed lagoon. The access road is a route across an existing soccer field via dirt road.

The lagoon will inundate the grassy field and will capture water from an ephemeral stream that runs through the site. The stream bed is incised and rocky, and upstream from the site is mostly mixed secondary forest and shrubs. Downstream from the reservoir site there is prominent riparian vegetation in a narrow strip along the streambed. This riparian area is only about 35m long and about 15m wide, and below the band of riparian vegetation, the streambed widens into a grassy field. The site is 300 to 400 meters from irrigation plots

The agricultural fields are located downstream of the reservoir, and, currently, the most common crops include beans, corn, and cashews. Approximately 20 individuals and their families will benefit from the project, and plan to use the water to irrigate subsistence crops as well as family gardens. Potential future uses of water include cultivation of vegetables, watermelon, sesame, cane, pasture land, etc. Currently, the group does not have a plan for management of allocation of water, especially if other community members express interest in accessing water from the lagoon. The group did not indicate they intend to use tilapia to manage mosquitoes.

Given the current condition of the site, filling the reservoir will not cause deforestation or loss of trees. The largest potential impact at this site is potential loss of environmental flows downstream. The design of the reservoirs allows for spillover into the existing stream channel, but it is not clear how much water will flow downstream once the reservoir is constructed. Maintenance of environmental flows to maintain the limited riparian vegetation is an important consideration for the site. As recommended for all the sites, the earthen dam and newly excavated slopes of the reservoir should be stabilized with a fast-growing native grass, such as the native star grass and/or a legume to enrich the soil.

Recommendations for this site include:

(1) The earthen dam and newly excavated slopes of the reservoir should be stabilized with a fast-growing native grass, such as the native star grass and/or a legume to enrich the soil;

(2) The community and technical consultants providing guidance at the reservoir site will need to ensure that the dam and reservoir do not significantly interfere with downstream environmental water flows;

(3) The community will need technical assistance/training to ensure that they do not engage in unsustainable hunting of wildlife that is attracted to the reservoir;

(4) The community will need a plan to keep cattle and other domestic animals out of the reservoir (e.g., fencing around the reservoir, creating a separate watering area that may be fed by the reservoir, etc.);

(5) As the community intends to reforest the watershed, the community group would benefit from technical assistance for the entire process of reforestation, from species selection to cultivation and site selection for reforestation efforts.

5.12.2 SAN RAFAEL 2, NAMASIGUE, CHOLUTECA

The proposed reservoir in San Rafael 2 will have a volume of approximately 12,000 m^3 and is located at the base of a small valley. The land use conditions in the upper part of the micro-watershed are mixed trees and shrubs while the hillsides bordering the proposed reservoir site are grazed. The proposed reservoir site is an ephemeral stream in a ravine, which will be blocked with an earthen dam to hold water. The dam will inundate an area that is currently covered by shrubs and grasses and a few trees. Access to the site is on a dirt road and a short trail, and a new access road is not anticipated for the site.

Downstream of the reservoir site, there is an area of mature riparian vegetation characterized by a mix of shrubs and several mature trees. While the earthen dams are designed to allow for overflow into the existing streambed, maintaining environmental flow at this site is particularly important to maintain the existing healthy riparian vegetation.

Land use around the proposed reservoir site is mixed and is lightly forested, grazed, and/or cultivated. The primary crops currently cultivated include corn, green beans, beans, and stover for livestock. Currently, there is very limited water for crops in the community, and farmers often water crops by hand using a small nearby water source that is reportedly drying up. With the existing rainfed agriculture, the farmers will plant and harvest twice a year, while a more reliable water source would enable them to plant and harvest three to four times a year. The farmer group reported that with a more reliable water source, they would like to grow crops that could be sold, such as squash, peppers, cucumber, and pumpkin. The plots that will be irrigated are located below the reservoir site, and thus, there is minimal risk of contamination of the reservoir by agro-chemicals.

Currently, the group does not have a plan for management of allocation of water, especially if other community members express interest in accessing water from the reservoir. There is a strong forest management ethic in the community whereby cutting of trees is not allowed unless it is specifically for home construction. In the case of timber harvest for home construction, harvest is not allowed in riparian areas or

in the upper part of the micro-watershed. The group did not discuss how the project would manage increased mosquitos.

Given the current condition of the site, the potential for landslides in the upper watershed and erosion elsewhere at the site appear to be minimal. The main concern at this site is the potential impact on the altered environmental flow on the well-developed riparian area downstream of the proposed reservoir, which could be habitat for sensitive species, although no record of these species exists. Maintenance of environmental flows to maintain the limited riparian vegetation is also an important consideration for the site.

Excluding livestock access is also an important recommendation for the reservoir site given the high intensity of grazing of surrounding lands. Livestock may damage the earthen dam and negatively impact the functioning of the reservoir.

Recommendations for this site include:

(1) The earthen dam and newly excavated slopes of the reservoir should be stabilized with a fast-growing native grass, such as the native star grass and/or a legume to enrich the soil;

(2) The community and technical consultants providing guidance at the reservoir site will need to ensure that the dam and reservoir do not significantly interfere with downstream environmental water flows;

(3) The community will need technical assistance/training to ensure that they do not engage in unsustainable hunting of wildlife that is attracted to the reservoir;

(4) The community will need a plan to keep cattle and other domestic animals out of the reservoir (e.g., fencing around the reservoir, creating a separate watering area that may be fed by the reservoir, etc.);

(5) As the community intends to reforest the watershed, the community group would benefit from technical assistance for the entire process of reforestation, from species selection to cultivation and site selection for reforestation efforts.

(6) If the community intends to farm tilapia as a method of mosquito management, the community group would benefit from technical assistance for managing the fish.

5.12.3 VUELTA DEL CERRO 2, NAMASIGUE, CHOLUTECA

The Vuelta del Cerro 2 rainwater harvesting site is designed to hold approximately 9,300 m^3 of water and will benefit a group of 14 families with eight to 10 members per family. The site is a shallow, wide basin largely denuded of vegetation from intense cattle grazing and removal of vegetation for cultivating crops. The conditions in the upper watershed are mixed use. Generally, the ridges and crests of the hills are forested, while the hillsides are heavily grazed. Filling the reservoir will impact about four to five trees; however, it is generally not good habitat for wildlife given the high intensity of grazing at the reservoir site. Additionally, the community plans to reforest areas in the vicinity of the reservoir.

The reservoir site is transected by a shallow ephemeral stream channel that will be blocked with an earthen dam at one end. About 100m below the reservoir site, the tributary stream meets with a larger stream that is at least two to three times larger in width and depth. During rain events, larger stream channel conveys the majority of the water downstream. Thus, it appears that the small streams, which will be used for the reservoir, will not significantly abstract flow in the system. However, the broad, shallow and long shape of this reservoir may be more susceptible to evapotranspiration than other reservoirs.

Currently, the farmer group plants corn and beans for household use, and about four or five of the group members also have five to 10 head of cattle they graze. With a more reliable source of water, the farmers would cultivate of vegetables, watermelon, sesame, cane, cassava, sweet potato, fruit trees, etc. Currently, the community lacks a structure to manage requests from other communities to use the reservoir. One

community member suggested that the decision to allow more beneficiaries be based upon the volume of water available. The group stated they would stock the reservoir with tilapia to manage the mosquitos, although the group did not have extensive knowledge on the lifecycle of tilapia or how the tilapia would be managed.

There is community interest in reforesting the hillsides around the reservoir with a mix of fruit trees for additional income and native trees. The fruit trees of interest include mango, orange, and cashew trees, while the native tree species include the Guanacaste tree, mahogany, cedar, and laurel trees. The community group would benefit from technical assistance for the entire process of reforestation, from species selection to cultivation and site selection for reforestation efforts.

Given the highly impacted nature of the site and compacted soils from cattle grazing, the reservoir itself will not cause loss of existing forest or likely any threatened and/or endangered species. Furthermore, given the large primary stream channel adjacent to and below the site, environmental flows are less of a concern at this site, and the major concerns are related to potentially high rates of evapotranspiration given the reservoir's size and depth, sedimentation due to eroded hillsides, and the potential impact of cattle on the reservoir. Nonetheless, maintenance of environmental flows to preserve downstream riparian vegetation is an important consideration for the site.

Additional recommendations for this site include:

(1) The earthen dam and newly excavated slopes of the reservoir should be stabilized with a fast-growing native grass, such as the native star grass and/or a legume to enrich the soil;

(2) The community and technical consultants providing guidance at the reservoir site will need to ensure that the dam and reservoir do not significantly interfere with downstream environmental water flows;

(3) The community will need technical assistance/training to ensure that they do not engage in unsustainable hunting of wildlife that is attracted to the reservoir;

(4) The community will need a plan to keep cattle and other domestic animals out of the reservoir (e.g., fencing around the reservoir, creating a separate watering area that may be fed by the reservoir, etc.);

(5) As the community intends to reforest the watershed, the community group would benefit from technical assistance for the entire process of reforestation, from species selection to cultivation and site selection for reforestation efforts; and

(6) As the community intends to farm tilapia as a method of mosquito management, the community group would benefit from technical assistance for managing the fish.

5.12.4 LAS PILITAS 2, NAMASIGUE, CHOLUTECA

The Las Pilitas reservoir site is designed to hold approximately 14,000 m^3 of water and benefit about 20 families, each family has about six members. Access to the site is via a secondary dirt road in good condition; the project site is located within about 100 m of the road. Approximately five years ago, the community excavated an area adjacent to a main road to collect water for irrigation; the proposed new reservoir is located directly above the old retention pond. During the Scoping team's visit in August 2015, the old retention pond still retained a limited amount of water in an unusually dry year. The team observed bird activity around the existing pond; in addition to bird activity, community members reported observing wildlife such as armadillo, paca (a small rodent), and ocelots near the existing pond. Some of the wildlife are hunted for supplemental food for families.

The area to be inundated by the new reservoir is located directly above the existing water retention pond and appears lightly grazed and does not appear to be critical habitat. There are approximately 12 to 15 trees located in the reservoir's area of impact. Several existing ephemeral streambeds on the site are overgrown with grasses and brush while the land use conditions in the upper part of the watershed are a mixture of

sparse forest, grazed hillsides, and some cultivated areas. The existing retention pond is located adjacent to a road with culverts that convey any overflow from the existing pond to the stream channel beyond the road. Across the road, there is an existing second-growth forest that appears to provide good habitat for birds and wildlife. Maintaining environmental flow from the reservoir site under the road and into this forested area is critical for maintaining ecosystem function.

The community currently cultivates staple crops such as corn and beans in fields located below the proposed reservoir site; however, with a more reliable water source, they would like to diversify their crops to include sweet pepper, cucumber, potatoes, bananas, watermelon, and sweet potato for personal consumption and to sell. No members of the community group have livestock, but some do maintain chickens and pigs. The Scoping team observed pigs wallowing in the existing retention pond, and it would be important to exclude all livestock, including pigs and cows, from the reservoir.

The proposed reservoir site is located in an area without existing homes and the community does not view mosquito management as a priority at this site. They are not considering use of tilapia for mosquito management. However, the community group did express concerns about the earthen dam failing and how the water may potentially impact the road, which is a main thoroughfare for the surrounding villages. Lack of maintenance of the culverts could cause water to overflow the road; as such, maintenance of the culvert and of the earthen dam should be included in project design and management.

The community group has limited experience with reforestation and has received some technical assistance in reforestation techniques from government agencies. Group members suggested planting Guanacaste, mahogany, acacia, neem, and melina trees as part of a reforestation effort. The community would benefit from technical assistance related to reforestation and the operation and management of the reservoir. Given the impact on existing mature trees on site and the limited forested hillsides above the proposed reservoir, benefits from reforestation include erosion control, development of a sustainable source of firewood, provision of wildlife habitat, and potential groundwater recharge from the reservoir. Maintenance of environmental flows to maintain the downstream riparian vegetation is an important consideration for the site. As recommended for all the sites, the earthen dam and newly excavated slopes of the reservoir should be stabilized with a fast-growing native grass, such as the native star grass and/or a legume to enrich the soil.

Recommendations for this site include:

(1) The earthen dam and newly excavated slopes of the reservoir should be stabilized with a fast-growing native grass, such as the native star grass and/or a legume to enrich the soil;

(2) The community and technical consultants providing guidance at the reservoir site will need to ensure that the dam and reservoir do not significantly interfere with downstream environmental water flows;

(3) The community will need technical assistance / training to ensure that they do not engage in unsustainable hunting of wildlife that is attracted to the reservoir;

(4) The community will need a plan to keep cattle and other domestic animals out of the reservoir (e.g., fencing around the reservoir, creating a separate watering area that may be fed by the reservoir, etc.);

(5) As the community intends to reforest the watershed, the community group would benefit from technical assistance for the entire process of reforestation, from species selection to cultivation and site selection for reforestation efforts.

5.12.5 ALTOS DE DOÑA JULIA

The proposed reservoir site at Altos de Doña Julia is designed to hold approximately 16,500 m^3 of water benefiting approximately 10 families with an average of six members each. The proposed site is heavily impacted by slash and burn agriculture and cattle grazing; as a result, the site is generally denuded and much

of the area is exposed soil. The site is accessed by road and through a farm and agricultural field. The hillsides in the watershed are sparsely forested, and there are some tall shrubs on the perimeter of the property. About 25 m downstream of the reservoir site is a small stand of riparian vegetation in the streambed. The ephemeral stream that runs through the property will be blocked with an earthen dam creating a shallow and long retention pond. With this design, the potential for evapotranspiration may increase, and use of tilapia for mosquito control will have to be carefully considered.

The environmental condition of the site is poor as the soil has been compacted by cattle grazing, and most vegetation has been removed via slash and burn agriculture. There are approximately 8 to 10 medium trees that will be inundated by the reservoir; the trees are dispersed and do not comprise a forest stand. Despite heavy use, community members report observing wildlife in the area, including rabbits, snakes, deer, pacas, and armadillos; there is occasional subsistence hunting.

The community currently uses a 200' deep well to supply water for livestock; however, there is not sufficient supply for irrigation of crops. The cultivated plots that will be irrigated are located below the proposed reservoir site and there is limited use of pesticides and fertilizers. When there is adequate rainfall, the community grows sweet potato, yucca, corn, beans, and sorghum; however, like much of the region, there has not been adequate rainfall in 2015 to cultivate these crops.

The reservoir will not impact forests in the planned reservoir area, and the primary concerns at the site are related to training for reforestation, management of the reservoir, especially to avoid rapid evapotranspiration; training in use of tilapia for mosquito management. Maintenance of environmental flows to maintain the limited riparian vegetation is also an important consideration for the site.

Recommendations for this site include:

(1) The earthen dam and newly excavated slopes of the reservoir should be stabilized with a fast-growing native grass, such as the native star grass and/or a legume to enrich the soil;

(2) The community and technical consultants providing guidance at the reservoir site will need to ensure that the dam and reservoir do not significantly interfere with downstream environmental water flows;

(3) The community will need technical assistance / training to ensure that they do not engage in unsustainable hunting of wildlife that is attracted to the reservoir;

(4) The community will need a plan to keep cattle and other domestic animals out of the reservoir (e.g., fencing around the reservoir, creating a separate watering area that may be fed by the reservoir, etc.);

(5) As the community intends to reforest the watershed, the community group would benefit from technical assistance for the entire process of reforestation, from species selection to cultivation and site selection for reforestation efforts; and

(6) As the community intends to farm tilapia as a method of mosquito management, the community group would benefit from technical assistance for managing the fish.

5.12.6 SANTA IRENE 1, NAMASIGUE, CHOLUTECA

The proposed reservoir site in Santa Irene 1 will benefit 13 families with an average of five to six members per family. The reservoir capacity is about 15,500 m^3 and is located in an open, shallow, saucer-shaped area of land that is heavily grazed and impacted by slash and burn agriculture. It is accessed by a road, and no additional road building will be required. There are a few dispersed trees at the reservoir site, and the hills above the reservoir site have been grazed by cattle and have few trees. The streambed is gravelly, and there is some bank erosion within the stream channel. On both sides of the ephemeral streambed at the proposed reservoir site, the soil is compacted, grazed, and sometimes burned. About 50 m below the reservoir site,

there is limited riparian vegetation with scattered large trees in the ephemeral streambed. Maintenance of environmental flows to maintain the limited riparian vegetation is an important consideration for the site.

The landowner has 250 head of cattle, which have grazed large areas around and in the proposed reservoir site. Given the high number of cattle, it will be important to remove cattle from the reservoir in order to maintain structural integrity and prevent contamination. Furthermore, the cattle may prevent successful reforestation efforts by grazing new sapling growth. Thus, a more comprehensive plan for livestock management is particularly relevant at this site.

In years with regular precipitation, community members cultivate corn, beans, and sorghum, but to date, the families have been unable to cultivate crops because of the drought in the region. If water were more readily available, community members mentioned that they would like to plant fruit trees, such as cashew, mango, and nance (*Byrsonima crassifolia*). In addition to planting fruit trees, the group expressed interest in reforestation and suggested species such as laurel, mahogany, cedar, and almond trees. The group also suggested planting eucalyptus trees for a fast-growing source of firewood, although eucalyptus is not recommended as it is a non-native invasive species that uses significant amounts of water. The community group would benefit from technical assistance for reforestation, including species selection, nurseries, and maintenance of the plantings.

The proposed site is located within a kilometer of a school, and the community expressed two concerns in that regard: 1) if the dam fails, it may flood the school; and 2) the reservoir may be a breeding ground for mosquitoes, and the community would like to control them. The school is located at a higher elevation than the proposed reservoir site, and in the unlikely event of failure of the earthen dam, the reservoir is designed to follow the existing stream channel, which has not historically impacted the school. The community proposed using tilapia or shrimp to manage mosquitoes. While a few members have worked in shrimp aquaculture in the region, and specific training on use of either species will be important for long-term management of mosquitoes.

The community group is newly formed and has not yet considered how they will manage the water resource, especially if other community members wish to use the water for irrigation.

As with most of the other sites, the reservoir will not inundate forests, and the primary concerns at the site are related to training for reforestation, management of the reservoir and mitigation of rapid evapotranspiration, and training in use of tilapia for mosquito management. Maintenance of environmental flows to maintain the limited riparian vegetation is an important consideration for the site. Given the high number of cattle at the site, developing a management plan for cattle exclusion from the reservoir and recently reforested plots is an important management measure. Finally, this site has additional social concerns related to the proximity of the school to the site, mosquito management, and weak group cohesion for management of the water.

Recommendations for this site include:

(1) The earthen dam and newly excavated slopes of the reservoir should be stabilized with a fast-growing native grass, such as the native star grass and/or a legume to enrich the soil;

(2) The community and technical consultants providing guidance at the reservoir site will need to ensure that the dam and reservoir do not significantly interfere with downstream environmental water flows;

(3) The community will need technical assistance/training to ensure that they do not engage in unsustainable hunting of wildlife that is attracted to the reservoir;

(4) The community will need a plan to keep cattle and other domestic animals out of the reservoir (e.g., fencing around the reservoir, creating a separate watering area that may be fed by the reservoir, etc.);

(5) As the community intends to reforest the watershed, the community group would benefit from technical assistance for the entire process of reforestation, from species selection to cultivation and site selection for reforestation efforts; and

(6) As the community intends to farm tilapia as a method of mosquito management, the community group would benefit from technical assistance on managing the fish, especially given the proximity of the site to the school and the effects of mosquitos on public health.

5.12.7 ALTOS DEL ESTIQUIRIN, NACAOME, VALLE

The site selected for construction of rainwater harvest is known as Cerro Las Marias, and the projected volume will be 4,300 m^3. Approximately 12 families will benefit from access to stored water for ultra-low drip irrigation. Access to the site is via an unimproved road and a short distance across agricultural fields. No access road construction will be required.

The proposed reservoir site is located at the base of steep forested hillsides and is adjacent to watermelon and bean fields. The stream channel feeding the reservoir is very rocky, steep, and narrow; as the stream enters the reservoir site, one side of the reservoir has a more gradual slope (~20 degrees) versus a steeper slope (~35 degrees) on the opposite side of the proposed site. Based on stream channel morphology, a high volume of water moves rapidly through the system. As such, the design plans include construction of a dike at the upper end of the reservoir to slow the velocity of water entering the reservoir.

There are about five large (5 to 10 m tall) trees and five to eight medium-sized trees (<5 m tall) that are in the reservoir area. Only the medium-sized trees will be inundated by the reservoir. Immediately above the reservoir site, there is a dense patch of riparian vegetation with many tall trees (>5 m tall), which follows a narrow channel upstream into a fairly well-forested watershed. The Scoping team observed high levels of bird activity at this site, likely due to the relatively intact riparian and forested areas. Other wildlife observed by community members includes deer, rabbits, foxes, ocelots, paca, white-nosed coati, armadillo, iguana, and various birds. None of these species is on Honduras's list of threatened and endangered species.

The community normally cultivates corn, sorghum, beans, cucumber, and recently experimented with growing watermelon. They use limited pesticides and fertilizer (such as urea and 12-24-12). As the region has been affected by drought, they have not been successful harvesting crops this year. Without irrigation, the farmers water the crops by hand. If there were a more regular supply of water, the farmers would like to grow squash, watermelon, radish, tomatoes, and pumpkin. Community members supplement their diets by hunting wildlife in the hillsides above the reservoir site.

While the group plans to use tilapia to manage mosquitos, they lack experience in this method of mosquito control. Thus, technical assistance will be an essential component for success of this aspect of the project. Given the relatively well-forested watershed feeding the reservoir, community members did not express a concern about reforesting areas. However, given the important role of forests in watershed health, technical assistance in land use management is an important consideration for this site.

The water sharing structure has not been completely developed by the group, and there are concerns that communities downstream may complain if sufficient water does not reach them during the rainy season. Maintenance of environmental flows to maintain downstream riparian vegetation is also an important consideration for the site. Furthermore, the reservoir spans the land of two separate owners, and continual coordination with both will be required for long-term success for sharing the water.

A unique consideration at the Altos de Estiquirin 2 site is the predominance of rocky substrate at the reservoir site, which will need to be removed. Outside material (e.g., clay or soil) may be required to complete construction of the reservoir, given the underlying soil type.

Recommendations for this site include:

(1) The earthen dam and newly excavated slopes of the reservoir should be stabilized with a fast-growing native grass, such as the native star grass and/or a legume to enrich the soil;

(2) The community and technical consultants providing guidance at the reservoir site will need to ensure that the dam and reservoir do not significantly interfere with downstream environmental water flows;

(3) The community will need technical assistance/training to ensure that they do not engage in unsustainable hunting of wildlife that is attracted to the reservoir;

(4) The community will need a plan to keep cattle and other domestic animals out of the reservoir (e.g., fencing around the reservoir, creating a separate watering area that may be fed by the reservoir, etc.);

(5) As the community intends to reforest the watershed, the community group would benefit from technical assistance for the entire process of reforestation, from species selection to cultivation and site selection for reforestation efforts; and

(6) As the community intends to farm tilapia as a method of mosquito management, the community group would benefit from technical assistance for managing the fish, especially given the proximity of the site to the school.

5.12.8 EL TAMARINDO 2, NACAOME, VALLE

El Tamarindo 2 reservoir site will hold approximately 9,000 m^3 of water and provide irrigation to approximately five families with an average of four members per family. The proposed site for the reservoir is located in a shallow depression spanning an ephemeral stream. The owner manages about 50 ha of which only 2.5 ha are forested, and runs about 55 head of cattle on the land. The reservoir site has been significantly impacted by cattle; as a result, the soils are compacted, and the vegetation is largely grasses. There are about six mature trees dispersed throughout the reservoir site; although the site with water will not cause loss of forested areas as the site itself and the surrounding hillsides have been heavily impacted by cattle and lack continuous tree cover. The vegetation 50 to 100 m up- and downstream of the reservoir site has been significantly impacted by cattle, and riparian vegetation is thus absent in these areas. An established section of riparian vegetation exists more than 100 m below the reservoir site, and, given the lack of riparian vegetation in the area, maintaining environmental flows to this area is an important consideration.

Wildlife has been observed in the vicinity of the proposed site. The group reported siting squirrels, rabbits, armadillos, deer, skunk, and iguanas. With the exception of deer, all species are hunted for supplemental food. None of these species is currently on the Honduras threatened and endangered species list.

The primary beneficiaries rent land from the owner and will cultivate fields downstream from the reservoir. Typically, they will plant corn, sorghum, beans, and squash, but given the significant drought this year (2015), the farmers have been unable to successfully harvest their regular crops. The farmers expressed an interest in planting fruit trees, such as mango and cashew, to supplement their staple crops. Additionally, there is an interest in reforestation, and tree species suggested by the groups included Guanacaste, mahogany, and acacia.

The social issues at this site are common to all the sites—the structure for sharing water is unformed and methods for mosquito management are not well defined. Two homes are located within ½ km of the reservoir site; however, the beneficiaries did not express concern about mosquito management.

As with most of the other sites, the reservoir will not impact forests in the immediate area that will be inundated. Maintenance of environmental flows to maintain the limited riparian vegetation is an important consideration for the site. Given the high number of cattle at the site, developing a management plan for cattle exclusion from the reservoir as well as from recently reforested plots is an important management measure.

Recommendations for this site include:

(1) The earthen dam and newly excavated slopes of the reservoir should be stabilized with a fast-growing native grass, such as the native star grass and/or a legume to enrich the soil;

(2) The community and technical consultants providing guidance at the reservoir site will need to ensure that the dam and reservoir do not significantly interfere with downstream environmental water flows;

(3) The community will need technical assistance/training to ensure that they do not engage in unsustainable hunting of wildlife that is attracted to the reservoir;

(4) The community will need a plan to keep cattle and other domestic animals out of the reservoir (e.g., fencing around the reservoir, creating a separate watering area that may be fed by the reservoir, etc.);

(5) As the community intends to reforest the watershed, the community group would benefit from technical assistance for the entire process of reforestation, from species selection to cultivation and site selection for reforestation efforts; and

(6) If the community intends to farm tilapia (uncertain at the time of the scoping visit) as a method of mosquito management, the community group would benefit from technical assistance for managing the fish, especially given the proximity of the site to the school.

5.12.9 CHAGUITE, NACAOME, VALLE

The Chaguite reservoir site encompasses a former clay excavation pit, and will store approximately 2,700 m^3 of water, benefiting about four families with about five members per family. The proposed reservoir site has been significantly impacted by clay extraction activities as well as cattle grazing. A large shallow puddle persisted in the former clay excavation pit at the site, and the site has been used as a source of clay for the past 16 years. The owner reports, however, that the excavation was stopped about two years ago. Access to the site is an unimproved rocky road that requires a four wheel drive vehicle.

The land conditions in the upper part of the micro-watershed are largely deforested and covered with small shrubs and grasses. Cattle utilize the hillsides for grazing, and although there is little forest cover, the shrubs and grasses stabilize the soil. There was no visual evidence of landslides on surrounding hillsides. The stream originates in a saddle near the top of the micro-watershed and passes through marginal riparian vegetation lining a streambed filled with small rocks and pebbles. The streambed is dominated by grasses at the entrance to the reservoir site, and then it is disrupted by the clay excavation pit. Dispersed through the reservoir site are about 8 to 10 medium-sized trees (~3 to 4 m tall), which will be impacted by the reservoir. No continuous forests, though, will be impacted at the site that will be inundated.

Downstream of the proposed reservoir and clay pit, the stream follows two distinct streambeds, which appear to change seasonally and/or depending on the volume of water flowing through the site. The streambed downstream is shallow and flat with drought-adapted shrubs and low trees in the riparian area. About 130 m downstream from the earthen dam site, the shrubby dry vegetation transitions to a narrow strip of trees about 5 to 8 m tall.

The existing pond attracts animals, and the group reported observing coyotes, ocelots, and white-nosed coatis at the pond. While this group does not hunt very often, a longer-term plan for wildlife management is still an important consideration for environmental management at the site. The Scoping team observed small minnows in the remnant pond on-site. Community members reported that the fish seem to "appear" every time there is rain, suggesting a species well-adapted to flashy stream systems. These species do not appear on Honduras's threatened and endangered species list, although the fish species was not positively identified.

The subsistence crops normally cultivated by the farmers include bean, corn, and sorghum, but, like many farmers in the region, they have experienced decreases in harvest quantity and quality due to drought. The project would enable these farmers to irrigate about 6 ha downstream of the reservoir site. With a more reliable water source, the farmers would like to plant cashew and mango trees to supplement their subsistence crops. There is an interest in reforestation efforts, but the group requires additional technical assistance for all stages of reforestation (e.g., species selection, tree nurseries, planting techniques, and maintenance).

As with most of the other sites, the reservoir will not impact forests at the inundation site, and the primary concerns at the site are related to training for reforestation; management of the reservoir to avoid rapid evapotranspiration; and training in use of tilapia for mosquito management. Maintenance of environmental flows to maintain the limited riparian vegetation is an important consideration for the site. In addition, the landowner has about 50 head of cattle that currently freely graze the property, and developing a strategy to exclude the cattle from the reservoir is also an important consideration for the long-term structural integrity of the reservoir. Finally, given the history of clay excavation at the site, future excavation must be prohibited in order to protect the structural integrity of the site.

Recommendations for this site include:

(1) The earthen dam and newly excavated slopes of the reservoir should be stabilized with a fast-growing native grass, such as the native star grass and/or a legume to enrich the soil;

(2) The community and technical consultants providing guidance at the reservoir site will need to ensure that the dam and reservoir do not significantly interfere with downstream environmental water flows;

(3) The community will need technical assistance/training to ensure that they do not engage in unsustainable hunting of wildlife that is attracted to the reservoir;

(4) The community will need a plan to keep cattle and other domestic animals out of the reservoir (e.g., fencing around the reservoir, creating a separate watering area that may be fed by the reservoir, etc.);

(5) As the community intends to reforest the watershed, the community group would benefit from technical assistance for the entire process of reforestation, from species selection to cultivation and site selection for reforestation efforts; and

(6) As the community intends to farm tilapia as a method of mosquito management, the community group would benefit from technical assistance for managing the fish, especially given the proximity of the site to the school.

5.12.10 TAMARINDO 3, APACILAGUA, CHOLUTECA

The Scoping team was unable to visit this site as the property owner decided he no longer wished to participate in the water-sharing project. Global Communities, the implementing partner, will select another site and communicate the site conditions to the Scoping Team, when it is available.

6. ISSUES TO BE ANALYZED IN THE EA AND ISSUES ELIMINATED FROM FURTHER REVIEW

Sections 6.1 and 6.2 include a comprehensive list of concerns that the Scoping Team identified in its review of documents, fieldwork, and stakeholder consultations. Section 6.1 describes the potentially significant adverse impacts to be evaluated in the EA (Table 12). Section 6.2 lists the impacts to be eliminated from further study in the EA, and gives a justification for elimination (Table 13). As stated in Reg. 216, a concern can be eliminated from detailed study in the EA if the issue is not significant or has been covered by earlier environmental review or approved design considerations.

6.1 IDENTIFICATION OF POTENTIALLY SIGNIFICANT ISSUES, SCOPE, AND STATEMENT OF IMPACT

An issue is deemed significant if it represents: (1) a nonconformance with a USAID or Honduran national environmental requirements; (2) classes of actions normally having a significant effect on the environment as defined under 22 CFR 216.2(d); or (3) cumulative effects associated with the proposed project.

An impact generally refers to an effect caused by the proposed action, such as induced changes in the pattern of land use, population density or growth rate, or related effects on air and water and other natural systems, including ecosystems[8]. An impact can be either primary or secondary.

Primary impacts refer to actions and effects that occur at the same time and place. Secondary impacts or cumulative effects[9] refer to "impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonable foreseeable future actions." These effects result from multiple activities over time or geographic areas, and may last for many years beyond the life of the project that caused the effects. Typically, the cumulative effects assessment of a proposed project considers the overall effects of "associated facilities" on those same environmental and human resources and systems in the project area of influence.

The EA will describe best practices (from the USAID sector environmental guidelines; from lessons learned in Honduras, Latin America, and elsewhere; and from other EAs) for the mitigation of potential adverse impacts listed in Table 12. These best practices are considered required mitigation measures of the Cosecha rainwater harvest project, and, as with all mitigation measures, must be included in engineering contracts and in the Cosecha project's Environmental Mitigation and Monitoring Plan.

In the EA, the Team will use the potentially significant issues as the framework for the Environmental Consequences discussion (22 CFR 216.6(c)(5)), which will include (but not be limited to): the environmental impacts of the alternatives; any adverse effects that cannot be avoided; irreversible or irretrievable commitments of resources; direct and indirect effects and their significance; cumulative effects; possible unintended consequences; possible conflicts between the proposed action and land use plans, policies, and controls for the areas; and energy requirements.

[8] See definition under http://ceq.hss.doe.gov/nepa/regs/ceq/1508.htm#1508.1.

[9] See http://www.usda.gov/rus/water/ees/pdf/AECI_FEIS/Sect_4.pdf. U.S or the definition of cumulative effects offered by the Council on Environmental Quality. This definition is used in the National Environmental Policy Act, and is the reference document for USAID EIA regulations.

Table 12. Potentially Significant Issues to be addressed in the EA

NO.	CONCERN	DETERMINATION OF SIGNIFICANCE	MITIGATION MEASURE
1	Maintenance of environmental water flows in the stream channels below the reservoirs	The reservoirs will subsume sections of ephemeral stream channels and will abstract flow downstream until the reservoir fills sufficiently to allow overflow. Since stream volumes are unknown and the potentially impacted species are also unknown, restricting water flows could negatively impact downstream riparian vegetation, species, and communities.	The reservoir design should allow for sufficient downstream water flows to permit existing downstream flora and fauna to thrive.
2	Proper construction and site selection of the reservoirs so as to avoid risk of dam failure, high evapotranspiration, and erosion.	Soil type, location, slope, and condition of the micro-watershed are all important indicators for the success of the reservoir program. Dam failure could negatively impact downstream users as well as reduce the potential for success of the project.	Provide a checklist of the criteria used to select each site, including the location in the micro-watershed, predominant soil type, slope, and general condition (forested or deforested) of the watershed. Completing and verifying the checklist will be part of the Environmental Mitigation and Monitoring Plan. Provide technical assistance to ensure that the earthen dam and newly excavated slopes of the reservoir can be stabilized with a fast-growing native grass, such as the native star grass and/or a legume to enrich the soil;
3	Reforestation planning and implementation (including cultivating saplings, species selection, planting, maintenance, etc.), including micro-watershed management	Producers generally do not know which species should be selected based on the objectives of forest plan. In this case, the main objective is reforestation for conservation. Although several communities are very interested in planting eucalyptus as a rapid growth species, eucalyptus is an exotic invasive species in Honduras with high water requirements; thus, it is not the most appropriate species for reforestation. The lack of knowledge about the selection of species, plantation management, maintenance, etc., will be a problem for conservation of reservoirs unless appropriate technical assistance is provided.	Provide technical assistance and training for all phases of reforestation planning and implementation.

NO.	CONCERN	DETERMINATION OF SIGNIFICANCE	MITIGATION MEASURE
4	Management of tilapia for mosquito control	One possible impact on reservoirs is an increase in the number of mosquitos that cause certain diseases such as malaria, dengue, and chikungunya. These diseases are listed as recurrent in the project area of intervention, especially during the winter. Although the reservoirs are typically located far from the beneficiary populations, there are still significant public health considerations, mainly for those responsible for maintaining reservoirs with pipe connections for drip irrigation. Although producers noted that they intend to control mosquitoes by introducing tilapia and perhaps other types of fish in the reservoirs, producers were not aware of specific management techniques or requirements to do this.	Where applicable, provide trainings and technical assistance for sustainable, effective management of tilapia.
5	Plans for exclusion of cattle and/or other livestock from the reservoir sites	Some owners of the land where reservoirs will be built have livestock, and, due to water scarcity in the region, supplying water to livestock is a challenge. Currently, farmers carry water to the troughs of the animals, and the reservoirs could be used as permanent sources of water for livestock in summer, especially if the current extreme drought conditions continue. This is a significant concern because the reservoirs are intended for irrigation of crops, not as a source of drinking water for livestock. In addition, cattle can trample the sides of the reservoirs, causing destabilization and erosion of the soil banks, and cattle can contaminate the water with feces and fecal-borne pathogenic microorganisms.	Installation of a fence to exclude cattle and redirection of a portion of water to a separate trough for livestock use.
6	Wildlife management at the reservoirs to avoid unintended impacts on wildlife, especially unsustainable hunting of wildlife	Some of the farmers indicated that they hunt animals like the paca (tepezcuintle), rabbits, agouti (guatusa), etc. The reservoirs could be strategic places to hunt these animals because the animals may be attracted to the reservoirs for water, especially in times of extreme heat and drought.	Technical assistance related to wildlife conservation and management should be considered as a mitigation measure.
7	Potential conflict between beneficiaries and non-beneficiaries	The number of beneficiaries will depend on the amount of water collected annually, and not on the storage capacity of the reservoir. Those consulted said that anyone who is not part of the group can benefit from drip irrigation. People are willing to share the water, but it depends upon the amount captured annually to make projections of useable irrigated areas. This is a significant	Provide capacity building and conflict resolution training to producer groups for planning related to use of the water resource.

NO.	CONCERN	DETERMINATION OF SIGNIFICANCE	MITIGATION MEASURE
		concern because groups currently do not have policies, procedures, or agreements in place to manage potential demand for water.	
8	Diversion and withdrawal of water during operation of irrigation schemes could impact other water users	If the reservoirs impact downstream usage, this could cause social conflict with other water users.	Identify any communities downstream of the project area to determine usage of water and potential impacts.
9	Potential negative impacts on threatened and endangered species	Because specific data on abundance and distribution of threatened and endangered species are not available for the project area, the potential significance of this concern is uncertain. This is an information gap that will be further researched in the EA.	Mitigation measures may include those previously mentioned: maintaining adequate environmental flows, pursuing reforestation of the micro-watersheds, and providing training on wildlife management to the surrounding communities.

6.2 IDENTIFICATION OF ISSUES TO BE ELIMINATED FROM FURTHER REVIEW (ISSUES THAT ARE NOT POTENTIALLY SIGNIFICANT)

The Scoping Team identified the following issues that are not potentially significant and can be eliminated from consideration in the EA (Table 13).

Table 13. Issues Deemed Insignificant During Scoping and Justification for Eliminating

NO.	CONCERN	JUSTIFICATION FOR ELIMINATING
1	Air quality	Construction activities, such as earthwork that could result in dust, will be short in duration (often less than five days). Additionally, at most sites, the reservoirs are not in the vicinity of homes and communities.
2	Noise pollution	Construction activities such as earthwork that could result in noise pollution will not exceed a maximum of five days, so this could be considered an acute impact. Additionally, at most sites the reservoirs are located far from homes and communities.
3	Loss of forests in the areas that will be inundated when the reservoirs are filled with water	There is no primary or secondary forest that will be inundated when the reservoirs are filled with water. Typically the sites are denuded of trees or only a few young trees exist on the actual sites, or the sites are heavily grazed or cultivated.
4	Landslides in the upper watershed	Reservoirs will be built in the lower parts of the micro-watersheds, and none of the sites indicate a propensity for landslides.
5	Use of agro-chemicals in refill zone and surrounding areas would lead to contamination	Plots for crops are located below the reservoirs.
6	Migration of people from other communities because of the benefits of the project	The project areas and land tenure are well defined, and land use disputes or migration is highly unlikely in the area of project influence.
7.	Road construction to access the sites	Gravel roads and primitive dirt roads exist to all the proposed reservoir sites, and road construction is not necessary to access the reservoir sites.
8	Impacts on vegetation in the areas that will be inundated when the reservoirs are filled with water	There is no primary or secondary forest that will be inundated when the reservoirs are filled with water. Typically, the sites are denuded of trees or only a few young trees exist on the actual sites and most of the sites are heavily grazed or cultivated.
9	Impacts related to poor management of human waste	The sites are located away from communities and are not susceptible to contamination by human waste.
10	Closing and abandonment of works	A backhoe with a shovel will be used to move soil and excavate the reservoir areas, and a roller-compactor will be used to compact the soil in the reservoir areas and the dams. Because the reservoirs will be used indefinitely, a process for closing and abandonment of the micro-reservoirs is not anticipated.

7. PRELIMINARY IDENTIFICATION OF ALTERNATIVES TO BE ANALYZED IN THE EA

This section contains a *preliminary* list of reasonable alternatives that the EA Team may consider. As mentioned above, *reasonable* alternatives, which will be compared in the EA, must meet the project purpose and need. USAID's Reg. 216 requires that the EA must present and compare alternatives to the proposed

action. The analytic basis for comparing alternatives must also be presented, along with reasons for eliminating those alternatives that are not included in the detailed EA study.

Below is a list of possible alternatives. It will be the EA Team's responsibility to identify reasonable alternatives to conduct the comparative analysis.

7.1 ALTERNATIVE WATER HARVEST SYSTEM OPTIONS

FLOOD (TRADITIONAL) IRRIGATION

Many farmers in the region still flood their fields. This is the method preferred by lower-income farmers since installation costs are relatively low, and it allows them water usage during the sporadic rainy seasons. This method functions only when water is available, limiting crop production during the long dry seasons. Additionally, it increases the level of effort for farmers since flooding encourages weed growth and encourages pests. Another disadvantage of this method is that it leads to rapid soil degradation and inefficient use of water. Fields must also be located close to streams or rivers, further limiting its widespread application.

PUMP IRRIGATION FROM GROUND WATER, DRILLED OR TRADITIONAL WELL

Smallholder farmers commonly use surface or ground water or small rainwater storage tanks for individual plots. With the use of pump irrigation, farmers are able to take advantage of all the benefits that come with water availability, such as a substantial increase in crop diversification and yield and increased number of harvests per year, which leads to increased incomes. The cost of pumping water is substantial, and in some cases like Honduras there has been a long and unsuccessful history of irrigation through the use of inefficient powered pumps. While less than 10% of water need is met in Honduras via groundwater, groundwater availability and recharge rates vary throughout the country; thus, any plans for boreholes or other wells would need to consider the regionally-specific groundwater conditions. The MoA had various programs that donated irrigation pumps to farmers who later abandoned use of the pumps after two to three years due to the higher costs for operation and maintenance. Additionally, the pumps-to-tanks alternative does not incentivize farmers to associate and scale-up production collectively.

WATER HARVESTING WITH SPRINKLER TECHNOLOGY

While water harvesting could also be combined with sprinkler technology, to irrigate in this manner, farmers would need twice as many reservoirs as the drip system due to less efficient water use. The maintenance costs are also much higher since pumps have to be serviced and replaced on a regular basis.

7.2 PROPOSED ACTION

The proposed action is to implement a study on the efficacy of rainwater harvesting plus drip irrigation. The joint community-based approach to irrigation reservoirs combined with ultra-low-drip technology provides an important alternative to traditional methods as well as a tool for resiliency in the face of climate change. As described earlier, the southern region of Honduras is one of the most water-stressed regions of the country, and receives less precipitation and has less groundwater recharge potential than other areas of the country. Given the increasing irregularity of precipitation in the region, rainwater harvesting technology has the potential to provide a more reliable source of water for agricultural purposes with potentially low impact to forests and other natural resources.

In the pilot phase, the Cosecha project increased farm income, improved crop yields, and improved household food security at nine reservoir sites. As a project designed for "testing and positioning for scale," it will allow Global Communities to measure the effect of these potential significant adverse impacts on several outcomes among project beneficiaries. The project's goal is to provide evidence of whether and how reservoirs, combined with ultra-low drip irrigation and improved agronomic practices, drive producer group formation, increase harvests and household income, and provide social and environmental benefits. Expected outcomes are:

- Significantly improving incomes for famers, their families, and their communities;

- Improving agricultural practices via technical assistance targeting soil conservation practices, soil fertility, use of ultra-low drip irrigation, and improved cultivation methods, among others ;
- Providing social and environmental benefits, including the formation of farmer associations at each reservoir site; increased reliability of subsistence crops for household consumption; potential for cultivation of cash crops, such as watermelon; more efficient use of cultivated lands; and efficient use of limited water for irrigation.
- Demonstrate the efficacy of rainwater harvest compared with existing practices; and
- Training at least 220 people in the processes of the construction, maintenance, and management of the rainwater harvest system, good agricultural practices, and use of ultra-low drip irrigation systems

7.3 NO ACTION

As mentioned previously, the project is located within the Corredor Seco of Honduras, one of the most critical regions in terms of poverty and climate conditions. Under normal conditions, agriculture in this area depends mainly on predictable rainfall. As a result of El Niño in the last few years, the region has suffered severe changes that put at risk the production, productivity, and the food security of the families of small-scale farmers who have fewer resources and are located in marginal hillside areas. In coming years, similar conditions experienced under El Niño are anticipated as the effects of climate change on the region become more apparent. Furthermore, these farmers only cultivate during the rainy season using the traditional slash and burn methods for basic grains (corn, sorghum and beans) for their livelihood. Thus, the No Action alternative would preserve the status quo and diminish the opportunity to enhance resilience of the region to climate change and provide potential improvements in food security.

8. EXPERTISE NEEDED, FORMAT, AND SCHEDULE FOR THE EA PHASE

8.1 EXPERTISE AND FORMAT FOR CONDUCTING THE EA

The EA Team will consist of a mix of local and international experts who, as a team, will possess the expertise needed to evaluate the potential significant environmental and social impacts identified in Section 6. The following specialists would be ideal to have on the EA Team, but, given the scope and budget for the EA as a desk exercise, it might not be feasible to include all the following experts. In some cases one team member may possess more than one skill set.

- Social impact assessment specialist
- Hydrologist with experience in irrigation
- EIA specialist
- Agro-forestry specialist
- Mapping/GIS specialist

The Cosecha project EA will follow the format outlined in 22 CFR 216.6. There will be no variations from the required format, except that the EA will be performed as a desk exercise and the August 2015 scoping visit will serve dual purposes for the Scoping Statement and the EA. As the Honduran Government already approved the Cosecha project, the EA will conform to the USAID format.

8.2 EA PHASE SCHEDULE

The following tentative task timetable (Table 14) is proposed for preparation of the EA, depending upon BEO approval of this Scoping Statement prior to the start date of the EA.

Table 14 Tentative EA Task Timetable

DATES	ACTIVITY	RESPONSIBLE PARTY	DELIVERABLE
October 23, 2015	Begin preparation of EA work plan	Cadmus	Work plan
October 26 to November 6, 2015	Begin additional research and identify potential interviewees for the EA; identify available and relevant GIS data layers	Cadmus	NA
November 6 to 23, 2015	Continue with additional research; develop preliminary GIS maps, and conduct interviews for the EA	Cadmus	NA
October 23 to November 23, 2015	Compile and analyze information; complete GIS analysis	Cadmus	NA
December 4, 2015	Submit draft EA	Cadmus	Draft EA document
December 11, 2015	Comments received on draft EA	USAID	Comments on draft EA
December 22, 2015	Final EA Submitted	Cadmus	Final EA document

9. SCOPING PHASE GAPS (LIMITATIONS OF SCOPING STUDY)

Individuals, organizations, and sites that were not visited by Scoping Team, and that should be included in the EA itinerary, are listed below, as well as documents that the Scoping Team was unable to obtain during the scoping phase.

9.1 INDIVIDUALS AND ORGANIZATIONS THAT THE SCOPING TEAM WAS UNABLE TO MEET

The team was unable to meet with:

- Municipal leaders;
- Secretary of Agriculture staff in charge of the Government of Honduras's rainwater harvesting program;
- Communities and/or individuals downstream from the proposed reservoir sites;
- Government entities in charge of biodiversity, climate, weather, and water data;
- The producer group associated with the tenth research site, as a last minute change prevented the Scoping Team from visiting the tenth site; and
- Representatives from Agrolibano Foundation, a project partner, and COMESA, the distributor of ultra-low drip irrigation in Honduras.

9.2 SITES THAT THE SCOPING TEAM WAS UNABLE TO VISIT

The Scoping Statement team was unable to visit the tenth site proposed for the rainwater harvesting project because the landowner decided at the last minute that he wanted to use the water for his cattle and not for the proposed reservoir, as intended by the project. The Global Communities team had identified 25 to 30

preliminary sites and will be selecting a tenth site based on the criteria used for site selection (e.g., water table, location, accessibility for construction, profile of the producers and landowner, soil type, and proximity of crops that would be irrigated).

9.3 DOCUMENTS THAT THE SCOPING TEAM WAS UNABLE TO OBTAIN

The Scoping Team was unable to obtain the following documents and information, but the EA Team intends to obtain them for the EA:

- Lists of critical habitats and species relevant for the project area, especially any threatened and endangered species;
- Regionally-specific precipitation data;
- Regionally-specific climate data;
- Soil type for each proposed reservoir site;
- Specific stream measurements to characterize the volume and flow for each reservoir site, such as the thalweg, volume of water moving through the stream, width of riparian vegetation, among other stream indicators. Given the inconsistent collection of these types of data by the Honduran government, it might not be possible to locate the data for the EA;
- Design drawings for all 10 proposed reservoir sites; and
- Geographic coordinates of the updated reservoir sites (see highlighted rows in Table 15).

Table 15 Geographic Coordinates for 10 Reservoir Sites

DEPARTMENT	MUNICIPALITY	COMMUNITY	GEOGRAPHIC COORDINATES
Choluteca	Namasigue	La Constancia	13°12´ 36.7´´N, 87° 07´15.5´´W
Choluteca	Namasigue	San Rafael 2	13°11´47.6´´N, 87° 04´54.5´´W
Choluteca	Namasigue	Las Pilitas 2	13°11´ 2.7´´N, 87° 05´ 48.3´´W
Choluteca	Namasigue	Vuelta del Cerro 2	13°11´17´´N, 87° 07' 33´´W
Choluteca	El Triunfo	Altos de Doña Julia	Unavailable
Choluteca	Namasigue	Santa Irene 1	Unavailable
Valle	Nacaome	Altos El Estiquirin 2	13° 29´ 29.4´´N, 87° 28´ 41.4´´W
Valle	Nacaome	El Tamarindo 2	13° 29´ 36.5´´N, 87° 28´41.4´´W
Valle	Nacaome	Chaguite	Unavailable
Choluteca	Apacilagua	El Tamarindo 3*	NA

* El Tamarindo 3 is no longer participating in the program. Global Communities will identify an alternative site.

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ANNEXES

Annex A: Bio-Sketches of Scoping Team

Annex B: List of Contacts

Annex C: Notes from Stakeholder Consultations

Annex D: Photos from Stakeholder Consultations April 2015

Annex E: Photos from the August 2015 Field Visit

Annex F: Maps

Annex G: Site Visit Schedule – August 2015

Annex H: List of Threatened and Endangered Species

ANNEX A: BIO-SKETCHES OF SCOPING TEAM

Ms. Kathleen Hurley (Co-lead). Ms. Hurley (The Cadmus Group, Inc.) is an environmental management professional with more than 15 years of experience in all phases of project development. She is a biologist by training and has expertise in environmental and social safeguards for USAID, multilateral development banks, and domestic US environmental policy. She is a Latin American rural community development and tropical ecology expert, who has conducted community development work in Costa Rica, specifically with coffee value chains and rural agriculture, as well as tropical ecology research. Ms. Hurley has provided environmental compliance support in Asia, Latin America, the Caribbean, and Africa, with a particular focus in Latin America. Ms. Hurley was the technical lead for the 10-country Caribbean FAA 118/119 and the South Sudan FAA 118/119 assessments for USAID; she led the environmental audit for the Rural Value Chains Project in Guatemala, and leads multi-lateral development bank ESIA gaps analyses. She is experienced with USAID environmental compliance procedures and regularly facilitates workshops on USAID environmental compliance. Ms. Hurley has a B.A. in Biology and Environmental Studies from the University of St. Thomas (MN), an M.S. in Environmental and Marine Science from Western Washington University, and a M.A. in International Affairs, with a focus on environmental policy and governance from The Fletcher School at Tufts University.

Ms. Michelle Rodríguez (Co-lead). Mrs. Rodriquez is Sun Mountain's (SMTN) Climate Change Adaptation and Agroforestry specialist. Mrs. Rodríguez is forestry engineer with 15 years of professional experience, who holds a master's degree in Tropical Agroforestry from the Agronomic Research and Teaching Center (CATIE) in Costa Rica. She has more than seven years of experience in the implementation of climate change adaptation and mitigation projects, as well as an intimate familiarity in ecosystem services and water harvesting projects in Central America and Ecuador. In addition to her position within SMTN, she has worked with IUCN, ACICAFOC, CATIE, and many other reputable organizations. During the past two years, Michelle has worked in the Ecuadorian Amazon, coordinating a project on climate change adaptation measures including carbon sequestration and forest cover rehabilitation in Sucumbíos. She also has served as a specialist in a number of USAID environmental assessments of agricultural development and value chain projects. She has experience in technology transfer, forest management, and development and delivery of programs to strengthen capacities in climate change adaptation for local authorities and other key stakeholders. In addition, Michelle has developed the ability to effectively coordinate local government and state institutions in order to generate strategic alliances that increase a project's impact in the territory.

Mr. Charles Hernick (Quality Assurance and Quality Control). Mr. Hernick (The Cadmus Group, Inc.) is an expert on USAID environmental compliance requirements, including FAA Sections 118 and 119, most recently demonstrated through his contributions to assessments in Peru and South Sudan and his management of a tropical forestry/biodiversity and climate change vulnerability assessment for 10 Caribbean countries. He has six years of ecology field- and laboratory-based research experience. He has leveraged his background in ecology and economics to conduct environmental impact assessments for development projects in Asia and Africa, and to support environmental compliance trainings in Latin America and Africa. He has managed extensive policy and finance research and analysis, and facilitated expert consultations in the design of U.S. policy for mitigating the financial risks associated with environmental liabilities (i.e., polluter pays principle/financial assurance). Mr. Hernick has a B.S. in Ecology from the University of Minnesota and an M.A. in International Relations and Environmental Policy from Boston University.

ANNEX B: LIST OF CONTACTS

NO.	NAME	ORGANIZATION	TITLE	EMAIL ADDRESS/PHONE
1	Brian Husler	Global Communities	National Director	bhusler@globalcommunities-hn.org
2	Alejandro Aguero	Global Communities	Program Manager	aaguero@globalcommunities-hn.org
3	John Jordan	Global Communities	Operations Manager	jjordan@globalcommunities-hn.org
4	Olman Rivera	Independent	Consultant	olmanri@hotmail.com
5	Sonia Suazo	Mi Ambiente	Climate change and rainwater harvesting	Sonia.suazo@gmail.com
6	Fernando Ochoa	Mi Ambiente	Assistant Director of Hydrological Resources	
7	Juan Carlos Golindez	Mi Ambiente	Environmental	
8	Peter Hearne	USAID	Mission Environmental Officer	phearne@usaid.gov
9	Issac Ferrera	USAID	Climate Change Office	iferrera@usaid.gov
10	Nabil Kawas	Instituto de Ciencias de la Tierra, UNAH	Professor & Meteorologist	nkawask@gmail.com
11	Francisco Argenal	Comite Permanente de Contingencias	Meteorologist	
12	---	Instituto de Conservacion Forestal	Departamento de Cuencas Hidrograficas	www.icf.gob.hn/

ANNEX C: NOTES FROM STAKEHOLDER CONSULTATIONS

During the scoping field visit in August 2015, the Scoping Team met with members of each beneficiary group to discuss the benefits and potential disadvantages of the rainwater harvesting project and assess the environmental conditions at the site. Generally, the concerns raised by community members were similar to those raised during the April 2015 public meetings. The main points raised during the August 2015 community meetings were:

- Concerns about the dam failing
- Mosquito management at some of the sites
- Climate change and impacts on precipitation patterns
- Reforestation plans, including training, species, and extent of reforestation
- Timeline for reservoir construction
- Management and allocation of water resources amongst beneficiaries, as well as members outside the beneficiary group

In general, the community groups indicated strong support for the project, especially in light of the significant drought that has affected the region, and were eager to know when construction would begin. The beneficiaries view the rainwater harvesting project as a potential way to increase crop production and decrease food insecurity. Beyond providing for subsistence needs, many of the groups indicated a desire to grow cash crops, such as watermelon, peppers, squash, and/or cashew trees. The project is perceived to provide both nutritional and economic benefits.

Most stakeholder groups do not have a governance structure, whether informal or formal, to manage water distribution, resolve conflicts, and maintain infrastructure. Water is a scarce resource in the region and potential conflicts could arise related to access and distribution of water.

All community groups were interested in participating in reforestation efforts, but expressed a lack of knowledge and/or training in selection of species and implementation of the reforestation plan. There is a desire for more training and capacity-building in that regard.

Frequent comments, questions, and answers discussed during the community forums are summarized in the Appendix 8.2 of the April 2015 EA and below.

POSITIVE ISSUES IDENTIFIED DURING THE SCOPING PROCESS (APRIL 2015):

1. In the current government, the water harvesting projects are prioritized as a strategy for encouraging agricultural production and food security.
2. Employment opportunities are generated, which prevents migration of the population to other regions and to the USA.
3. Community-based structures are strengthened.
4. Public-private alliances will be strengthened.
5. Rainwater is harvested and conserved for farming use.
6. Rainwater harvest project models are established that can be extrapolated for use in other regions.
7. Farming areas that are only cultivated in winter or have been out of use are recovered.
8. Nutrition status, food security, and economic condition of beneficiary families are improved.
9. Climate conditions and biodiversity are improved in sites near reservoirs.

10. Beneficiary communities will decrease their vulnerability to climate change.

NEGATIVE ISSUES IDENTIFIED DURING THE PUBLIC SCOPING PROCESS (NOVEMBER AND DECEMBER 2014):

1. Possibility of poor construction of rainwater harvest lagoon.
2. In the absence of a good management plan, the reservoirs could become a threat, for example: mosquito breeding site, drowning site for animals and domestic animals, etc.
3. A lack of adequate training on the reservoir maintenance, operation, cultivation, and drip irrigation microsystems could result in a negative project effect.
4. If the project is not executed, it could result in demotivation for all involved sectors and beneficiaries of the project.

POSITIVE ENVIRONMENTAL AND SOCIOECONOMIC IMPACTS IDENTIFIED BY THE COMMUNITY FORUMS (NOVEMBER AND DECEMBER 2014):

1. Diversification of cultivations and production
2. Preservation the forest areas around the rainwater harvest reservoir
3. Permanent water supply for uses other than irrigation
4. Productive of the water that will be stored in the reservoir
5. Improved fish quantity and quality in the reservoir
6. Reforestation
7. Reduce the amount of unusable land
8. Reduce the risk of losses of cultivations in winter and summer
9. Better commercialization of products
10. Increase in biodiversity is a tourist attraction

NEGATIVE ENVIRONMENTAL AND SOCIOECONOMIC IMPACTS IDENTIFIED BY THE COMMUNITY FORUMS (NOVEMBER AND DECEMBER 2014):

1. Possibility of poor construction of rainwater harvest lagoon
2. Increase of mosquitoes in the reservoir
3. Communities further from lagoon may protest a lack of water
4. Inappropriate use of agro-chemicals at low plots of land by farmers who are not project beneficiaries
5. Lack of supervision could lead to danger or accidents near lagoon
6. Landslides in the upper part as a result of lack of vegetation
7. Use of agro-chemicals in refill zone and surrounding areas would lead to contamination

CHALLENGES FACED BY THE COMMUNITY RELATED TO THE PROPOSED PROJECT INCLUDE (NOVEMBER AND DECEMBER 2014):

1. Project sustainability and reproducibility
2. Good management of reservoirs and adjacent areas- principally refill zones

3. Expansion of cultivation areas for better crop diversification
4. Creation of packaging, processing, and trading companies
5. Expansion of employment sources

ANNEX D: PHOTOGRAPHS OF NOVEMBER/DECEMBER 2014 SITE VISITS

COMMUNITY EL TAJO, NAMASIGUE, MUNICIPALITY


La Cusucera, designated plot for the construction of the rainwater retention structure

COMMUNITY LA DANTA, NAMASIGUE, MUNICIPALITY



El Carao, designated site for the construction of the structure of rainwater reservoir


Plot of land sown with corn; Plot of land with weeds or bush

Plots of land selected for the installation of the drip irrigation system on Rubén Gomes Cadena's property

SAN AGUSTIN COMMUNITY, NAMASIGUE, MUNICIPALITY

El Mango, selected site for the construction of the rainwater harvest structure

Plots of land selected for the establishment of the drip irrigation system

COMMUNITY SAN RAFAEL CENTRO, NAMASIGUE, MUNICIPALITY


La Poza del Hoyo site**,** San Rafael Arriba, area selected for construction of structures to harvest rainwater


Plot of land selected for the installation of the drip irrigation system

COMMUNITY LA CONSTANCIA, NAMASIGUE, MUNICIPALITY


Cultivation of corn in La Laguna; Tree cultivations in La Laguna



Cultivation of corn; transporting corn; Orchard cultivation

COMMUNITY LA VUELTA DEL CERRO, NAMASIGUE, MUNICIPALITY


La Mora site, designed for the construction of the structure for rain water harvesting


Plots of land selected for the establishment of the drip irrigation system

COMMUNITY SAN FRANCIS AND PILITAS, NAMASIGUE, MUNICIPALITY


Coyol Solo place, selected for construction of a structure for retention of rainwater and water flow

COMMUNITY GUANACASTE ABAJO, CONCEPCIÓN DE MARÍA, MUNICIPALITY


El Farallón y Las Minas, selected places for the construction of the structure for rainwater harvest and retention

Sorghum plot selected for drip irrigation system

COMMUNITY LAURELADA, EL CORPUS, MUNICIPALITY

El Gavilan, construction of the structure for retention or harvest of rainwater and water flow

Plot chosen for the installation of drip irrigation

COMMUNITY EL TAMARINDO, APACILAGUA MUNICIPALITY

The site selected for construction of a reservoir for the retention of rainwater and superficial water flow

Plots of land for drip irrigation

COMMUNITY ALTOS DEL ESTIQUIRIN, NACAOME'S MUNICIPALITY, DEPARTMENT DE VALLE


Cerro de Maria

Sesame cultivation

Parcels with weeds of the cultivation of corn

ANNEX E: SCOPING STATEMENT SITE VISIT PHOTOS – AUGUST 2015

Location: El Moracito Arriba, Jicaro Galan
Date: 15 August 2015
Pilot project of Global Communities and Grupo Nuevo amanecer in Nacaome, Valle (L) and watermelon fields (R)


Location: La Constancia, 12 de noviembre
Date: 15 August 2015
Designated area for construction of the rainwater reservoir in Choluteca, Namasigue (L); dry creek bed; water flows during winter.


Location: San Rafael 2, Choluteca, Namasigue
Date: 15 August 2015
Designated site for construction of the rainwater reservoir (L); no large streambeds at the site (R)


Location: Pilitas 2, San Francisco Community, Choluteca, Namasigue
Date: 15 August 2015
The reservoir was built five years ago (L) and the new reservoir will be expanded uphill of the existing site (R)


Location: Vuelta al Cerro, October 24 Association, Choluteca, Namasigue
Date: 16 August 2015
Selected area for the construction of the reservoir (L); livestock grazing at the project site (R)


Location: Altos de Doña Julia, Choluteca, El Triunfo
Date: 17 August 2015
Selected site for reservoir construction (L); site is currently used for agriculture and subject to slash and burn (R)


Location: Santa Irene 1, Choluteca, Namasigue
Date: 17 August 2015
Selected area for the construction of the reservoir, recently burned to cultivate crops (L, R); the school is 50 meters downstream from the dam site.


Location: Altos de Estiquirín 2, Valle, Nacaome
Date: 18 August 2015
Selected site for construction of the reservoir (L). The creek bed and overall site is very rocky, which will need to be removed for reservoir construction (R)

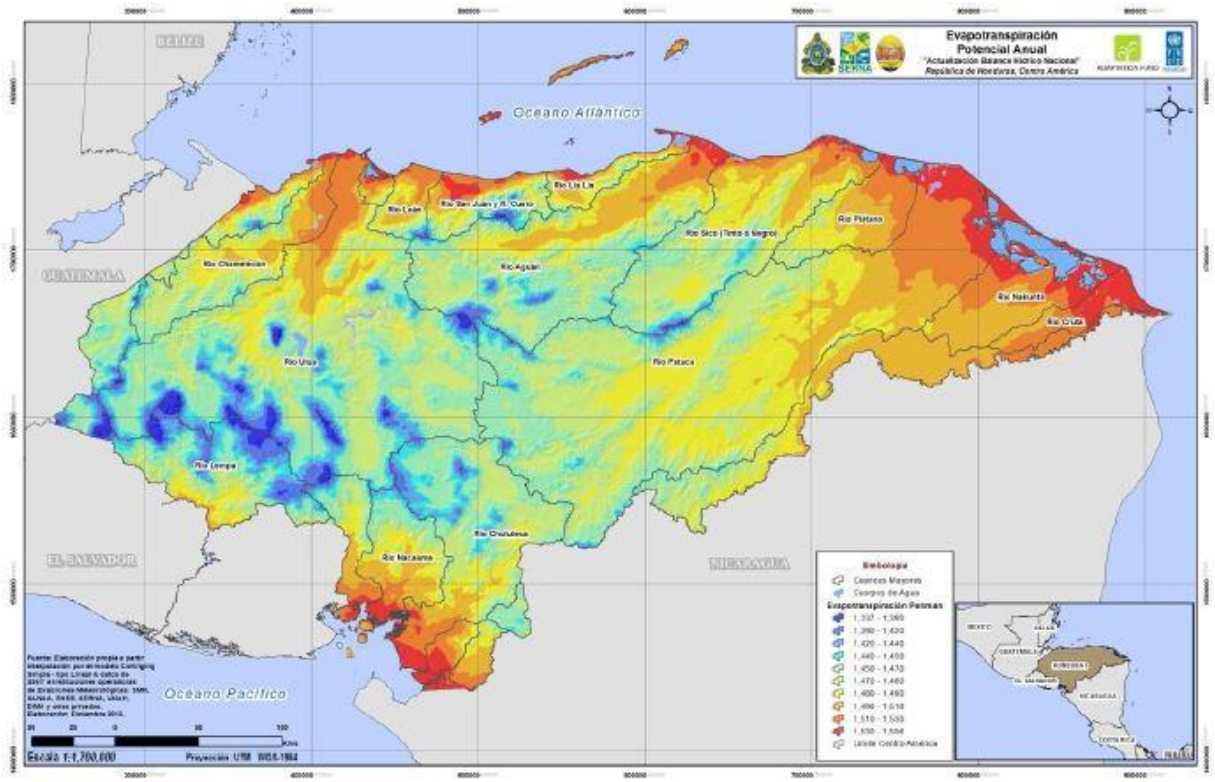

Location: Tamarindo 2, Valle, Nacaome
Date: 18 August 2015
Selected site for the construction of the reservoir (L) Hillsides in the micro-watershed have minimal forest cover (R)


Location: Chaguite, Nacaome, Valle
Date: 18 August 2015
A small pond was created for extraction of clay on the site, which is where the reservoir will be located (L); minnows found in the ephemeral pond (R); cattle graze in the area surrounding the existing pond (Lower)

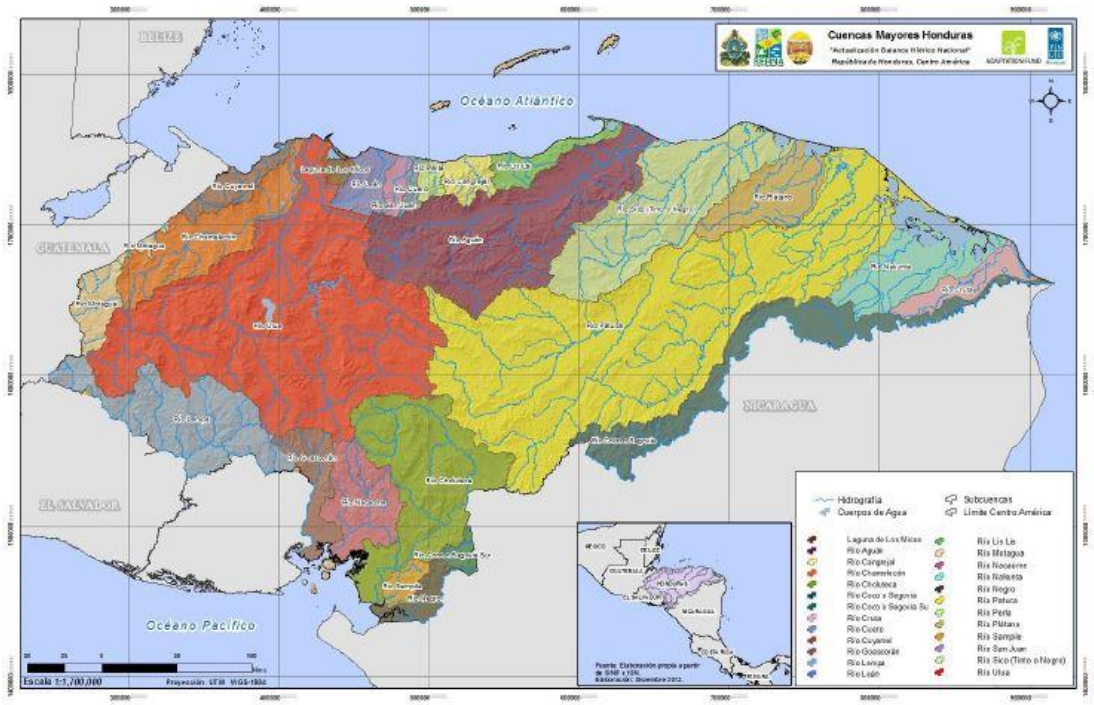

ANNEX F: MAPS

WATER RESOURCES

Map of Annual Evapotranspiration Potential (SERNA 2014)



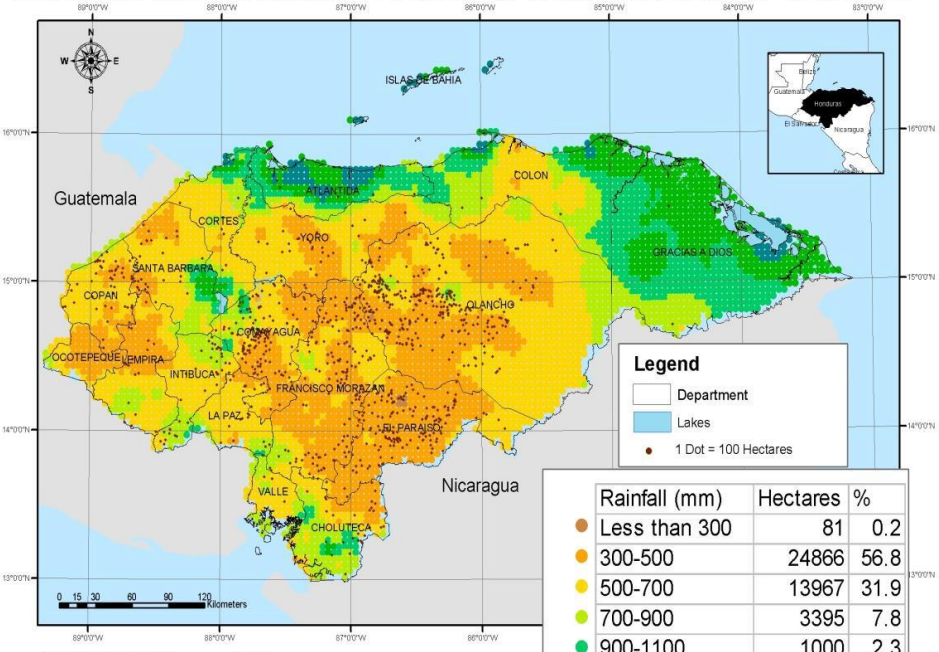
Watershed map of Honduras (SERNA 2014)



Sub-watersheds of Honduras (SERNA 2014)

HONDURAS CLIMATE AND WEATHER

HONDURAS: AVERAGE RAINFALL "POSTRERA" SEASON SEPTEMBER - DECEMBER



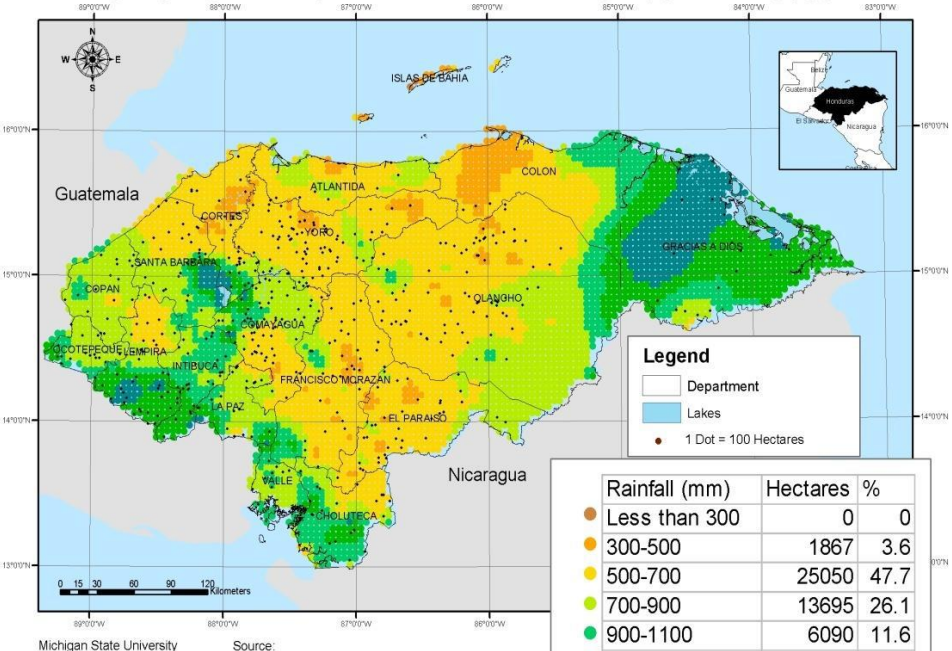
Rainfall (mm)	Hectares	%
Less than 300	81	0.2
300-500	24866	56.8
500-700	13967	31.9
700-900	3395	7.8
900-1100	1000	2.3
1100-1300	380	0.9
More than1300	96	0.2

Michigan State University
Bean Cowpea CRSP
Projection: UTM Zone 16
Geographic Coordinate System:
North American Datum 1927

Source:
IV National Agricultural Census 1993

Rainfall average Global Precipitation Center 1950-2000

HONDURAS: AVERAGE RAINFALL "PRIMERA" SEASON MAY-AUGUST



Rainfall (mm)	Hectares	%
Less than 300	0	0
300-500	1867	3.6
500-700	25050	47.7
700-900	13695	26.1
900-1100	6090	11.6
1100-1300	4215	8
More than1300	1567	3

Michigan State University
Bean Cowpea CRSP
Projection: UTM Zone 16
Geographic Coordinate System:
North American Datum 1927

Source:
IV National Agricultural Census 1993

Rainfall average Global Precipitation Center 1950-2000

ANNEX G: SITE VISIT SCHEDULE – AUGUST 2015

PROGRAMA "COSECHA"

ANALISIS DE PREFACTIBILIDAD DE SITIOS DE COSECHAS DE AGUA

SITIOS CON MAYOR EFICIENCIA

No.	NOMBRE DEL SITIO	NOMBRE DEL DUEÑO DEL PREDIO	DEPARTAMENTO	MUNICIPIO	Agenda
	Experiencia Piloto Moraicito	**Leonidas Cruz**	**Valle**	**Nacaome**	**Sabado 15 de agosto**
1	La Constancia 1	Genaro Muñoz	Choluteca	Namasigue	
2	San Rafael 2	Hermes Ramirez	Choluteca	Namasigue	
3	Vuelta al Cerro 2	Angel Argueta Trejos	Choluteca	Namasigue	**Domingo 16 de agosto**
4	Las Pilitas 2	Wilfredo Ordoñez	Choluteca	Namasigue	
5	Altos de doña Julia	Ramon A.Colindres Rodriguez	Choluteca	El Triunfo	**Lunes 17 de agosto**
6	Santa Irene 1	Roberto Gutierrez	Choluteca	Namasigue	
7	Alto del Estiquirin 2*	Antonio Matamoros	Valle	Nacaome	**Martes 18 de agosto**
8	Chaguite	Jose Eugenio Fuentes	Valle	Nacaome	
9	El Tamarindo 2	Ramon Pereira	Valle	Nacaome	
10	Tamarindo 3	Marco Tulio Vaquedano	Choluteca	Apacilagua	**Miercoles 19 de agosto**

ANNEX H: LIST OF THREATENED AND ENDANGERED SPECIES

Threatened and Endangered Species of Southern Honduras

KINGDOM, CLASS	SCIENTIFIC NAME	COMMON NAMES(S)	RED LIST STATUS
Animalia, Mammalia	*Artibeus inopinatus*	Murciélago, Honduran fruit eating bat	DD
Animalia, Mammalia	*Cabassous centralis*	Armadilllo, Northern naked tailed armadillo	DD
Animalia, Mammalia	*Cryptotis hondurensis*	Musaraña hondureña, Honduran small eared shrew	DD
Animalia, Mammalia	*Tapirus bairdii*	Danto, Tapir, Biard's Tapir	EN
Animalia, Aves	*Dendroica chrysoparia*	Chipe mejillas doradas, Golden cheeked warbler	EN
Animalia, Reptilia	*Caretta caretta*	Tortuga caguama, Loggerhead sea turtle	EN
Animalia, Reptilia	*Ctenosaura flavidorsalis*	Garrobo de la Paz, Yellowback spiny-tailed iguana	EN
Animalia, Reptilia	*Dermochelys coriacea*	Tortuga laúd, Leatherback sea turtle	CR
Animalia, Amphibia	*Bolitoglossa carri*	Salamandra cantagallo	CR
Animalia, Amphibia	*Craugastor emleni*	Sapito	CR
Animalia, Amphibia	*Exerodonta catracha*	Rana	EN
Animalia, Amphibia	*Hypopachus barberi*	Ranita oveja	VU
Animalia, Amphibia	*Leptodactylus silvanimbus*	Ranita de charco, White-lipped frog	CR
Animalia, Amphibia	*Oedipina ignea*	Salamandra lombriz, Chimaltenago Worm salamander	DD
Animalia, Amphibia	*Oedipina stuarti*	Salamandra,	DD

KINGDOM, CLASS	SCIENTIFIC NAME	COMMON NAMES(S)	RED LIST STATUS
		Stuart's worm salamander	
Animalia, Amphibia	*Oedipina taylori*	Salamandra lombriz del sur, Taylor's worm salamander	DD
Animalia, Amphibia	*Ptychohyla salvadorensis*	Rana	EN
Plantae	*Abarema oxyphyllidia*		VU
Plantae	*Aegiphila panamensis*		VU
Plantae	*Agonandra loranthoides*		VU
Plantae	*Amphitecna molinae*		EN
Plantae	*Bombacopsis quinata*	Ceiba	VU
Plantae	*Casearia williamsiana*		CR
Plantae	*Cedrela odorata*	Cedro, Cedro real, Cedro oloroso, Red cedar	VU
Plantae	*Coccoloba cholutecensis*	Uva de monte	CR
Plantae	*Colubrina hondurensis*		CR
Plantae	*Dalbergia retusa*	Coccobolo, Palo negro	VU
Plantae	*Lonchocarpus molinae*		CR
Plantae	*Lonchocarpus phlebophyllus*		EN
Plantae	*Lonchocarpus retiferus*		EN
Plantae	*Lonchocarpus phlebophyllus*		EN
Plantae	*Lonchocarpus retiferus*		EN
Plantae	*Pinus tecunumanii*	Pina macho, Pino rojo, Ocote de caretilla, Teco Uman Pine	VU
Plantae	*Quercus skinneri*	Roble de montaña, Encino, Malcote	VU

KINGDOM, CLASS	SCIENTIFIC NAME	COMMON NAMES(S)	RED LIST STATUS
Plantae	*Swietenia humilis*	Caoba, Honduran mahogany	VU
Plantae	*Swietenia macrophylla*	Caoba, Caoba del Atlántico, Big leaf mohagany	VU
Plantae	*Zamia herrerae*	Camotillo	VU
Plantae	*Zanthoxylum ferrugineum*		EN
Plantae	*Zanthoxylum procerum*		EN

DD= Data deficient, CR = critically endangered, EN = endangered, VU = vulnerable, NT = near threatened

Sources:

IUCN. Lista de Especies de Preocupación Especial en Honduras. www.ahprahonduras.org/uploaded/content/category/834655672.doc

SERNA. 2008. Especies de Preocupación Especial en Honduras. Evaluación de las Capacidades y Prioridades del País para Implementar El Plan de Acción de La Estrategia Nacional de Biodiversidad ENB II. http://www.undp.org/content/dam/honduras/docs/publicaciones/Especies_Preocupacion_Especial_Honduras.pdf