## Title of the proposed project

Characterization of energy use in Central America: households choices and opportunities to promote energy transition initiatives in low and middle-income countries

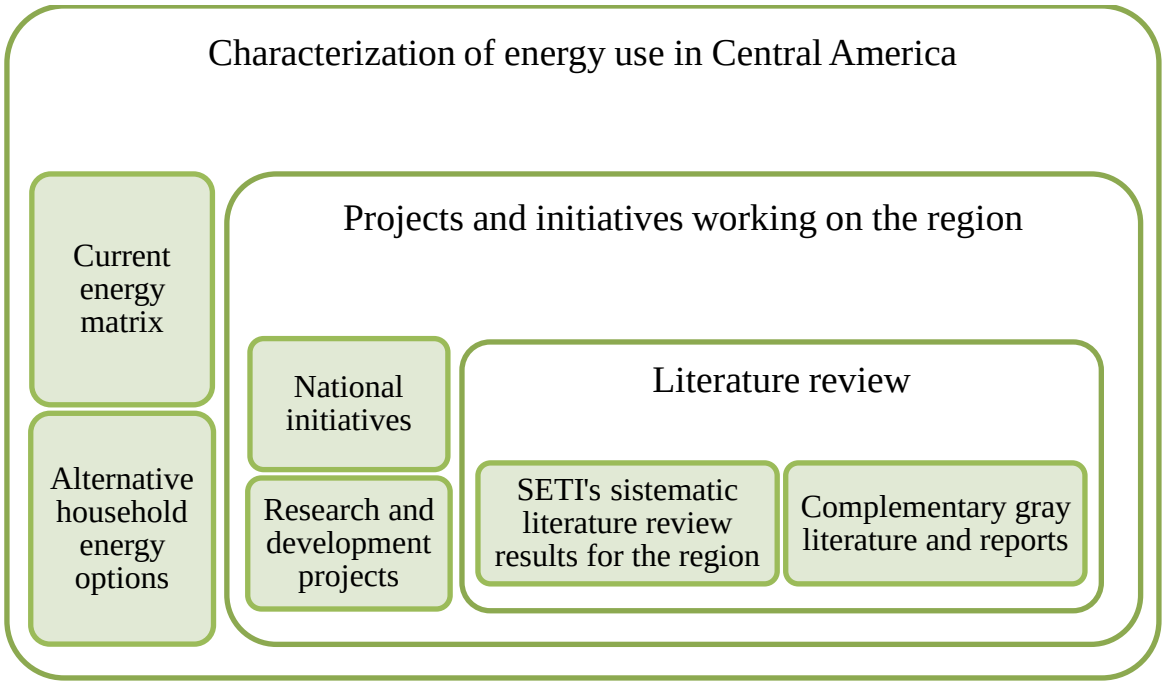
## Context

While developed countries are increasing their reliance on renewable energy sources, low and middle-income countries maintain their energy matrix on conventional fuels and natural resources, increasing their energy dependency and unsustainable use of natural resources to respond to a growing population and emerging economy. There is a need to understand the current status and the drivers of energy transition in low- and middle-income countries to promote a change in the current energy model.

In Central America, where natural resources are overexploited, and most rural areas are isolated and disconnected from the electricity grid, the energy matrix remains dependent on fossil fuels. A high share of energy comes from oil sources (50%), followed by biomass (38%) and electricity (12%, estimated in 2013). Biomass corresponds mainly to firewood used in homes for cooking (PEN, 2016). With the expansion of the economies, the use of fossil fuels is increasing, while the use of fuelwood as main cooking source continues being unsustainable (Dolezal et al., 2013). Central America had the double challenge of ensuring the provision of the energy needed for its development and, at the same time, reducing the social, economic and environmental impacts associated with the use of traditional sources (Galvez et al., 2010).

As a response, regional development goals and national interests are aligned towards the embracement of renewable energies and sustainable alternatives. In this aspect, several projects and initiatives are currently working on improved stoves, using forestry waste for bioenergy and photovoltaic systems, to mention some, aiming to spread the access to energy sources, increase the efficiency of energy generation and reduce the emission of greenhouse gases in the region. For example, the regional strategy on environment and health (2009-2024) considers the efficient use of energy and biofuels together with energy, social and environmental sustainability criteria (SICA et al., 2008). However, Dolezal et al. (2013) highlight deficiencies in the delineation, implementation, and functioning of national policies, accompanied of financial, technical and other barriers. Mechanisms driving household choices behavior remain unclear, hinder the transition efforts. Therefore, we aim to understand the use of energy at a household level and the potentiality of available alternatives in order to coordinate future research, development, and policy efforts towards an energy transition in Central America.

## Rationale for the Proposed Project




## Project Goal and Methodology

We aim to understand the status of energy use in Central American households to coordinate future research and development efforts on the potential energy alternatives, ensuring policy embracement for energy transition in low- and middle-income countries of Central America. For this, we will combine data of energy consumption and available alternatives at household level with efforts from initiatives, research and development projects conducted in the region, national strategies that sustainably pursue provision of energy, and findings from previous studies.

Specifically, we will:

- Explore the current data from Living Standards Measurement Study (LSMS) and additional data sources at country level to assess the heterogeneity for households choosing energy alternatives.
- Identify energy options available at small scale in the region and compare the potential for household economies, environment, and national energy dependence.
- Register current projects and initiatives present in the region to find implementation gaps.
- Assess relevant literature about the regional approach of energy generation and use to find research gaps, common objectives, and policy needs.
- Consider which type of data, primary surveys or secondary data, is required for future research based on experiences from previous studies in the literature review.

## Project Strategy/ Listing of Project Activities

| Activities | 2017 | | | | | | |
|---|---|---|---|---|---|---|---|
| | *Jun* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* |
| Present concept note and get feedback from SETI | | | | | | | |
| Review the current data from Living Standards Measurement Study (LSMS) | | | | | | | |
| Include databases from other CA countries | | | | | | | |
| Analyze heterogeneity in households for choosing energy alternatives, trends, and implications | | | | | | | |
| Review the current or recent projects and initiatives present in the region | | | | | | | |
| Review relevant research published about energy choices in the Central American region | | | | | | | |
| Catalog the data used by authors and list data sources concerning primary surveys and secondary data | | | | | | | |
| Overlap the current project's initiatives with the relevant research done in the region | | | | | | | |
| Summarize findings in a report about the state of the art | | | | | | | |
| Presentation of results to SETI at EfD meeting Ethiopia | | | | | | | |
| Develop research idea for pilot | | | | | | | |
| Write proposal and look for potential donor | | | | | | | |

## Expected Results

- Report on state of the art on household energy choices in Central America, indicating research gaps and promissory options for the promotion of energy alternatives.
- Analysis of household energy choices for the region given the data possibilities.
- Potentially, identification of successful experiences, innovation options, and financial opportunities.

## Organizational background (including the expertise and experience)

The **Environment and Development Center for Central America (EfD-CA)** is an integral part of the thematic Research Program in Economics and Environment for Development (EEfD) of the Tropical Agricultural Research and Higher Education Center (CATIE).

**CATIE** is the leading regional research and higher education institution in the fields of agriculture, agroforestry and natural resource management. Its mission is "contribute to rural poverty reduction by promoting competitive and sustainable agriculture and natural resource management, through higher education, research, and technical cooperation." CATIE's unique strength comes from an integrated approach that combines multiple disciplines (from economics to biotechnology) and various strategies that include research, higher education, training and technical assistance.

**María A. Naranjo** is the director and research fellow for the EfD-CA. Her research is focused on understanding farmers' behavior, risk management strategies and preferences towards risk. She has experience with the application of experimental and behavioral economics methods, conducting fieldwork and in Nicaragua and Costa Rica. She has also worked on related topics including voluntary environmental programs and management and funding of natural protected areas.

**Bárbara Viguera** is EfD-CA researcher and project manager at CATIE. Bárbara is a specialist in climate change adaptation and sustainable management of forest and agronomic systems. She has experience supporting research in climate change adaptation of tropical and social systems, forest dynamics and energy crops as restoration alternative. She also has experience in conducting fieldwork and development initiatives in Central America. The resilience of eco- and agroecosystems dealing with climate change and human pressure, food security of farming communities, adaptation alternatives and climate-related issues are her current research interests.

**Ahías Steller Mora** is a research assistant at CATIE. Majored in economics, with master degrees in Development Economics and Environmental Economics, has worked closely with the Costa Rican farmers and fishermen due to his work for the Central Bank of Costa Rica as Agricultural Account Analyst, where he gained experience in performing research related activities. His research interests include climate-adaptation, energy related topics and food security of rural communities

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