



# RESIREA

## Renewable Energy Sustainable Programs for Intelligent Rural Electrification and Poverty Alleviation

### DETAILED STUDIES OF THE PRIORITY VILLAGES Dak Nong province

### SUMMARY REPORT WP6

March 2009



European partners:



Local partners:



Financing partners:



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## I- INTRODUCTION

### 1- *Context of the study*

After a provincial study carried out in Dak Nong in 2007 and 2008, 1800 households, scattered in 26 priority villages have been identified in 8 communes.

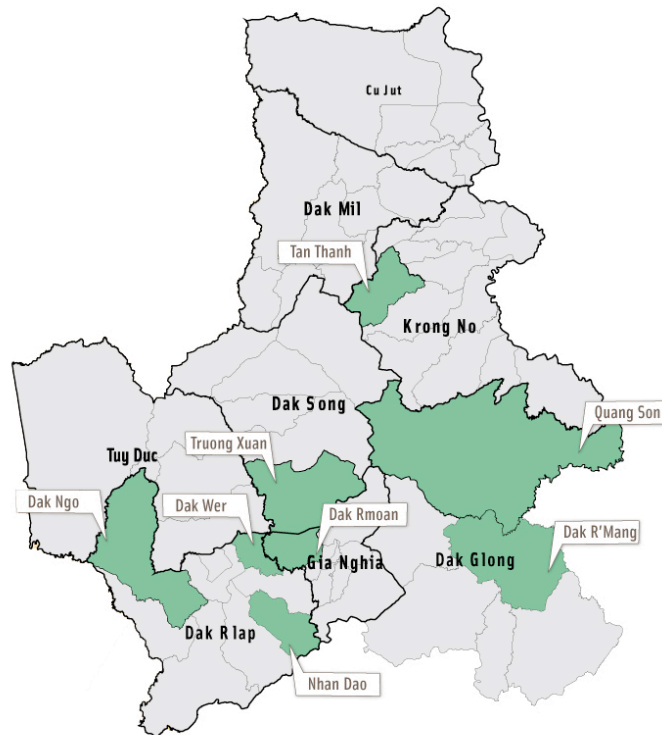


Figure 1: Localization of the targeted communes – Dak Nong province

These villages have been selected because they presented a favorable context for off-grid rural electrification projects, based on renewable energies, and mainly because they would not be connected to the national grid within the next few years, due to their scattered configuration. The list of priority villages was discussed with local authorities during a workshop held in Dak Nong in March 2008, with the collaboration of RESIREA local partner, RERD.

Further to this selection, RESIREA partners launched the next phase of the project, consisting in in-depth analysis of the selected villages.

### 2- *Methodology of the survey*

Detailed data have been collected in each priority villages by the Commune People's Committee, with the support of the RERD.

The **collected data** concerned:

- Accessibility;
- Geographical configuration and context;
- Distance to the Commune city;
- Number of households not to be connected to the grid, and far from the village center;

- Economic level;
- Agriculture and revenues;
- Ethnic group;
- Priority for the authorities.

Thanks to these data, the priority villages have been ordered into a hierarchical order, according to the following criteria:

- There is no grid extension plans;
- The households are scattered<sup>1</sup>;
- The number of targeted households is higher than 50;
- The economic development is good.

The villages have been shared into three categories, according to their more or less favorable context for a suitable development of a rural electrification project. Category 1 is the top priority of the province and commune authorities.

Name of the priority villages	Commune	District	Grade of priority
Thôn Dak Ro	Tan Thanh	Krong No	<b>2</b>
Thôn Dak Na			<b>3</b>
Thôn Dak Lưu			<b>3</b>
Thôn Dak Hoa			<b>1</b>
Tân hiệp	Dak Rmoan	Gia Nghia	<b>2</b>
Village No 6	Truong Xuan	Dak Song	<b>1</b>
Tà Mung( Vĩnh Phú)			<b>1</b>
Bang Sim( Bắc Giang)			<b>1</b>
Village No 8	Nhan Dao	Dak R'Lap	<b>2</b>
Village No 7			<b>1</b>
Village No 6			<b>2</b>
Village No1			<b>2</b>
Village No 10	Dak Wer		<b>2</b>
Village No 7	Dak Ngo		<b>2</b>
Bon Điêng Đu			<b>1</b>
Village No 4	Quang Son		<b>1</b>
Village No 5			<b>2</b>
Village Dak Nnsao			<b>2</b>
Other 7 villages			<b>1</b>
Group No 9	Dak R'Mang	Dak G'Long	<b>3</b>
Group No 6			<b>3</b>
Group No 5			<b>2</b>
Group No 4			<b>2</b>
Group No 2 +3			<b>2</b>
Group No 12			<b>3</b>
Group No 1			<b>2</b>

Table 1: List of priority villages, per category 1, 2 or 3

Then, to get all the data necessary to the design of the electrification programme, surveys of the potential users have been completed, by interviewing representative households.

<sup>1</sup> This is a key criterion, because Electricity of Vietnam (EVN) plans to connect in priority dense groups of households. To plan off-grid electrification projects, it is necessary to consider scattered households, which will not be reachable by the national grid.

Methodology of the users' surveys:

Basing on the results of the village database, 6 representative villages have been identified in the list, and a sample of households has been selected in each of them.

- Bang Sim (Bac Giang) - Village 2, Truong Xuan Commune, Dak Song District
- Group 3 (Đak Nhu) – Village 6, Truong Xuan Commune, Dak Song District,
- Group 3 (stream area) - Village 7, Nhan Dao Commune, Dak Rlap District,
- Village 1, Nhan Dao Commune, Dak Rlap District,
- Village 8, Nhan Dao Commune, Dak Rlap District,
- Bon Dieng Du, Dak Ngo Commune, Dak Rlap District (Tuy Duc) District.

Within these villages, a sampling has been done to survey group of users that is the most representative of the targeted population.

The sampling of households was done basing on professions and housing conditions with cooperation of local authorities.

Thus, 151 households have been surveyed in the three Priority Zones. For each Priority Zone, these surveys assessed:

- The traditional energy expenses (recharge of batteries, kerosene lamps, diesel gen sets, etc.)
- The electricity needs,
- The ability and willingness to pay of the population.

The results of the household's surveys **were presented during a workshop held in Gia Nghia Town (Dak Nong) on the 10<sup>th</sup> of February 2009.** The detailed results of the studies are presented in the next section.

## II- RESULTS OF THE VILLAGE STUDIES

### 1- Description of the targeted villages

#### 1.1 Demography

In Dak Nong province, **1 800 direct beneficiaries** (families) are targeted in RESIREA programme, which is to say **8 000 people**.

Name of the priority villages	Commune	District	Number of households	Population	Number of targeted households
Thôn Dak Ro	Tan Thanh	Krong No	108	524	<b>35</b>
Thôn Dak Na			105	620	<b>30</b>
Thôn Dak Lưu			110	505	<b>30</b>
Thôn Dak Hoa			167	627	<b>72</b>
Tân hiệp	Dak Rmoan	Gia Nghia	130	370	<b>40</b>
Village No 6	Truong Xuan	Dak Song	154	489	<b>74</b>
Tà Mung( Vĩnh Phú)			151	654	<b>55</b>
Bang Sim( Bắc Giang)			220	815	<b>80</b>
Village No 8	Nhan Dao	Dak R'Lap	130	650	<b>50</b>
Village No 7			140	700	<b>65</b>
Village No 6			109	545	<b>49</b>
Village No1			84	420	<b>40</b>
Village No 10	Dak Wer		90	450	<b>90</b>
Village No 7	Dak Ngo		123	376	<b>32</b>
Bon Điêng Đu		127	435	<b>127</b>	
Village No 4	Quang Son		84	440	<b>84</b>
Village No 5			29	108	<b>29</b>
Village Dak Nnsao			135	605	<b>135</b>
Other 7 villages			250	1250	<b>250</b>
Group No 9	Dak R'Mang	Dak G'Long	40	262	<b>40</b>
Group No 6			59	328	<b>59</b>
Group No 5			61	332	<b>61</b>
Group No 4			69	394	<b>69</b>
Group No 2 +3			58	304	<b>58</b>
Group No 12			46	261	<b>46</b>
Group No 1			73	423	<b>73</b>

Table 2: Number of households and inhabitants in the targeted villages

On average, in the targeted villages, each family counts **4,2<sup>2</sup> persons**.

#### 1.2 Accessibility

Access conditions are generally difficult in the targeted households, as summarized in the table below:

<sup>2</sup> Source: households interviews

	Average distance	Access time during dry season	Access time during rainy season
Access to the center of village (with motorbike):	2,5 km	17 min	33 min
Access to the center of commune (with motorbike):	9 km	41 min	1h05

Table 3: Access conditions to the targeted households

The targeted households are on average at 120m far from the nearest neighbor, which shows the scattering conditions of the targeted population.

## 2- Socio-economical analysis

### 2.1 Economic activities

The main economic activity in the targeted villages is **agriculture** (coffee, pepper, rubber trees and cashew nuts), and **chicken breeding**. 70% of the villagers practice agriculture as main source of revenues.



Figure 2: Professional activities and sources of income

### 2.2 Housing conditions

The type of houses can be described by three categories:

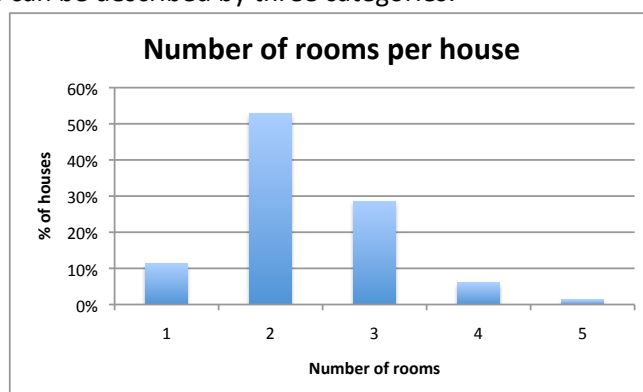


Figure 3: Housing conditions

Each house is composed of 2,3 rooms on average.

### 2.3 Expenses of the families

The distribution of the families’ expenses is shown in the diagram below:

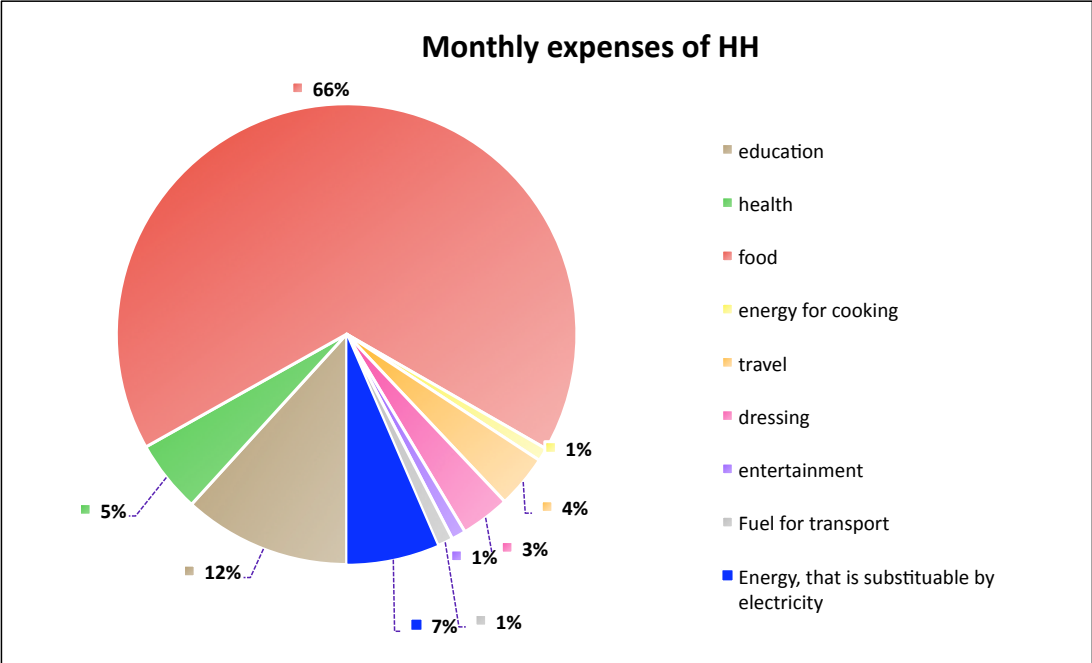


Figure 4: Distribution of the families’ expenses

On average, each family spends **2,6 millions VND** per month, that is to say **145 USD<sup>3</sup>**. The highest expense for the family budget is for buying food: it accounts for 66% of the total expenses. The second highest expense is fuel for education. Energy expenses, which are substitutable by electricity counts for 7% of the total expenses.

**89% of the interviewed households can make savings** each month. This amount is saved mainly to invest by buying cattle or renovating the house.

## 3- Socio-economical context

### 3.1 Ethnic groups

A third of Dak Nong’s population belongs to ethnic minorities, both indigenous and recent immigrant. The main ethnic groups are Kinh, M’Nong, Tay and Ede.

**80% of the interviewed households belong to Kinh ethnic group.** The remaining population belongs to M’Nong (15%) and Tay people (5%).

<sup>3</sup> Exchange rate (30/03/09): 1 USD = 17,785 VND  
 Source of the data: Phase II surveys: households’ interviews

### 3.2 Development projects

Some development programmes, carried out by national and international organizations, are in progress in the targeted areas.

- Red Cross,
- Association of farmers,
- National development programmes N°132, N°134 and N°135 for the improvement of living conditions of ethnic minorities (housing, agriculture, infrastructures).

## 4- **Energy context**

### 4.1 Traditional energy uses

**82% use petrol lamps** for lighting at night-time and **4% use a water dynamo**. **13%** of the interviewed households use a **diesel generator** for their electricity supply for lighting and entertainment (TV and VCD). **93% of them use small batteries** to supply an electric torch.

The durations for lighting are approximately **2,8 hours per day**, early morning and at night-time.

	Candles	Petrol lamps	Dry batteries for radio	Dry batteries for Torch	Rechargeable battery	Diesel generator	Pico hydro turbine
% of Households using	13%	82%	52%	93%	56% <sup>4</sup>	13%	4%
Consumption per week per family	9 candles	0,7 l	0,8 battery	0,7 battery	0,75 charge per week	9 l	-
Unit cost <sup>5</sup>	1,123 VND	19,111 VND	5,400 VND/battery		7,655 VND/charge 0,4 \$/charge	18,175 VND/l 1,02 \$/l	-

Table 4: Traditional energy uses

### 4.2 Traditional expenses for energy

The average amount spent by the families for energy, that can be substituted by electricity<sup>6</sup> is **168,000 VND/month**, which is to say **9,4 \$/month**. This amount represents 7% of the total monthly expenses of the families.

The median<sup>7</sup> value of the monthly energy expenses is **90,000 VND** (5,06 \$/month).

However, the following graph shows that the majority of the population (57 %) spend between **3 and 8\$ per month for energy expenses**.

<sup>4</sup> 17% of the interviewed households use 2 rechargeable batteries.

<sup>5</sup> Unit costs have been evaluated during the households interviews.

<sup>6</sup> Expenses that can be substituted by electricity: for candles, petrol lamps, small batteries, diesel that is used at night time for entertainment purposes.

<sup>7</sup> Median value, also called midpoint = it is the figure dividing the population in two groups of the same size. Here, that means that there are as many households with lower expenses than 90,000 VND than households with higher expenses.

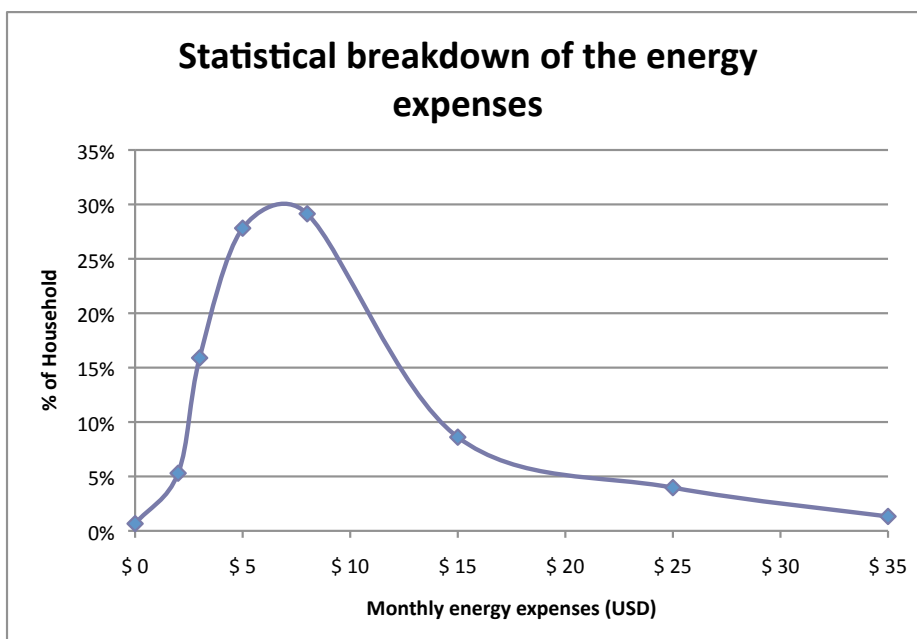


Figure 5: Statistical breakdown of the energy expenses of the households

This shows that energy is an important issue for the interviewed households and that they have a **relatively high capacity to pay an electricity service**, which would substitute the use of rechargeable batteries, petrol lamps and diesel generators.

#### 4.3 Energy demand

During the surveys, the energy demand of the households has been analyzed.

The type of appliances and their number has been reported, together with the duration of use per day of each appliance. For households, electricity would supply in priority lamps, radio and color TV. Considering lighting, the average number of lamps demanded is 2,4 and the average duration of use is 3,5 hours per day.

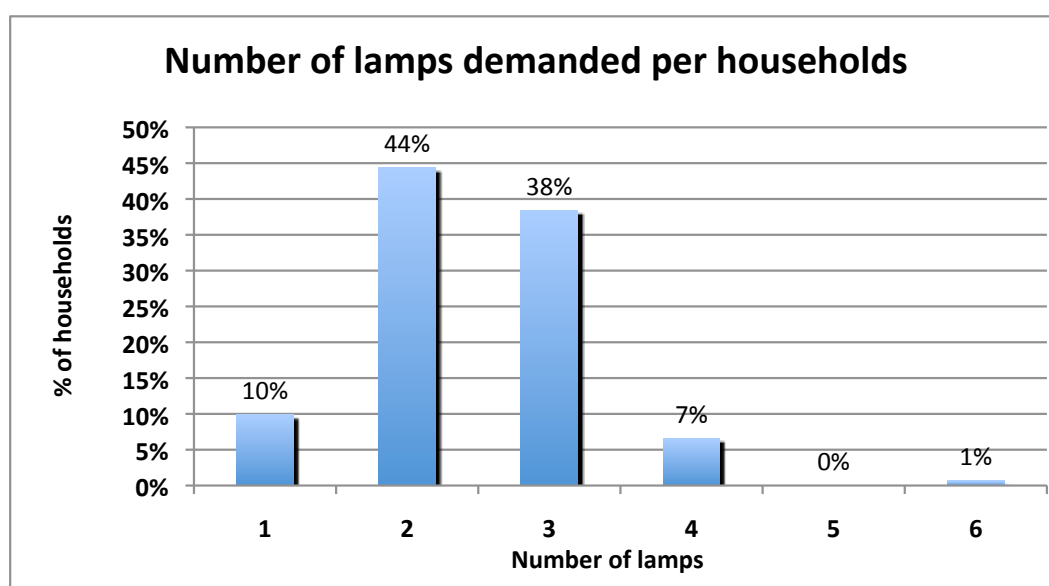


Figure 6: Number of lamps per household

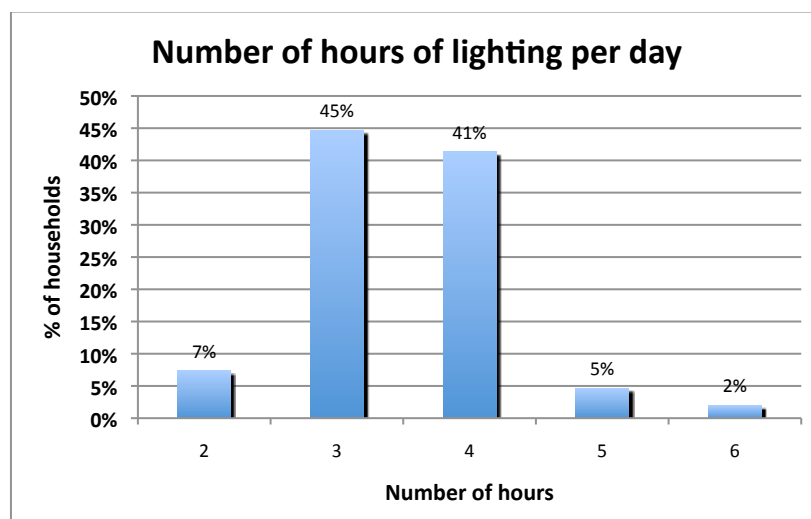


Figure 7: Number of hours of lighting per day per household

The analysis of the current energy uses for lighting (petrol lamps, candles), crossed with the survey results shows that the usual period of use are mainly at night-time and in the early morning.

Considering the other appliances asked by the interviewed households, the following table summarizes the average data obtained:

	Average number per household	Average duration of use per day	Period of use
Radio	0,6	3	Early morning Midday Evening
Outside night lamp	0,3	1,7	Night
Tape player	0,3	1	Midday Evening
CD player	0,2	0,5	Midday Evening
Black and White TV	0,3	1	Midday Evening
Color TV	0,7	2,8	Midday Evening
VCD or DVD	0,3	0,8	Evening
Fridge	0,04	-	-

Table 5: Analysis of the energy demand

## 5- Ability and willingness to pay for access to electricity

### 5.1 Introduction

Considering the scattered configuration of the targeted population, mini-grids are not possible. The two individual possible options for the electrification of the targeted households are pico-hydro systems and Solar Home Systems (SHS).

The survey shows that 96% of the interviewed households are favorable to an electrification by a Solar Home System, while only 2% preferred a pico-hydro system. This can be explained by poor quality of the electricity supplied by pico-hydro (low availability during dry season) and by the low investment costs.

Furthermore, no private company can operate and manage these electricity systems, due to the low profitability, the scattered configuration and difficult access conditions.

Thus, **the only remaining option** for the electrification of the targeted households is **Solar Home Systems, individually managed by each user.**

To assess this option, the households surveys aimed at evaluating the ability and willingness to pay:

- the initial investment,
- monthly fees as repayment of a credit.

The results are presented in the two sections below.

### 5.2 Willingness to pay initial investment

The surveys on the willingness to contribute to the initial investment for a SHS show the following results:

On average, each household is ready to pay **5 million VND for the initial investment**, in one or two payments. This is shown with the following diagram.

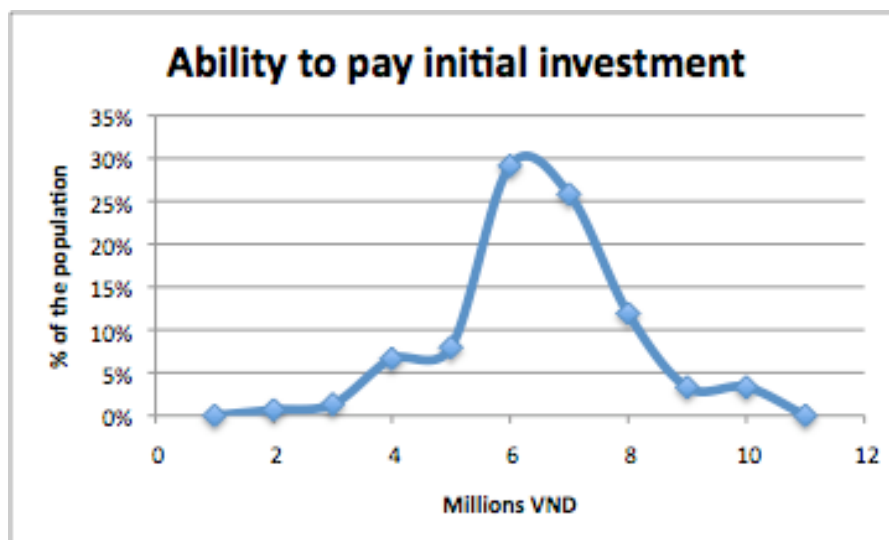


Figure 8: Willingness to contribute to initial investment for a solar home system

This amount represents approximately **20% of the initial investment cost for a solar home system of 100 Wp.**

### 5.3 Willingness to re-pay a credit

During the interviews, the possibility to pay a part of the initial investment through a credit on a couple of years has been investigated.

The survey shows that on average the interviewed households are ready to pay **282,000 VND (15,8 USD)** each month to repay a credit, in order to purchase their SHS.

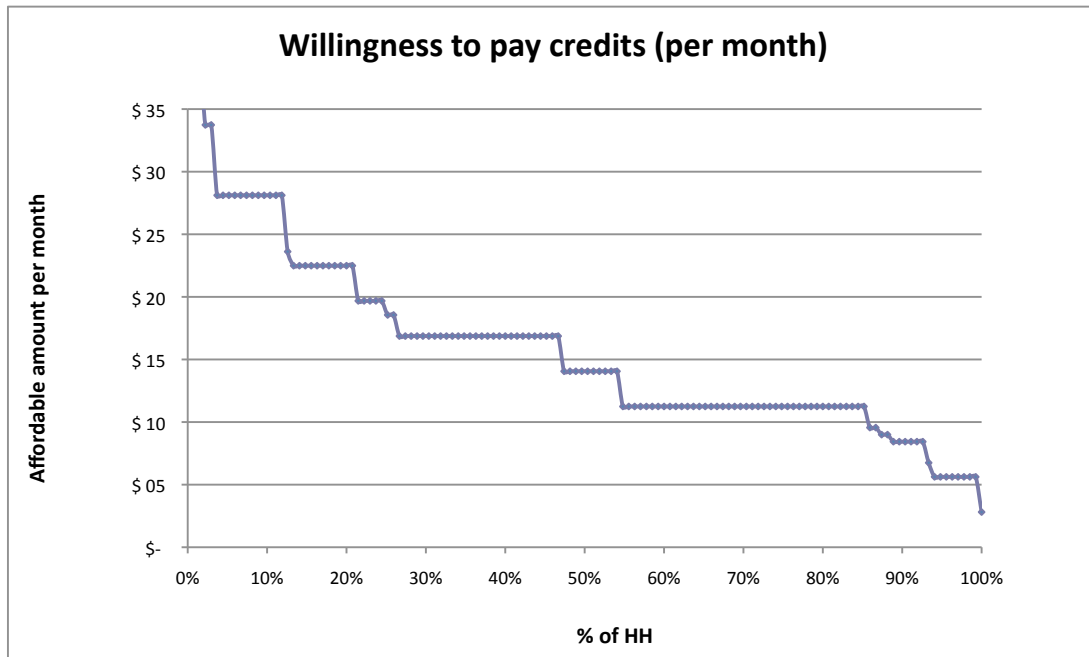


Figure 9: Capacity to repay a credit each month for the purchase of a SHS

This shows that the targeted population is favorable to a micro-credit scheme to access electricity, and that their ability to pay is quite important.

However, the conditions for such a financing scheme will have to be discussed in further details with local banks and credit organizations.