

Review of Household Clean Energy Technology for Lighting, Charging and Cooking in East Africa—Kenya and Tanzania

By: GVEP International

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INTRODUCTION

Household energy is a crucial issue for organizations such as the African Wildlife Foundation (AWF) and the Jane Goodall Institute (JGI) who are working to conserve local environments that are coming under pressure from increasing human populations and activity. In areas of ecological importance energy services are of high significance as communities need to rely less on natural resources such as firewood to lower pressure on depleting forest resources.

In June 2012, GVEP International was contracted by AWF and JGI, under the Africa Biodiversity Collaborative Group (ABCG), to produce an in-depth review and documentation of clean energy technologies used by households in the conservation landscapes of Kenya and Tanzania. The main outputs from this study are a learning report outlining the key findings from the analysis and a toolkit on the appropriate identification and implementation of sustainable energy projects within the context of conservation.

FINDINGS FROM THE LEARNING REPORT

The learning report documents the findings of a review of household clean energy technologies for lighting, charging and cooking in Kenya and Tanzania. It includes details on energy technology suppliers in both countries, insights from other stakeholder activities in



Mbirikani Ranch solar products demonstration. Photo GVEP

holder activities in household energy and findings from surveys conducted at AWF's site in Imbirikani Kenya and JGI's site in Kigoma Tanzania.

The report focuses on the technologies of improved cookstoves, biomass briquettes and eco-charcoal, solar, biogas and wind. Each technology

option has a range of both imported and local products which vary in capacity and price. The energy market in Kenya is slightly more advanced than in neighboring Tanzania and the report has listed key suppliers of these technologies in both countries. Whilst most are located in the major cities and towns, they will supply products country-wide and are expanding their activities into rural areas through partnerships and dealer networks.

GVEP INTERNATIONAL

GVEP (Global Village Energy Partnership) International reduces poverty by increasing access to affordable modern energy services in developing countries, where state or large utilities' interventions are slow to reach. We help establish and grow micro, small and medium size energy enterprises so that they can deliver sustainable access to clean energy, and in turn improve quality of life for people in developing countries. Our work towards delivering improved access to clean and sustainable energy has a positive impact in the fields of health, agriculture, small businesses, households and education.

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Ms. Clough has been working with GVEP International for the past 2 years providing technical support to the Developing Energy Enterprise Programme through activities including product testing, research reports, brand development and documentation. More recently, Laura has been leading the support GVEP offers to biomass related businesses including those making improved cookstove and biomass briquettes. Laura graduated from the University of Birmingham with a Masters degree in Mathematical Engineering and has over 5 years' experience working in technology related fields.

Find the full report of this summary in the Climate Change Adaptation section online at: <http://www.abcg.org/>

In addition to suppliers of energy technologies, a number of stakeholders are active in promoting and disseminating these technologies, several within conservation contexts, such as Wildlife Works, WWF and African Solar Design. Lessons can be learned from the experience of these organizations when planning the introduction of energy technologies.

Promotion of energy technologies, such as improved cookstoves and bio-gas, has been on going in Kenya and Tanzania for several decades, yet the uptake of the technology remains relatively low. This report has outlined some of the barriers that have hindered the uptake of these technologies including the lack of affordable financing for both the consumers and entrepreneurs operating in the sector. Many initiatives initially disseminated energy technologies for free which has left the end user with a sense of entitlement and reluctance to pay for these technologies on a commercial basis. Lessons learnt from past programs have also been discussed, including the positive effect of peer marketing on the demand for energy products and the importance of having product maintenance available at the local level to maintain confidence in the quality of the product.

A range of financial institutions exist in Kenya and Tanzania from commercial banks, to micro finance institutions to informal savings schemes at the village level, all with differing terms and conditions. Financing for energy products is still at infancy, with Kenya slightly ahead of Tanzania. Current payment options of energy products include upfront payments and installment payment with credit provided through financial institutions or product suppliers.

Pay-as-you-go schemes are also being piloted. The cost of small products such as improved cookstoves and small solar lanterns are low, and therefore financial institutions often do not include such products into their lending portfolio for customers as transaction costs will



A solar home system demonstration at the Sun Transfer shop, Loitokitok, Kenya.



Traditional hearth and kerosene lamp in a Maasai home, Imbirikani Ranch.

be higher. Without key technical experts, financial institutions often face problems with quality assessments, and it is recommended that certified products and guarantees be essential elements for any product financing.

The following conclusions were drawn from site surveys conducted at the Imbirikani Group Ranch in Kenya and the Gombe-Masito-Ugalla Landscape in Tanzania;

- i. Firewood use within both areas is high, whilst charcoal is limited to the main towns and surrounding areas. The use of the three stone fire (open fire) is high in both areas and few homes are using improved stoves. In Kenya many of those interviewed feel they do not know any way to cook other than with the three stone fire, indicating that switching from this cooking practice represents a significant behavior change. Awareness and availability of the stoves is also a factor at both sites with many households not knowing where to purchase these items.



Demonstrating energy products with community leaders, Imbirikani Ranch.

- ii. Fixed wood stoves with chimneys are suitable for both sites as well as portable charcoal stoves in more urban areas. Existing domestic stove producers around the Imbirikani site could be supported to expand their product range and reach. No domestic stove producers were identified at the Tanzania site although locally made wood stoves had been introduced by JGI. There is scope to develop the market for charcoal stoves in Kigoma town but further assessment of the demand would need to be carried out and production established locally.
- iii. Institutional stoves are also suitable for both areas where schools and restaurants have high wood expenditure. Financing options can be assessed for those that cannot afford the upfront costs, by channeling credit through local financial institutions. There is also potential to work with

local schools to set up woodlots for sustainable wood harvesting.

- iv. At both sites, charcoal is sold and used mainly within the towns. Whilst targeting the market in urban areas with energy savings stoves and alternatives such as briquettes and LPG could help reduce demand, there is also potential to work with local land owners and charcoal producers to introduce more sustainable production techniques.
- v. Access to grid electricity is very low in both sites outside of the main towns and kerosene is the most widely used fuel for lighting. There is potential to increase the availability of solar lanterns through establishing dealers for existing solar businesses and linking with solar initiatives such as that facilitated by Camco in Kigoma.

- vi. There is potential to work with businesses with high energy demands, such as salt mines and those burning bricks in Kigoma, to introduce more energy efficient techniques (improved kilns) or establish wood lots to make their fuel wood use more sustainable.



Women carrying wood, Mwamgongo Village, Kigoma.

- vii. There is potential to establish briquette production with potential feedstocks such as coffee husk and sawdust in plentiful supply at the Kigoma site. The economics of production would need to be established to see if the production price could compete with charcoal in the market.

- viii. The level of financial activity amongst households and financial institutions varies between the two sites. Most households would opt to pay for energy products in monthly installments to make payments more affordable. There is potential to further explore consumer financing options through financial institutions, local SACCOs (Kenya & Tanzania) and farming associations (Tanzania) with access to credit facilities.

- ix. Existing CBOs and NGOs already working in the area can provide links to the local community in potential energy projects. Existing associations and cooperatives can also be engaged since they are well organized, with strong

community links and often with distribution and financing capacity (such as the Matyazo Coffee Cooperative in Kigoma).

TOOLKIT FOR IMPLEMENTING HOUSEHOLD ENERGY PROJECTS IN CONSERVATION AREAS

The toolkit has been designed as a resource document for the African Wildlife Foundation (AWF) and the Jane Goodall Institute (JGI) to implement clean energy projects at the household level in conservation areas in Kenya and Tanzania. The toolkit guides the user through the steps of designing and implementing an energy program and covers the following sections:



Waste sawdust at a timber mill in Kigoma, Tanzania, potential feedstock for biomass briquettes.

- **Energy Technology Options:** The toolkit considers the technologies of solar, improved cookstoves, briquettes & eco charcoal, wind and biogas and the prerequisites for when these technologies are suitable. For example solar is most suitable in areas that are off grid that are unlikely to be connected in the next five years and receive sufficient levels of sunlight. Various types of technology exist that may be suited to different situations, for example fixed and portable improved stoves. The pros and cons of each technology option should also be considered; for example briquettes can reduce reliance on charcoal from unsustainable sources but production may be more labor intensive and increase the unit price of the fuel.



Basic improved charcoal stove, Mwamgongo Village, Kigoma.

- In most cases energy technologies will be sourced through suppliers and there are several ways to identify local suppliers including talking to local organizations and connecting with energy networks and associations. When considering which suppliers to use it is important to think through factors such as geographical reach, production capacity, maintenance services and the quality of the product.
- **Market Feasibility:** It is important to consider the current conditions of the target market and the feasibility of the product when deciding on a suitable energy technology. Urban and rural markets will have distinctive energy needs and may require different implementation approaches. Some of the factors to be considered are the existing energy needs and habits of the market, the current level of consumer awareness of energy technologies, willingness to pay of the target market and the existing businesses and projects in place. Assessing these factors will help decide on the approach to take, for example the level of marketing and awareness creation needed, how to collaborate with existing suppliers and businesses and the need for consumer financing mechanisms.
- **Socioeconomics:** Social and cultural factors can have a strong influence on the uptake of energy technologies. Users can attach certain perceptions around cooking methods, fuels and technologies and many communities have been using the same technologies to meet their household energy needs for generations. It is important to assess the current methods being used by the community, any secondary uses the methods provide (such as heating the house or drying maize) and the impact on resources of introducing a new technology (for example competing uses of agricultural waste that could be utilized for briquette production). When conducting assessments in communities, methods such as household surveys, community stakeholder interviews and focus groups should be used. It is important to seek opinions from all members of the community and hold separate discussions with men and women to allow for open dialogue that consider all views.
- **Implementation Process:** A number of different implementation models exist for introducing energy technologies. For example, a project based model sourcing directly from an established supplier may be used, or an enterprise model either setting up dealer networks for products or training businesses in the local area to produce energy products. Working with energy businesses can help to develop a commercial and

sustainable market for energy products. An energy program may support such business to improve on their technical and business skills in order to scale up and improve access to their services. Appropriate ownership and management are both important determinants of successful projects or businesses.

- When planning how the project will be executed think about what activities will need to be done. These are likely to include project planning, setting up an M&E system, recruiting project partners, providing training to businesses, conducting marketing activities and project evaluations. Monitoring and evaluation indicators need to be developed to capture outputs, outcomes and impacts. Indicators could include the number of energy products used, the reduction in household fuel expenditure and improvements in the health of women and children. It is important to capture the baseline for the project area and determine what success looks like for your project.

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