**Introduction**

The provision of affordable and reliable energy is a prerequisite to sustainable development, especially in the rural outer parts of Fiji where it is most needed.

Providing locally sourced, renewable and affordable power in Fiji plays an important role in the overall strategy to provide basic services to Fiji’s households living in the remote and rural areas.

The provision of Biodiesel mills in rural areas enhances the use of under the utilized coconut resources, and opens up opportunities for other economic activities, which in turn will improve the overall living standards of these rural dwellers. Most of these people fall below poverty level.

The Government of Fiji is committing itself to the provision of least cost sustainable energy forms of energy to the nation. Primarily it is to alleviate poverty and improve the standard of living of people living in remote places and the outer islands. The Department of Energy is addressing this by utilizing abundant biomass resources, such as coconuts, to generate a sustainable energy fuel supply, for transport and electricity, as well to amortize the impacts of high annual fossil fuel imports.

The rationale of setting up a modular scale coconut oil biodiesel production in the island of Rabi is to assist in achieving these major development goals. The impact is even more remarkable if it is implemented from rural and remote island communities. By changing from mere production of dried copra, as they have been doing in the past, into value adding activities such as the production of biofuel, cooking oil, body lotion, and soap, the communities will increase the income base and economic resilience of these communities.

**Background**

**Rabi Island** pronounced (Rambi) is situated off the north-east coast of Vanua Levu, Fiji’s second largest island in the Fiji group. The island is near 17° latitude and sits on the International Date Line at 180° longitude. Rabi consists of approximately 17,000 rich volcanic acres and rises to a height of 1,550 feet above sea level. The island is covered with natural vegetation and an abundance of coconut trees. Prior to the Banabans settlement on Rabi in 1945 the island was used as a copra plantation by the famous Lever Brothers group of companies.
Rabi Island is self-governed by its own elected Council of Leaders and Elders and is a privately owned community within Fiji itself. The language spoken on the island is Gilbertese and the customs and traditions of the Banabans are still practiced today.

The Banabans live in four major villages on the protected Fiji side of the island. The four villages and their occupants are the survivors and descendants from the same four villages that were destroyed by the invading Japanese forces back on their homeland island of Banaba/Ocean Island.

![Rabi Island Map](image)

**Village Locations**

**Tabwewa** is the biggest and most northern village on the island. The business district, administration buildings, wharf, post office, court house, main oval, the island’s only Guest House, and the hospital are situated here in this area known as Nuku.

**Uma** is the second biggest village on the island and is situated along the coastal strip between Tabwewa Village and Tabiang.

**Tabiang Village** is situated 8 miles from Tabwewa on the south-west tip of Rabi, and is the site of the island’s only High School and airstrip.

**Buakonikai** is located further to the south-east and is the most isolated of the villages situated 14 miles away from Tabwewa.
Rabi’s nearest neighbours are the small Fiji village called Karoko, and the large garden island of Fiji called Taveuni. The nearest major town and business district is Savusavu which also houses a commercial airstrip and is located approx. 150 kilometres away from Rabi.

**Purpose of Visit**

The aim of the trip was to establish a feasibility tour to determine the possibility of setting up a modular biofuel mill on the island of Rabi. The island of Rabi has been selected to be one of the six project site for the biofuel development program for the year 2012. These islands are chosen based on their annual copra production capacity and the unaccessibility to constant supply of diesel fuel for their electrical generators. Other areas of this feasibility study is to determine the actual demand for diesel on the island as well as educate and inform the people on the application of biofuel as a substitute to diesel, with biofuel being a new fuel in the market there is a possibility of fear from the villagers to switch to this fuel.

Some of the main objectives set out for this trip were to:

1. Conduct a survey on the status of the coconut/copra industry on the island. This includes No. of farmers, coconut growing areas, copra production figures, copra buying price.
2. Obtain the average diesel consumption on the island and identify some of the major consumer of diesel on the islands.
3. Submit a report on the findings and include recommendations

This tour was conducted on the island with the help from the Rabi Island Council as well as the agriculture officer in charge on the island.

**Island Administration**

The Rabi Island Council handle the administration needs for the island. It consists of four (4) leaders and four (4) spokesperson including an executive director and a chairman representing the four villages on the island.

Elections are held every four (4) years where the people on the island get to select their leaders and spokesperson representing them in the council.

The council is responsible to liaise with the government of Fiji to address the needs of the islands and also establishment of capital funded projects such as schools, health stations, roads, jetties, rural electrification.
One of the major focuses for the current administration is the development and commercialisation of farmlands to bring in more returns and income to the island. With the help of the ministry of Primary industry farmers have been assisted in terms of receiving planting materials, fertilizers and tools to increase the production and supply to markets outside of Rabi Island.

The council also looks after the transportation needs for school students with the hiring of the trucks to transports students to and from the schools.

Overall the administration of the island is well organised and with the major developments in the education and agricultural sectors the council has been working towards ensuring a more sustainable future for the people of Rabi.

**Local Infrastructure**

**Schools**

There is currently three primary schools and one high school on the island of Rabi ensuring students are provided with education from classes one (1) to form seven (7). The students are provided with education grants from the ministry of education to cater for the school fees and transportation to schools. The council has arranged the use of the council trucks for the transportation of students to the schools. An interesting conservation made concerning the school curriculum was the inclusion of arts and heritage classes where students were taught the art of canoe building, and other rabian cultural activities. This as explained by the Rabi High School Principal was to reserve the cultural identity amongst the youths in Rabi.

**Health Service**

The island has a health centre situated at Nuku village providing health services for the people on the islands currently there is a senior medical officer and registered nurse employed at the health centre.

*Figure 1* Agriculture Official in front the Rabi Health Centre
**Police Station**
There are two police officers looking after the island of Rabi ensuring that law and order is upheld within the communities. All major cases are transferred to the Savusavu police post for investigation. Currently there is no major criminal activities on the island, the usual case brought in to the police post are regarding land dispute and some cases of family and domestic disputes.

**Access and Transportation**
The island can be accessed by boat (30 mins from Karoko village) and an additional 2hrs by road to Savusavu Town. The airstrip on Rabi Island has been closed off to all air traffic to allow for upgrade works. A well-maintained dirt/sand road stretches the island and provides road access Nuku village to Tabiang village. The roads leading up to **Buakonikai from Tabiang village has been closed and can the village is only accessible through the hire of small boats.** The Rabi island council recently purchased two (2) buses however these buses have been parked at the council garage in Tabiang as the council await the road upgrading to occur first before they are made operational.

**Water Supply**
Water supply in Rabi is managed by the newly formed Water Authority of Fiji. Water Authority supply water to every village and settlement in Rabi. They are operating three bore holes which are operated by submersible water pumps. The water pumps operate 24 hours per day.

**Power Supply**
The island of Rabi have community based generator that operate only in the evening for an average 2-4 hrs a day. Currently there is 10 generators operational on the island. Each family/household is responsibly to supply diesel for the generator on a routine basis.

**Telecommunications**
Telecom Fiji Limited has a satellite phone connection on Rotuma. This has enabled the people of Rotuma to access a pre-pay landline service provided by Telecom Fiji Limited referred to as Easy-Tel. Digicel/Vodafone mobile phones are able to get reception on the island via transmission towers on Taveuni

**Main sources of income (Agricultural activities)**
The agricultural activities on the islands is naturally diverse with the main forms farming such as

1. Yaqona
2. Dalo
3. Copra
4. Fishing
The council has also allocated wetland near Tapewa village to start trial plots for Rice farming. Rice is the staple food for Banaban and each week the island buys over 5 tons of rice for local consumption.

Copra Feasibility Survey
A trip was arranged with the agricultural officer in charge for Rabi Mr. Arun Prasad to visit and hold consultations with all the farmers in the four villages currently engaged in the copra business. The main objective of this survey was to get an update on the current production figure for copra and taking into consideration difficulties faced by copra farmers and recommendations and assistance required to assist copra farmers in improving their yields.

The Agricultural census for 2009 that was carried out on the island is yet to be released by the Ministry of Agriculture therefore raw data had to be collected from the farmers on the islands.
<table>
<thead>
<tr>
<th>Name of Village Farm</th>
<th>No. of Drier</th>
<th>Current Production (per farmer)</th>
<th>No. of Farmers</th>
<th>Transportation (Gallons) (monthly)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pani</td>
<td>Wood fired (3)</td>
<td>0.2 tonne</td>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>Uma</td>
<td>Wood (2)</td>
<td>0.3 tonnes</td>
<td>17</td>
<td>8</td>
</tr>
<tr>
<td>Tabiang</td>
<td>Wood (1)</td>
<td>1 tonne</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Boukonikai</td>
<td>Wood (2)</td>
<td>0.5 tonne</td>
<td>16</td>
<td>8</td>
</tr>
</tbody>
</table>

*Figure 6 Farm House in Pani Village*

*Figure 7 Consultations at Uma Farm*
Village Farms
Currently there are four (4) main village farms located on the un-habited side of the island. Each village has been given specific farming grounds by the council of Rabi to carry out farming. The land in each farm has been further sub-divided for each household per village. The men from each village have built farm homes in which they live in while farming. This is because all the farms are located on the other side of the island and they can only access the farms by boats. The hiring of boat to the farms is quite expensive ordeal therefore the men often stay in their farms homes and return to the villages in the weekends.

Copra Farming
There are no coconut estates or coconut plantation on the island of Rabi. Copra farming is limited to the available standing coconut trees from which the dried nuts are collected on daily basis by farmers. Each farmer can collect an estimated 100 – 150 dried nuts per day. De-shelling and drying of copra takes place at the farm huts close to the wood fired driers.

Majority of farmers visited mentioned that they believe copra could be potentially be the main form of income however assistance is needed to address the high cost of transportation the farmers incur in transporting their produce to tabewa (main copra trading centre).

The Rabi Island Council is currently providing incentives to assist copra farmers market their produces under the following arrangements

1. Buying copra at fixed rate of $1.00 per tonnes of copra at which the council usually subsidise almost 30cents additional to the current mill gate price at Savusavu.
2. Supply of 4 gallons of outboard premix out of the six gallons need by farmers to transport their copra to the trading shop each month. (this trips are limited to one per village on a monthly basis)
**Copra Driers**
Currently the use of wood fired driers is the common form of drying copra on the island of driers. The high cost of maintaining these driers have resulted in the closure of couple of the driers in the farms visited. Farmers have sent in their request to ministry of agriculture for assistance in rehabilitating some of the non-operational driers.

The closure of driers has greatly influenced the copra production figures as farmers diverge to other forms of income such as sustainable farming, fishing and dalo farming.

**Copra Production Figures**
It was noted that the island currently producers on an average of 2 -3 tons of copra monthly however, these figure are expected to increase once the project is in operational. Most of the farmers that were visited welcomed the idea of opening a new market for copra on the island and indicated their willingness to supply copra to the mill.

The current copra production is limited to following factors

1. Hiring of boats to transport copra
All the major copra farming belts have no access to proper roads/tracks therefore the only means of transportation of copra to the main trading centre is through the hire/use of privately owned boats. Compared to other form of transportation the use of boats is far more expensive and the volume of copra that is can be transported in each trip is quite less. The current rehabilitation of the roads is primarily focussed on the roads connecting the four main villages and upgrade works farm roads is yet to commence.

The Rabi island council has provided assistance in sharing the cost of transportation by providing two thirds of the fuel cost for only one (1) trip made by each farming unit on a monthly basis. The trips subsidized by the council can cater for approximately 100 – 120 bags of copra per month from the four farming units (3tonnes). Farmers often share the cost of transportation to transport the remaining volumes of copra they produce.

2. Lack of market options for farmers

All the copra produced on the island is sold to the Rabi Island Council commercial arm Banaban Ltd. The company is responsible for all the marketing of fruits and crops including yaqona and copra produced on the island.

The copra bought from farmers is sold to copra millers in Savusavu. The company has cater for cartage and freight cost to transport the copra to the nearest jetty at Karoko and then hire a truck to from Karoko village to the mill in Savusavu. With all the logistics and costs involved the company has also faced problems in sending the copra across which restrict the company from buying huge quantities of copra from farmers.

3. Non-operating copra driers

As mentioned earlier the closure of driers has greatly influenced the copra production figures as farmers diverge to other forms of income such as sustainable farming, fishing and dalo farming.

Farmers aren’t able to afford the cost of buying replacement drums, corrugated roofing iron and other materials needed to maintain the driers.
4. Market for VCO

Due to the opening of the market for VCO majority of the women prefer selling the dried nuts collected close to their villages homes whilst the men focus on only yaqona and dalo farming. Majority of the dried nut in the farms are not harvested into copra as the focus has now drawn to the market for VCO. The market for VCO has pushed the attention of copra farmers to the scattered coconut trees near the village leaving the abundance of coconut resource on the outskirts of the island idle.

Coconut re-planting

The officer in charge from the ministry of Agriculture Mr Arun Prasad working closely with farmers on the island to help rehabilitate the coconut resources. During an interview he mentioned that majority of the coconut trees on the island are old and senile and there is an urgent need to commence the replanting of coconut trees.

The replanting of coconut trees have already started at some village farms visited namely the farm at Pani and Naseu. Villages from these farms were given the “Fiji Tall” coconut seedlings brought in from the agriculture nursery at Wainigata research station.

The second round of re-planting has already begun with the agriculture unit now setting up a coconut nursery close to the Rabi island council. This will be the main distribution centre for the coconut seedling for Rabi Island.
Fuel Demand-Rural Electrification

All the electricity generated on the Island of Rabi is through diesel generators however, there is potential to introduce other forms of energy particularly with Solar and biomass. Currently the villages are powered through privately owned generators and generators installed by government through the department of energy rural electrification scheme. The table below gives the list of generators at each village highlighting also the operating details of these generators.

<table>
<thead>
<tr>
<th>Village</th>
<th>Model</th>
<th>Year of Installations</th>
<th>Gen Set Size</th>
<th>Fuel Consumption</th>
<th>Operation Hours Daily</th>
<th>Fuel Demand Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uma Village</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Uma Nuka</td>
<td>16</td>
<td>14</td>
<td>2</td>
<td>4.5</td>
<td>300 L</td>
<td></td>
</tr>
<tr>
<td>• Naidoi</td>
<td>14</td>
<td>14</td>
<td>1.5</td>
<td>4</td>
<td>180 L</td>
<td></td>
</tr>
<tr>
<td>• Kesukesu</td>
<td>14</td>
<td>14</td>
<td>2</td>
<td>4</td>
<td>240 L</td>
<td></td>
</tr>
<tr>
<td>• Fatima</td>
<td>14</td>
<td>14</td>
<td>1.8</td>
<td>4</td>
<td>215 L</td>
<td></td>
</tr>
<tr>
<td>Buokonikai</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Village Set</td>
<td>25</td>
<td>14</td>
<td>3.5</td>
<td>4</td>
<td>420 L</td>
<td></td>
</tr>
<tr>
<td>• Matanituku</td>
<td>14</td>
<td>14</td>
<td>3</td>
<td>4</td>
<td>360 L</td>
<td></td>
</tr>
<tr>
<td>• Private</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td>4</td>
<td>120 L</td>
<td></td>
</tr>
<tr>
<td>Tapewa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Tapewa Village</td>
<td>14</td>
<td>70</td>
<td>3</td>
<td>4</td>
<td>360 L</td>
<td></td>
</tr>
<tr>
<td>• Nuku</td>
<td>70</td>
<td>7.5</td>
<td>4</td>
<td>5</td>
<td>1125 L</td>
<td></td>
</tr>
<tr>
<td>• Rabi Health</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td>240 L</td>
<td></td>
</tr>
<tr>
<td>• Private</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>9</td>
<td>270 L</td>
<td></td>
</tr>
<tr>
<td>Tabiang</td>
<td></td>
<td></td>
<td>18</td>
<td>2.5</td>
<td>3</td>
<td>315 L</td>
</tr>
</tbody>
</table>

**Total Diesel Consumed**

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4145 L</td>
</tr>
</tbody>
</table>

**Current Demand for Diesel**

As stated in the table the current demand for diesel is averagely 4,000 liters monthly. This demand is only for power generation and does not take into consideration the fuel consumed by vehicles on the island. This volume when switched to supply from biofuel (Blend of Diesel and Coconut oil) would require a total volume of 3200 liters of diesel and 800 liters of coconut oil. Once operational the mill will be targeting to produce the volume required to produce biofuel for the whole island and the excess coconut oil and copra meal will be sold to the available markets in the mainland.
Cost of Electricity
All the villages have adapted the non-metered system where each household contributes towards the cost of diesel to run the community generator. Each family unit in the village is required to supply diesel to the village generator on a daily basis. This kind of system is commonly used in majority of the rural areas in Fiji however as experience in the past this has often brought conflict between the individual families as the cost of electricity is fixed and does not cater for the level of power consumption.

Site selection
Under the current Rabi Council Act, the Rabi Island Council holds authority over all the land on the island. This made the process of selecting the site much more easier as we required to only consult the council on the availability of a piece of land to house the biofuel mill.

The site proposed by the council is located on the border of Tabiang and Buokonia village. It is about 2 KM away from the new jetty. The site is currently situated next to the Council garage and suggestions have been made to have the council garage and the biofuel mill be operated under the same business management.
The site has access to water; telecommunication network however there is no available power grid near the site. The clearing workings needed for the site will be limited to clearing and grading of small shrubs and vegetation.

**Recommendation on Keys Aspects from the Survey**

**Coconut Rehabilitation**

Rehabilitation of the current coconut resource is very vital in sustain the proposed biofuel project for Rabi Islands. Each modular mill requires on average 20 -30 tonnes minimum of copra and the island
is currently producing a little less than 10 tonnes a month. The low output has being tagged towards the overall logistic of producing copra and farmers believe Rabi has the resources to potentially produce more copra. Having the coconut rehabilitation will in fact secure the industry on a more sustainable level which later benefits the future generations on the island.

**Proposed business Structure for Rabi Project**

Considering the involvement and the level of authority the Rabi island council has over all the development on the island I recommend that we use them as the main governing body on the island for the project. The council has already a commercial arm (Banaban Ltd) that handles the copra buying/selling on the island and the same company can be used to manage the project. The selection and training of workers will be organised by the department with the help of council leaders. Management training is also important and must be undertaken by the selected manager/account to get an understanding on how these projects are operated financially.

**Awareness on the use of biofuel**

The villages need to be made aware on the application of biofuel as an alternate fuel source to diesel. Our past projects in Koro, Cicia and Rotuma have shown to us the lack of understanding and false information provided on biofuel has caused many villagers to refrain from using biofuel. A biofuel drive or awareness workshops must be held during our regular visit to the island to demonstrate the advantages of using biofuel and conduct small training on managing generators/vehicles to operate more efficiently.

**Securing markets for By-Products**

The department needs to work closely with the council to engage talks with local buyers of coconut oil and copra meals. For coconut oil the target companies will be mainly soap/cosmetic factories including copra millers of Fiji. The copra meal can be sold to local piggery farms in Rabi and in Vanua Levu.

**Infrastructure development to allow better/affordable transportation for farmers**

The access roads to farms need to be made and upgraded to allow motor vehicles access to the farms. Transporting copra by means of boats is quite expensive and not enough room to carry huge volumes of copra. Improvement in the overall accessibility of farms will greatly impact in the production capacity of the farmers as farmers will have better access to their farms with cheaper transportation and handling cost.
**Conclusion**

Overall the trip to Rabi was a success as it gave us more knowledge on the current status of the copra industry and the level of rehabilitation works that is needed to increase the current production figures. The island has the coconut resources to support the biofuel mill however majority of the work must be focussed now on the awareness and securing the market for all the by-products from the mill. A thorough study must be carried out on the financial prospect of setting up a mill in Rabi and recommendation made for proposed business plans and marketing methods for the mill.

The team would like to acknowledge finally the Rabi Island Council and the people of Rabi for playing such great host during our visit to their island.

Vinaka
Appendix A

**Itinerary for Rabi trip**

Depart Nadi - 2.30pm Thursday 8th

Arrive Savusavu-4pm

4pm -6pm Brief with SAO Agriculture

Friday 9th

1. (8am-12 Midday) Meeting/Arrangement of travel to Rabi with SAO Agriculture/Rabi Council Officials
2. (Midday)Depart for Rabi

Saturday 10th (Overtime)

1. (8am -4pm) Field Visit to Copra Farmers/Farms (selection of possible sites included)(Tabwewa/Uma)
2. (5pm -10pm) Meeting with Villages@ Uma/ Tabwewa Villages

Sunday 11th (Rest)

Monday 12th

1. (8am -4pm) Field Visit to Copra Farmers/Farms (selection of possible sites included) (Tabiang/Buakonikai)
2. (5pm -10pm) Meeting with Villages@ Tabiang/Buakonikai Villages (Overtime)

Tuesday 13th

1. (8am-11am) – Meeting with Rabi Council to Discuss Findings
2. 12 MIDDAY – Return Savusavu

Wednesday 14th

Depart Savusavu for Suva (12pm Flight)
Appendix B Visit to Copra Millers – Savusavu

Summary of Discussion

• Copra Supply to Mill currently sits at around 5000 tonnes annually compared to 22000 tonnes capacity. Preferred operating capacity around 10-15 thousand tonnes per day.

• Major area of supply included the Wailevu and Savsavu tikina. Other areas including Tunaloa, Taveuni, Bua, and Macuata have dropped in terms of the supply to the mill.

• Major cause of the recent decline in the copra figures includes the rapid growth of other agricultural produce such as dalo, yaqona. The market for these two has been in the past few years progressively peaked and farmers have opted to concentrate more on these two commodities and neglect the copra industry.

• Majority of the coconut estates have been left idle by owners due to lack of copra cutters on the island.

• Mr Ashok had also indicated governments need to subsidise the cost of freight for the transportation of copra to assist farmers to supply copra to the mill.

• He (Mr. Ashok) had suggested the possibility of setting up a larger mill in the upper Cakaudrove sector to address the problem of high cost of freight incurred by the farmers. They would then look at purchasing the oil from the proposed factories.

• He had stressed the importance of finding market for our proposed biofuel projects as this has been the major downfall for similar projects in the previous years.

• He had also stressed the failure of such projects usually resulted in the farmers switching to other means of farming adding more insult to the struggling copra industry.