

# Identification

## of Requirements for the Community

### Guyana

**Project: Rural Electrification**

**Date: March 2008**



**GUYANA ENERGY AGENCY**



**Canadian International  
Development Agency**

**olade**  
Organización Latinoamericana de Energía



**UNIVERSITY OF  
CALGARY**

The author of this document is Patrick Ketwaru, consultant.

The opinions expressed in this document are the responsibility of the author and do not bind the sponsoring organizations, Latin American Energy Organization” (OLADE), “Canadian International Development Agency” (CIDA), “University of Calgary” or the “Guyana Energy Agency” (GEA).

The use of the information contained in this document is permitted if the source is cited.

The rights to this document are the property of the Rural Electrification Project of OLADE/University of Calgary/CIDA/GEA.

## Contents

<b>1.0 Introduction.....</b>	<b>5</b>
<b>2.0 The Community .....</b>	<b>6</b>
2.1 Geography .....	6
2.2 Political.....	7
2.3 Social.....	8
2.4 Health .....	8
2.5 Housing .....	9
2.6 Education.....	10
2.7 Transportation .....	11
2.8 Economics .....	12
<b>3.0 Workshops.....</b>	<b>14</b>
3.1 Workshop Session Held on December 16, 2007.....	14
3.2 Workshop Session Held on March 16, 2008.....	16
3.3 Working Session on March 16, 2008.....	20
<b>4.0 Projects.....</b>	<b>21</b>
4.1 Joinery Project.....	21
4.2 Garden Project.....	22
4.3 Solar Home System.....	22
4.5 Solar Freezer for Village Sho	

## Table of Contents

<b>1.0 Introduction.....</b>	<b>5</b>
<b>2.0 The Community .....</b>	<b>6</b>
2.1 Geography .....	6
2.2 Political.....	7
2.3 Social.....	8
2.4 Health .....	8

2.5	Housing .....	9
2.6	Education.....	10
2.7	Transportation .....	11
2.8	Economics .....	12
<b>3.0</b>	<b>Workshops.....</b>	<b>14</b>
3.1	Workshop Session Held on December 16, 2007.....	14
3.2	Workshop Session Held on March 16, 2008.....	16
3.3	Working Session on March 16, 2008.....	20
<b>4.0</b>	<b>Projects.....</b>	<b>21</b>
4.1	Joinery Project.....	21
4.2	Garden Project.....	22
4.3	Solar Home System.....	22
4.5	Solar Freezer for Village Shop.....	23
4.5	Cassava Processing Unit .....	23
4.6	Recommendations .....	24
<b>6.0</b>	<b>Management of Projects.....</b>	<b>24</b>
6.1	National Level.....	24
6.2	Community Level.....	25
6.3	Individual Projects.....	25
<b>7.0</b>	<b>Barriers to Success.....</b>	<b>25</b>
7.1	Market Intelligence .....	25
7.2	Participants .....	25
7.3	Technical Know How.....	26

## **1.0 Introduction**

This report is the final in Phase one of the Rural Energy Project which is being executed in Guyana by OLADE and funded by CIDA. This local project is part of the wider activity by OLADE and University of Calgary within Latin America and the Caribbean; to date, similar projects have been facilitated in Guatemala, Haiti, Bolivia and Paraguay. The project is being implemented by OLADE and the University of Calgary with in-country support from the national counterpart, the Guyana Energy Agency. The project is biased towards the improvement of the livelihood of women and indigenous populations.

This report is the basis for the implementation of the project, all the relevant details, social, economic and technical is highlighted here. The information presented in this report has been gleaned from the earlier reports and working sessions with the community members and the Multi-Stakeholders' Workshop. As such all of the projects recommended here have been reviewed by the community members and have been approve by them by consensus.

## 2.0 The Community

### 2.1 Geography

The community of Wowetta is found in Region 9 of Guyana at latitude 3.5 and longitude negative (-) 59. The landscape is typically gently undulating tropical grasslands broken by outcrops of rocky hills and wooded regions. The village essentially comprises of some 49 homesteads scattered over approximately eight square miles of land. The land is approximately 2 miles wide and 4 miles long. This area is split down the length by the Linden to Lethem main road. Homesteads are found fairly evenly distributed on either side of the road. In most instances the homesteads are in small clusters of three to four homesteads in relatively close proximity to each other. Current maps by the Guyana Lands and Surveys Commission locate Wowetta on the western side of this main road. However this is where the main administrative and community buildings are located.

Soil is a friable sandy clay which appears to be sandy at the top. Due to the undulating topography large areas become flooded in the rainy season. Subsequently, these areas are not normally utilized by the residents. This seasonal flooding helps to account for the scattered nature of the homesteads.



**Figure 1 Wowetta Showing the Health Hut and Nursery School**

The main source of renewable energy is solar, while there are occasional strong gusts of wind it is not sustained at the lower levels to make small wind systems viable.

**Table 1 Monthly Averaged Peak Sun Hours Radiation Incident On An Equator-pointed Tilted Surface / RETScreen Method (kWh/m<sup>2</sup>/day)**

Lat 3 Lon -59	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
SSE MAX	5.00	5.27	5.52	5.48	5.29	5.23	5.24	5.61	6.15	5.91	5.79	5.13	5.46
K	0.51	0.52	0.53	0.53	0.53	0.54	0.54	0.55	0.59	0.58	0.59	0.54	0.55
Erbs DIF	2.05	2.15	2.21	2.18	2.09	2.02	2.04	2.09	2.08	2.08	1.98	1.99	2.08
RET DNR	4.24	4.26	4.35	4.33	4.31	4.43	4.36	4.63	5.25	5.09	5.32	4.58	4.60
Tilt 0	4.94	5.21	5.45	5.41	5.21	5.15	5.16	5.53	6.07	5.84	5.72	5.07	5.40
Tilt 3	5.02	5.26	5.46	5.42	5.26	5.21	5.22	5.56	6.06	5.89	5.82	5.17	5.45
Tilt 18	5.29	5.38	5.37	5.36	5.34	5.36	5.33	5.56	5.85	5.96	6.13	5.51	5.54
Tilt 90	3.20	2.71	2.00	2.06	2.54	2.77	2.66	2.32	1.67	2.69	3.54	3.48	2.64
OPT	5.33	5.38	5.47	5.43	5.34	5.36	5.33	5.60	6.07	5.97	6.17	5.59	5.59
OPT ANG	26.0	17.0	5.00	7.00	15.0	19.0	17.0	10.0	0.00	14.0	25.0	29.0	15.3

Source: <http://eosweb.larc.nasa.gov/cgi-bin/sse/grid.cgi?email=pketu@yahoo.co.uk&step=2&lat=3&lon=-9&num=122094&submit=Submit&p=gridid&veg=17&hgt=+100>

## 2.2 Political

Wowetta is part of the larger Annai Village district which consists of five villages; Rupertee, Surama, Wowetta, Kwatamang and Annai Central. This political organization is different from the one laid out by the Regional System which have these villages appearing in different Neighbourhood Democratic Councils (NDC).

Since the five villages are part of the larger Annai village district, the governance of the villages is two tiered, at the individual village level and at the collective level. At the village level Woweta has the most senior leader being a Senior Councillor, Mr. Siegmund Moses. Along with this Senior Councillor are five councillors, three males and two females, a Secretary, Treasurer, Assistant Treasurer and then the community members.

At the Village District level the organisation is; the Toshao, a Deputy Toshao, a Secretary, a Treasurer and thirty three (33) committee members taken from the five villages. The 33 committee members consist of five Senior Councillors and the remainders being ordinary councillors of the villages. As such each village is autonomous in its leadership but they combine for wider governance. The governance structure of each village is legally recognised under the Amerindian Act.

## **2.3 Social**

The community of Wowetta is mainly one ethnic group, the Mucushi, with one family group being Wapishiana. The population of the village is 308 with 167 females and 141 males; approximately 40% of the population is below 15 years old. While most persons speak English and write it to a lesser extent the native Mucushi language is still used and is being encouraged by local and national leaders. The community of Wowetta is a very closely knitted community with a strong work ethic. The level of delinquency especially amongst the youth appeared to be minimal. There were no reports of any issues of social unrest or anti social behaviour on the part of any one. The meetings allowed for issues of abuse and discrimination to be raised, these were not. Both the men and women played important roles in the management of the household with shared workload.

Traditionally the women have a very heavy daily workload, they are responsible for the maintenance of the home, care for the children and cooking. They also do the day to day maintenance of the farm. Each family has a farm plot approximately one to two acres of land which the family will use to produce food for subsistence and in some instances sale. The women may also use excess cassava to produce cassava based products for sale. The main products from cassava are; farine, a kind of cassava meal that is used as a staple amongst Amerindians, and cassava bread. Casreep, a dark brown, viscous syrup used as a food flavouring, and tapioca, a starch based product, are also produced in smaller quantities from the cassava.

The men on the other hand are responsible for the heavier labour such as clearing and preparing the farm lands for sowing, digging wells, construction of structures, fishing and hunting. Men also tend to seek jobs away from the village such as logging or mining. In the instance of Wowetta because of the presence of other entities such as the Bina Hill Institute, Iwokrama and Rockview Lodge, in relatively close proximity to the village a few persons have acquired steady jobs fairly close to home. However most persons are self employed and do some amount of craft related work to earn cash.

The community's religion is Christianity, with some five denominations being active. These are; Christian Brethren, Anglican, Seven Days Adventist, Church of Christ and United Church of god.

The community has a Community Centre where community activities are held, such as council meetings, workshops and sports.

## **2.4 Health**

Health care is provided by a Health Hut with a resident community health worker. The Health Hut is usually adequate for most of the routine health issues such as colds and other minor illness. The more difficult cases are referred to Annai where there are more facilities or to the Lethem hospital, if very serious the person is air-dashed to Georgetown.

Water for domestic use is usually provided by the digging of wells; almost each homestead has its own hand dug well or shares one with the others close by. The wells are approximately

thirty (30) feet deep. At this depth the water is available through the year. In a few instances the homestead will use water from a spring or nearby stream. As a result of the availability of relatively safe water for domestic use the instances of gastro intestinal illness is relatively rare. However in some instance wells are contaminated during the rainy seasons due to the flood waters getting into the wells this usually leads to outbreaks of water borne diseases.

## **2.5 Housing**

Any member of the community is allowed to choose a spot within the village boundary and construct a house for personal use. However non-community members are only allowed to build in certain prescribed areas somewhat removed from the main housing areas.

The quality of housing is relatively satisfactory; the average house is built of sun baked clay blocks plastered together in a similar manner as a clay-brick building. In most instances they are thatched with native palm leaves or may have corrugated galvanised iron sheet roofs. The floors are generally hard packed clay, though a few instances concrete is being used. The roofs are supported by wooden substructure which is raised by wooden posts used to frame the building. Additionally, some of the newer houses are built using fire baked clay blocks, manufactured at Annai, and plastered with Portland cement also obtained from Annai. The houses are usually rather small, approximately fifteen feet (5m) by ten feet (3m). They are sometimes subdivided into living and bedroom areas. Due to the nature of the construction a well maintained house gives good protection from the elements.



**Figure 2 A Typical House**

Cooking is usually done on external firesides using wood as the main source of fuel. These firesides are usually under a small shed. In a few instances stoves utilising liquefied petroleum gas (propane) is used. This propane is usually sourced from neighbouring Brazil and is sold at Annai.

## **2.6 Education**

Guyana has achieved the Millennium Goal of Universal Primary Education, due to every village having access to nursery and primary schools. Wowetta has both nursery and primary schools. The enrolment to the nursery school is 20 and the primary school has 88 children. The schools are serviced by three (3) teachers, one at the nursery school and the other two at the primary. Due to the small amounts of students in the various primary grades the school applies the multi-grade teaching technique.

Secondary level education is available at Annai where the students have the option of residential quarters.



**Figure 3 Primary School**

## **2.7 Transportation**

The major means of transportation around the village is by walking or the use of bicycles, quite a number of villagers own bicycles. The traditional method of transportation of loads, especially from the farms, is by human labour, walking with the produce stacked in an open wicker backpack called a Warashee. The typical warashee can carry approximately eighty pound (37 kg). In most instances the farm produce is fetched by the women from farm to home. It is rather surprising that not much use is made of animal drawn vehicles given the relatively flat lay of the land.

Transportation to other areas is available on scheduled arrangement. There is a bus service which connects to Lethem and Georgetown. This service is available four days per week, the cost from Georgetown to Lethem is G\$16,000 (US\$80). The trip from Lethem to Georgetown takes approximately sixteen (16) hours. This is mainly due to waiting times at Annai, Iwokrama and the crossing at the Essequibo River.

The journey to Wowetta can be via roadway from Georgetown. The trip takes approximately 12 hours to get to Wowetta. The first leg of the journey is along the Georgetown to Linden Highway, this being a paved roadway and allows for fairly easy and swift travel. Beyond Linden is a laterite (all weather) roadway, this is the nature of the roadway for the remainder of the journey. The road is usually in fairly good condition during the dry periods, during the

rainy season some parts of the laterite roadway develops to some state of disrepair which required a greater degree of caution while driving. The roadway is interrupted by a river crossing at Kurupkari on the Essequibo River. This crossing is done via a diesel propelled pontoon which works on an hourly schedule during the daylight period.

On crossing the Essequibo the roadway continues through the Iwokrama forest, which is a protected area, and emerges into the open savannahs. The secondary road to Surama is found soon after one emerges from the Iwokrama forest.

Refreshments and washroom facilities are located along the way with the main one being at a location called 58.

In addition to the regular bus service there are a number of smaller buses (13 or 15 seats) which ply the route on an ad hoc schedule. They are usually faster but can be more risky and uncomfortable. However in the wet weather they are more likely to have problems negotiating the roads due to the damage sustained by the road.

Air transportation is facilitated by the Annai airstrip that is serviced by scheduled daily commercial flights. These tickets have to be booked in advance since seats are usually limited. The cost of a return ticket is G\$44,000 (US\$220).

## **2.8 Economics**

The majority of the residents of Wowetta are self employed living a subsistence type of livelihood. Most of families are just capable of meeting immediate needs from the economic activities they perform. A few, both men and women have been able to acquire steady jobs both within the community and close by. Additionally, others have jobs, such as logging, mining and domestic service, which are far removed from the community and lead to prolong absence from their families.

There are currently 11 men and 7 women who have full time employment and are being paid a salary. The rest are self employed. The self employed men earn their livelihood by the following means; farming, fishing, hunting, handicraft, logging and extraction of non traditional forestry products and beekeeping. The women earn money by making farine, cassava bread, casreep, pepper sauce, hammocks, embroidery, and by other such crafts.

The average earnings from self employment is relatively small, women earn between G\$3000 to –G\$5000 (US\$15 to US\$25) per week and the men between G\$2000 –G\$4000 (US\$10 – US\$20) per week. While the amounts stated are average amounts there are periods when no significant amount of money is earned.

As a result of this low earning power the villagers depend heavily on supplying most of their own food supplies from traditional means such as farming, hunting and fishing. However there is still the need to purchase non traditional inputs such as cooking oil, peas, rice, etc. These additional food supplied would cost the average household approximately G\$5000 (US\$25) per month. Fortunately for the residents the cost of foodstuff is not significantly

inflated at the stores where they are sold. The cost in the region is comparable to that in Georgetown (Table 2).

**Table 2 Cost Comparison for Selected Items**

<b>Item</b>	<b>Cost at Annai(G\$)</b>	<b>Cost at Georgetown (G\$)</b>
Rice	160/kg	160/kg
Flour (wheaten)	200/kg	178/kg
Salt	100/kg	100/kg
Cooking Oil	440/L	550/L
Split peas	210/kg	180/kg
Onions	300/kg	140/kg
Garlic	380/kg	200/kg
Chowmein (Noodles)	160/pk	180/kg
Potatoes (Irish)	300/kg	110/kg
Gasoline	320/L	189/L
Diesel	320/L	186/L
Kerosene	300/L	170/L

Source: Author, 2008

As can be seen the prices at Georgetown are comparable to the prices at Annai with the exception of the fuel prices. This may be due to the demand as well as the fact that fuel has to be trucked to these locations from Georgetown.

### **3.0 Workshops**

There were two visits to the community to hold working sessions with the community members. In both instances the community was informed about the impending visit a few days prior to the visit. This short notice was unavoidable due to communication and transportation logistics. The first visit was on December 16, 2007 while the second was on March 15 to 16, 2008.

The objective of the first visit was mainly a familiarization trip, both for the project personnel as well as the community members. The project personnel were Ms. Sandra Britton, National Coordinator from Guyana Energy Agency, and Mr. Patrick Ketwaru, the local consultant. In addition a representative from the Amerindian Affairs Ministry who was on vacation volunteered to accompany the team to facilitate the logistics, GEA's support staff were also a part of the team.

The second visit was by the local consultant Mr. Patrick Ketwaru and an assistant. The key objective of this visit was to formulate and finalise the projects to be implemented for the community. Additionally key socio economic information was gathered from this visit.

#### **3.1 Workshop Session Held on December 16, 2007**

The working session was held on Sunday December 16, 2007 at 2:30 pm to 4:30pm, present were the Toshao (Senior Councillor) Moses, members of the council, teachers and villagers. There were approximately thirty (30) persons present at the meeting which was held in the pavilion of the community centre. Also attending was the community development officer (CDO) for the North Rupununi Mr. Bryan Allicock.

Toshao Moses called the meeting to order and gave a brief overview of the purpose of the meeting and handed the floor to Ms Sandra Britton. Ms Britton introduced the team and proceeded to give the background of the project and the purpose of the meeting. Mr. Patrick Ketwaru (consultant) was then asked to lead the discussion on the core issues.

##### **a) Output of the Working Session**

The gathering was informed of the nature and objective of the project and the concept of the project not being a "handout" but a project that must be sustainable. The concepts of economic viability and pay back were highlighted. This concept seems to be generally accepted by the gathering.

From the discussions it was found that the audience were not well informed about marketing and managing a project to ensure sustainability.

The gathering suggested three possible projects that they thought would be sustainable.

1. A carpentry workshop to build furniture for sale to the community and other neighbouring communities.
2. Farming venture for the production of one of the region's staple, farine (dried grated cassava)
3. Farming venture for the production of processed peppers

A fourth project which could piggy back on any of the above project was the sewing and embroidery group where the women can use some of the power to provide light for evening work by this group.

### **b) Projects Suggested**

#### Carpentry Project

The community had been given a set of electrical power tools to equip a joinery workshop. They were also given a generator to supply power for the workshop. However they do not find it economically feasible to operate the generator to power the workshop. As such they believe that they can use a photovoltaic system to power the smaller tools and use the generator only when the heavier tools are required. A list of all the tools and their power consumption ratings was compiled by the team.

A group of youths were identified and already trained for this project. However the location of the workshop is still to be identified. At the meeting an unoccupied building was identified as a possible location for this workshop.

#### Farine Production

Farine is one of the main sources of carbohydrates in the region. It has been found that at times farine is rather expensive and difficult to obtain from the traditional suppliers. The villagers claim that Wowetta is ideally situated to provide this product since unlike the neighbouring communities it has its farmlands close to the community and has sufficient land space to extend the acreage being cultivated.

The electricity would be used to power a mill to grate the cassava for the production of the farine.

#### Pepper Processing

The pepper processing project is the one that would need the most initial input since the community is not cultivating pepper on a large scale. To have a reliable and sufficient supply of the pepper for a commercial scale the community would have to embark on large scale pepper cultivation.

The electricity would be used to power a mill to grind the pepper.

### **c) Conclusion**

The community was receptive to the introduction of electricity to drive economic activities. However based on the discussion with the gathering it was very clear that they do not have the management and marketing skills to properly manage any of these projects to make them economically viable. There would have to be some degree of basic management and marketing training for the community to make any of these projects viable.

However they do have persons with sufficient educational background to undergo advanced training. There is at the least one graduate (environmental studies) resident in the community.

It should be noted that due to the nature of each project it is very possible for all three to be powered by the same electricity system if it is properly designed and there is a well managed utilisation of the energy.

### **3.2 Workshop Session Held on March 16, 2008**

The sessions held during this period were rather better coordinated since it was held after the Multi-Stakeholder Workshop which allowed everyone involved with the project to get a better perspective of the goals and objectives of the projects to be implemented. Also firm lines of communications had been made with the community via Mr. Michael Williams who is attached to Bina Hill where there is internet access. With Mr. Williams another Wowetta community member Mr. Bertie Xavier acting as liaison between the consultant and the community the community was better prepared for the working sessions to be held. Additionally Senior Councillor, Mr. Moses, was able to work with his community members to make them more informed about the project and the input that would be required of them. The overall result was that the community sessions were very productive.

The working sessions were conducted at the community centre pavilion.



**Figure 4 The Session with the Women**

This working session was held after lunch from around 1.30 pm to 5.00 pm. This session was broken into three parts. The first part the consultant met with only the women and discussed the issues relevant to them. The next part was with the men only and finally a short session was held to give all the participants a working knowledge of how photovoltaic (solar) systems work and the precautions required for optimising and maintaining them.

a) Output from the women's session

The women are already organised into a formal women's working group, the group has forty-nine members. They currently engage in craft work and have other projects outlined, some of which have already started implementation. Twenty eight of the women were present at the meeting. The group has an elected governing body;

- Chairperson – Ms. Priscilla Torres
- Vice Chairperson – Ms Elfreda Domingo
- Treasurer – Ms Audrey Alexander
- Assistant Treasurer - Ms. Loceen Domingo

The women were concerned about the relatively low level of income that they earn from their craft work and farms. Their main issue is the amount of time taken up with routine domestic chores during the daylight period does not allow them sufficient time to do any significant

amount of craft work to earn any extra money. Any handicraft they do during the night-time is limited due to the poor lighting they have. They suggested the following would assist in overcoming the hurdles:

They are of the opinion that if they are provided with small solar lights they can optimise some of their night-time to do additional craft related work.

They also were interested in making farine and its by-products at a commercial scale since they have the farmland capacity to increase cassava production. However they needed some level of mechanisation to deal with the capacity of farine they would like to produce.

They want to implement a school feeding programme for the children of the school. To this effect they had already constructed a kitchen and started a garden to cultivate the vegetables for the kitchen. Also they intend to plant cotton plants to spin to produce cotton yarn to make hammocks and other handicraft items. They use native cotton which they spin using traditional methods to produce the yarn. This yarn is either sold as is, or used to produce other indigenous cotton craft such as hammocks and other knitted products. They needed power to provide water to irrigate the garden and provide the kitchen and schools with safe water.

Another grave concern was the contamination of the wells during the rainy season. They were interested in installing small water tanks to collect rain water during this period to be used only for drinking and cooking. They suggested that one tank could be used to supply each cluster of homes.

#### b) Output of the Men's Session

The session with the men was also very productive and surprisingly some of their concerns reflected those of the women. The men were interested in getting the joinery project off the ground and were prepared to jump start the process using the tools (both electrical and hand) and the gasoline generator already there. The men had the following suggestions:

They firmly believed that joinery venture was viable since they perceived that there was a market for their furniture. This venture is being done by the youth section of the community under the Wowetta Youth Initiative Project. However there was not any deep analysis of the strengths and weaknesses of the project. The main weaknesses were they did not know for certain the extent of their market and had not set any production targets for each piece of furniture. Also they had no idea of cost of production of any of the items they wanted to produce.

They were asked to compare their project to that in place at Surama; they stated that they were two different types of project since Surama's was geared to produce craft for sale to tourists and theirs would be producing furniture for homes, offices and schools.

The consultant recognised that the project had merit if properly managed. Additionally they already had a fair amount of infrastructure in place to facilitate the project implementation.

They were asked to produce an estimated production schedule and the consultant will then determine the average amount of energy required to run the lighter tools.

The men were also interested in the school feeding and garden project and stated that the water pump could be integrated use. They also suggested to reduce the wastage of the irrigation water they could use a “drip irrigation system” similar to the one that was introduced at Bina Hill Institute by the National Agricultural Research Institute (NARI). They suggested that the pump would have to deliver approximately 1600 imperial gallons (7.3m<sup>3</sup>) of water per day.

The men were also interested in the implementation of a village shop to ensure that the farm products produced by the village could be readily available to everyone. Also they intended to stock other items to reduce the need for the villagers to travel to Annai to get supplies. One key piece of infrastructure required is a freezer. This freezer would store perishable products such as meats and vegetables. They were thinking about using a regular freezer and supply enough power via the solar system. However the consultant enlightened them about the high efficiency solar powered types.

A number of men also do handicraft and stated that they do not get enough time during the daytime to do much work so if they can get some lights in the evenings it would help to increase their output.

The men were also interested in starting an aquaculture farm to produce inland fish. This required some system to replenish the water; it was thought that the garden project pump could do this also. However the details of this project were not readily available, also they were uncertain about the actual location of the ponds.

One individual was interested in setting up a tire repair shop but was informed that based on the amount of energy required for such a system it would not be cost effective to install one based on solar energy.

### c) Training Session

After the individual sessions with the two groups they were invited to reform as one group. The consultant then conducted a training session on the use of solar systems and the precautions one has to take to care for the system. The issue of wind energy was also discussed it was recommended that since wind speed are relatively low in the region for most of the time it was not recommended that wind be used as the main source of energy instead use solar as the main source and have wind just as a backup if there is sufficient funds. Large wind systems at very great heights are much more viable than the small wind turbines in that region.

The consultant toured the main buildings in the community and helped to troubleshoot the two existing solar systems in the community. One was overcharging the batteries since it had no charge controller and the other not charging because the fuse on the charge controller was blown.

### **3.3 Working Session on March 16, 2008**

This session was held after lunch it commenced around 1.30 pm and lasted until 4.30 pm.

This session was used to finalise which projects would be carried forward for funding. The details of implementation of each project were reviewed and technical specifications were arrived at. After exhaustive discussions it was agreed that the following projects would be recommended for funding.

1. The joinery project, providing the group could provide the details in a timely manner. This was to be provided via email by Mr. Bertie Xavier.
2. The garden and school feeding project, this only required the provision of a solar powered pump and tanks. The community committed to providing the trestle for the support of the tanks.
3. The installation of a home solar system for each home if the amount of money was enough. In the event that the funds were insufficient the then one system would be place for each cluster and the craft persons would get one each in their home.
4. The cassava processing project; this required only a cassava grater of a capacity of 50 kg per hour. This grater would only be used for approximately four hours per day. The additional infrastructure required would be provided by the community.
5. The community shop freezer would also be supplied.

## 4.0 Projects

All of the following projects have been discussed by the community and they have agreed that these are the projects that they are interested in. From preliminary examination of the cost of each project it seems that all of the recommended projects may not be possible since the total cost of the projects exceed the US\$60,000 available for acquisition and installation of the equipment. However it should be noted that the cost of most of the equipment were acquired from online catalogues and as such these prices may be somewhat inflated since bulk purchase and shipping discounts were not factored into the costs. However installation costs were estimated based on the time required to install the equipment. However one cost that can affect the installation cost is the nature of accommodation used by the installation team.

All systems include the standard safety factors such as lightening arrestors, earth rods, fuses disconnect switches, etc.

### 4.1 Joinery Project

This project was the most involved with respect to the technical details that were required. To date there are some outstanding information which is required but there is enough information to carry this project forward. The production schedule is outlined below

Table 3: Estimate for a One Month's Work Activity,  
Wowetta Youth Initiative Project

Furniture	Amount of Wood (BM)	Hours Of Machine Time	Unit Selling Price for one item (G\$)	Total G\$
10 Tables	260	11 hrs	8000 x 10	80,000
20 Chairs	80	8 hrs	4000 x 20	80,000
2 wardrobe	80	7 hrs	15000 x 2	30,000
6 Bed Frame	240	5 hrs	10000 x 6	60,000
Total	660	33 hrs		250,000

Provided by Wowetta Youth Initiative Group and Author

The equipment being utilised are the Electric Saw, Sanding Machine, Router and Electric Planes. Total power for these pieces of equipment is 3700 watts. Total energy required 122,100Wh. Based on this information the photovoltaic system was designed. Using information from various online catalogues the system cost was determined and an installation cost added. The overall installed cost for this photovoltaic system is US\$15,783. With this cost of energy supply it was found to be uneconomical.

However if the group uses the current gasoline generator this would now be more cost effective. The group decided instead to request from the project seed money to initiate operations. This money would cover the cost of the first few months of operation. This money would be used mainly to purchase fuel and raw material such as fasteners, consumables, varnishes, glues, etc. They have requested US\$2,000. The community will contribute the building to house the unit. The building is already existing but has to be

renovated this cost will be US\$1000. The equipment for the project can also be part of the cost of the project but since it was from a previous donation this will have to go at no cost.

From the supply schedule it can be seen that the youth group is only selling approximately G\$250,000 (US\$1,250) per month. Assuming this includes 30 percent profit then the group has US\$375 profit. If they pay back US\$100 per month to the community they would take approximately 1.7 years to repay the cost of the system. With the use of the generator the level of productivity can be easily increased by running the generator for longer periods. This removes the usage limit that the photovoltaic system had imposed.

## **4.2 Garden Project**

This project only needs the supply of the pump system. The infrastructure required is very minimal. The major cost factor is the supply of the water pump. The cost of the pump installed with 130 watts of solar panels, tanks and trestle is estimated to be US\$3,000 an additional US\$1000 will come from the community from the supply and construction of the trestle and the digging of the well.

This project will benefit the women on two fronts, in the level of child care it allows by providing a healthy meal to the children as well as provide cotton for spinning. Indirect savings and supply of cotton can be estimate to US\$5 a week to each woman in the women's group. If the each woman contributes US\$2.5 (G\$500) per week to the maintenance of the system then this will be US\$122.5 per week or US\$6,370 per year. This project has the ability of paying back for the system in just 8 months. It should be noted that an economic cost was not placed on the child care aspect of the project.

## **4.3 Solar Home System**

The solar home system is designed to provide the home with a 15 watts energy saving lamp for 6 hours per day, a small radio for approximately 3 hours per day. The system will consist of a single 40 watts solar panel, one 92 amp hours deep cycle battery, one 6 amp charge controller with low voltage disconnect. No inverter was provided since standard DC lamps will be connected to the charge controller. Two lamps will be supplied; a 7 watts lamp which will placed centrally for general lighting and the 15 watts lamp which will be placed in the work area. The householder can use the lower power light in normal situation and use the high powered lamp for craft work. This arrangement will prolong the hours available for profitable work. The cost of supply and installation of each unit is US\$850. This cost includes an installation cost of US\$75 per unit and a 15% mark-up for shipping. The total cost of 49 units would be US\$41,650. It is suggested that the support for the panel be supplied by the community at a cost of US\$25.

The occupant can easily spin cotton yarn or produce ethae straw for craft work. In addition baby slings or hammocks can be made during this using the light. These items are very high value. As such it is very possible that someone may be able to payback US\$5 (G\$1000) per week which will enable payback in 3.3 years. This payback does not include the cost of children being able to do more home studies.

Table 4: Selling Price for Selected Handicraft

Item	Cost
Raw cotton	G\$800/kg
Cotton Yarn (spun)	G\$2000/kg
Hammock	G\$2000/foot
Baby Sling (small)	G\$1500
Baby Sling (medium)	G\$2000
Baby Sling (large)	G\$2500

Source: Author, 2008

#### **4.5 Solar Freezer for Village Shop**

This freezer can be acquired as a complete unit for US\$2,500. This package includes the freezer (Sun Danzer), solar panel, battery and connection accessories. Installation and transportation cost is estimated at US\$500. This brings the total cost to US\$3,000. Since the shop will be utilising this freezer very extensively to make ice and provide cold drinks and frozen meat, the shop would be able to repay approximately US\$110 (22,000) per month which is less than G\$1000 per day. This will lead to a repayment period of just over two years.

#### **4.5 Cassava Processing Unit**

This project is possible the most complex and has significant implications for the manner in which work is done in the community. To implement this project the women and men involved would have to implement aspects of mass production and just in time delivery. This will challenge the easy going approach that is common to most Amerindian communities. This project has the potential to create a paradigm shift in the community. Based on the discussions at the working sessions it was evident that some of the community was buying into this paradigm shift.

The project requires that the women's group and the rest of the community put a fair amount of infrastructure in place to facilitate the project. The first is to increase the amount of cassava being sowed. The group also has to provide a building to house the production unit as well as provide a bullock cart. The workers on the other hand would have to be very organised and disciplined to ensure smooth execution of the production sequence. These issues were all discussed in detail at the working sessions.

This project requires the most input in terms of fund due mainly to the fact that the size of the cassava grater has not been finalised. This is mainly due to the fact to date no one has responded to the request for quotations. As result the worst case scenario was used. In the calculations it was assumed that the smallest available cassava grater to grate the amount of cassava required available was one driven by a 3kVA electrical motor. The cassava grater and a diesel generator will cost approximately US\$8,000.

The group expects to be processing 15 bags per week of farine when in full production. Each bag weighs 100 pounds, so this will yield 1500 pounds per week. At a cost of \$G100 per pound this gives G\$150,000 (US\$750) sales per week. If the women were to pay back US100 per week it would take approximately 1.5 years to repay this project.

Initially it was expected that approximately twelve women would be involved and some men. However they have since reorganised the structure and instead would involve more women. At this time they have already pre-empted the start up and have commenced additional land preparation and cultivation to meet the increased demand for the cassava. Land preparation can be valued at approximately US\$1000. This cost analysis is based only on the farine production but there are additional by-products such as casreep, tapioca, etc. Additional community input will be the additional facilities required such as a work shed, implements, etc. at a value of US\$750.

Table 5 Project Costs

Item	Project	Local Input	Funding Agency	Total
1	Joinery	1,000	2,000	16,783
2	Garden Project Solar Water Pump	1,000	3,000	4,000
3	Solar Home System	1,225	41,650	41,650
4	Village Shop Freezer	0	3,000	3,000
5	Cassava Processing	1,750	8,000	9,7500
	Total	4,975	57,650	62,625
	Balance		2,350	

## **4.6 Recommendations**

As can be seen from Table 5 the total amount of money required for the project as currently designed is just below the US\$60,000 allocated for acquisition and installation of the equipment. The additional US\$2,350 would be used for any contingencies that may arise.

## **6.0 Management of Projects**

### **6.1 National Level**

Management at this level should be more of an oversight and facilitating function. The National Advisory Committee (NAC) would have overall responsibility for the project. The most critical aspect of the project management is the financial management of the seed funds. This fund has to be securely managed and free of any departmental interference. It is recommended that the funds be managed external of Guyana since the GEA will not be able to open any account that may not be interfered with by other government entities. This is not meant to derogatory it is just the way the GEA is constituted it cannot hold autonomous funds. As such the NAC would act as an authorising agent for the release of the funds by the funding agency.

At the community level the NAC would coordinate with the community leadership and the individual project Steering Committees that are responsible for the execution of each individual project. The individual Steering Committees would be required to send monthly progress reports to the Community Council and the NAC. Additionally the NAC would

ensure that the recommendations coming out of the Multi-Stakeholders Workshop are implemented.

## **6.2 Community Level**

The community members are now aware that they will have to manage the individual projects for them to succeed. From all the discussions it was brought out that they do not have strong management skills that are required to make these projects sustainable. At the community level they have the village governance system which would continue to manage all the projects together. It would be foolhardy to impose another management system when the community already has this in place that is supported by the Laws of Guyana. As such the community can open a local bank account to handle the funds required for local use. The community can easily open the account at the Guyana Bank for Trade and Industry Lethem branch which is very accessible to the community.

The community would have to set up the parameters under which the individual projects work. This will include the amount and frequency at which the beneficiaries are expected to make payments to the central project fund. An account would have to be opened to keep these payments. The Community Council would have to decide how to utilise the funds collected. However the provision that the routine and breakdown maintenance of the equipment supplied by the project is serviced before any other use is made of the funds. These mechanisms would have to be formalised during the implementation stage.

## **6.3 Individual Projects**

At the individual project level the beneficiary group must elect a Steering Committee to manage the project. Since this kind of management requires some specialised training the larger project would have to facilitate this training. The facilities at the Bina Hill Institute may be used to assist in this training. Also the Amerindian Affairs Ministry has been carrying out management and financial training programmes for Council members so it may be possible to get their assistance.

During the implementation stage of the projects the Steering Committee would need significant support from the National Advisory Committee.

## **7.0 Barriers to Success**

Success should be defined before any attempt to measure and look at the barriers to success. In most projects of this nature the success of the project is usually measured by the successful installation of the equipment and start up. However since the objective of the Rural Energy Project is the sustainable utilization of the installed equipment to reduce the level of poverty within the target community. As a result the measure of success has to be done over the longer term.

### **7.1 Market Intelligence**

One of main issues that can affect the success of the project is the fact that most of the individual project depends on a market that has not been properly assessed. It is assumed that the market exists as discussed without any actual market research. This can backfire on the participants. To overcome this, the project group has to acquire real data about this market and if necessary adjust the project to meet these new requirements.

### **7.2 Participants**

Success can only be possible if the participants stick with the project, should they lose heart and drop out of the project then the equipment loses its value and utility. Most of the participants would not have any previous experience with a project that needs their constant input for its success. As such they would have to be encouraged on a regular basis. This is a key role of the community leadership and the NAC.

### **7.3 Technical Know How**

Most of the participants are not knowledge of the technical aspects of the project they are involved in. They have the ability to perform the tasks which they would have learned from someone but they are not aware of the science behind the techniques. There must be some attempt to have the techniques analysed for the science behind them. This would help to inform the participants how to make sensible adjustment to meet any new requirements.