Assessment of Biofuel Market Potential

Biofuel Mill Status Report

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ACRONYMS

ACRONYMS

BSP	Bank of the South Pacific
CATD	Centre for Appropriate Technology & Development
CNO	Coconut Oil
FDoE	Fiji Department of Energy
FNEP	Fiji National Energy Policy
FREPP	Fiji Renewable Energy Power Project
GBCL	Gau Biofuel Company Limited
GEF	Global Environment Facility
KBCL	Koro Biofuel Company Limited
LBCL	Lakeba Biofuel Company Limited
RBCL	Rotuma Biofuel Company Limited
RABICL	Rabi Biofuel Company Limited
RIL	Rotuma Investment Limited
SE4ALL	Sustainable Energy for All
SIDs	Small Islands Developing States
UNDP	United Nations Development Program
VBCL	Vanua Balavu Company Limited
VCO	Virgin Coconut Oil

About the Project

The project for the "Assessment of Biofuel Market Potential" for the Fiji Department of Energy is carried out under the Fiji Renewable Energy Power Project (FREPP). The FREPP is being implemented by FDoE and supported by UNDP Pacific - Fiji Office. The project is funded by the fourth cycle of Global Environment Facility (GEF-4). Specifically the FREPP is basically intended to remove major barriers that hinder the widespread and cost-effective use of grid-based renewable energy supply via commercially viable renewable energy technologies.

With the known fact that the uptake of Renewable Energy (RE) based power generation in Fiji is hindered by well understood barriers/constraints, addressing the removal of such barriers in a holistic and integrated manner will help facilitate the widespread utilization of the country's feasible renewable energy (RE) resources to sustainably meet the country's target of further augmenting its RE component in its energy mix. Compared to other approaches which address only specific aspects of RE-based power generation development and application, an integrated approach of addressing the various inter-related issues would bring about more benefits. The project consists of 4 main components: 1) Energy Policy and Regulatory Frameworks 2) RE Resource Assessments 3) RE-based Power Generation Demonstrations and 4) Institutional Strengthening.

With the above background, the FDoE with support from FREPP - UNDP has commissioned this particular assignment which was basically aimed at assessing the demand or potential for the Bio-fuel Mill Project Programme **This particular component is a brief or report on the nine Biofuel Mills implemented by the FDoE in Rural Maritime Communities in Fiji.**

1.0 INTRODUCTION

This report is intended to outline the history and current status of the Maritime Biofuel Mills in Fiji which is the second deliverable as stipulated in the agreed terms of reference for this particular project.

The objective of this consultancy is the assessment of the potential of biofuel markets in Fiji. This market assessment study will identify the demand for biofuels outside of the host islands, identify potential sites for biofuel re-fueling stations in Viti Levu and Vanua Levu along with associated technical arrangements and cost implications. The study will also develop a programme for proactive and meaningful awareness-raising to successfully market the locally produced biofuel. The report reflects entirely on the data obtained from FDoE.

As proposed in Fiji National Energy Policy 2013 – 2020 (that is yet to be endorsed by the cabinet), the work undertaken is to improve the energy sector through the utilization of local renewable energy for power generation and transportation sector and with the intention to reduce Fiji's fuel bill at the national level. In addition Fiji's Green Growth Framework outlines the need to put in place a major biofuel initiative through the private sector in developing the industry in the country. The work undertaken in Fiji is varying with work carried out in the power sector and also inroads in the transport sector through biofuel production. This particular report will try and delve into the work currently undertaken on biofuel and perhaps encourage effectiveness of the industry and market development in the country. More specifically it will entail field visits (to the mills) and discussions with local stakeholders.

This consultancy and the findings of the report will build on the work that is currently undertaken on the finalization of the Development of Biofuel Policy in Fiji

2.0 BACKGROUND

The Biofuel Development Unit at FDoE had set-up biofuel mills in rural and maritime areas with to ensure people have sustainable and affordable fuel utilizing copra as the feedstock. The unit has 7 biofuel mills under operation in Koro, Rotuma, Cicia, Gau, Rabi, Vanuabalavu, and Lakeba.

With respect to the latest assessment on the impacts of Cyclone Winston all except Vanua Balavu suffered extensive damages. The Koro mill shed was used as the evacuation center during the Cyclone as there was major destruction on the island. The equipment at the Vanuabalavu mill shed was transferred to the Lakeba Biofuel mill which had problems in relation to its oil expeller. The remaining equipment has been returned to Suva. The set-up of another two mills in Moala and Matuku has been completed and is awaiting commissioning. All these information are captured separately in the report below.

An assessment by CATD in 2014 for the three mills in Koro, Rotuma and Cicia has concluded the lack of demand for the products produced at these mills. There were no assessments done on the other four mills by any independent organization. However, Conan Hales on his Master of Science thesis at the Imperial College of London in 2011 carried out a supply chain analysis of Decentralized Mini-mills (Koro Bio-fuel Mill) for coconut bio-fuel. He recommended that if properly managed, the mills could be profitable and should also access outside market. Unfortunately for the local mills, most of the generators on the islands have switched or reverted to the use of conventional fuels. The switch to conventional fuel is due to the fluctuation in conventional fuel price or due to the standard of bio-fuel produced on the island. 'Diesel creeping' has happened for several other bio-fuel mill based rural electrification projects in Pacific Island Countries including in Fiji as experienced in Welagi and Lomaloma, Fiji. The current demand for these projects has dwindled to very low levels and affecting the overall profitability and sustainability of the mills.

Finally, the current products produced from the mills and will be further discussed in this report and subsequent report includes;

i. Coconut Oil;
ii. Renewable Diesel (80:20) – Diesel to Coconut Oil and;
iii. Coconut Meal.

3.0 METHODOLOGY

In compiling the report, initially attempts to travel to the Biofuel Mills (Rabi, Gau and Lakeba) was affected by the onset of Cyclone Winston. More specifically the team was caught in Vanua Levu on the eve of the cyclone making its way into Fiji. In addition, questionnaires were also prepared for the site visit (refer to appendix) had to be undertaken through phone calls with Mill Managers in three of the mills.

Notwithstanding the above, the study had to resort to meetings conducted with mills that were operating (Lakeba and Cicia) and with the FDoE officials to gather first-hand information in regards to the operations of all the mills. Also the services of biofuel staff that were waiting for their contract renewal from FDoE was utilized to obtain data. A copy of the questionnaires that were used for this work is attached.

The structure of the report is basically organized on each of the mill that has been implemented by the FDoE.

4.0 KORO BIOFUEL COMPANY LIMITED (KBCL)

Introduction

The Koro Biofuel Mill was commissioned on the 10th March 2010. After four years of operation the FDoE commissioned an assessment to gauge its overall performance. The assessment was undertaken by the Centre for Appropriate Technology & Development (CATD), a vocational training institution with the Government of Fiji located Nadave, Bau, Tailevu.

The Koro Biofuel Project was wholly funded by the Government of Fiji through the FDoE with a cost of FJD 343,103.26 which included the actual biofuel equipment at a cost of FJD 267,650.00, the Biofuel Mill shed FJD 52,453.26 and a start-up capital of FJD 23,000.00.

Management

There is a lack of clarity on the cooperative modality that the company – Koro Biofuel Company Limited (KBCL) is adopting. As a cooperative, all the copra is to be sold to the mill but not all of villages on the island buy the bio-fuel from the mill. This is because the generators in each village are run by the village committees that are separate from cooperative.

The initial organizational structure of the mill is given in Figure 1 below:

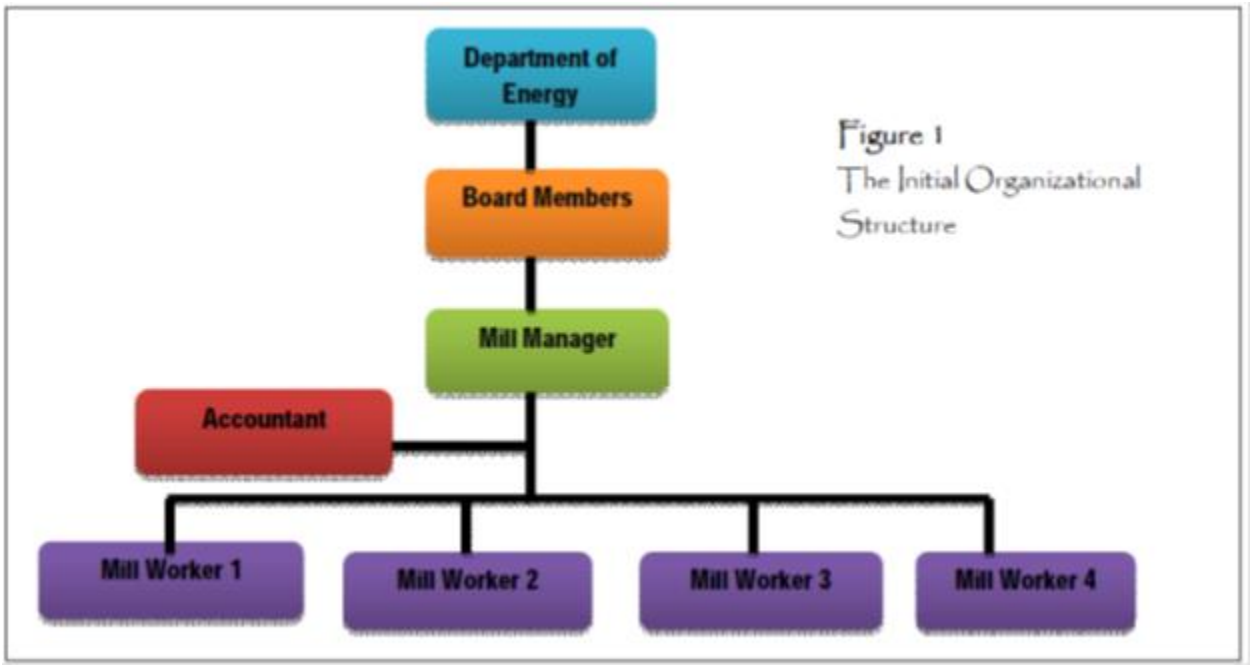


Figure 1
The Initial Organizational Structure

But according to the study by CATD, the current working structure of the mill is as given in Figure 2.

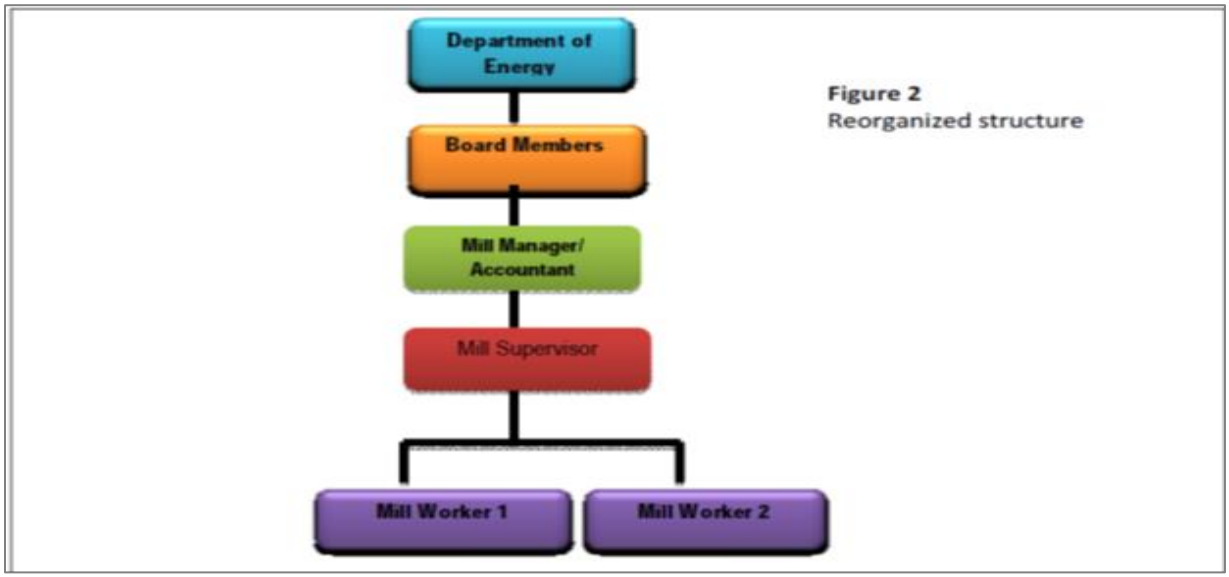


Figure 2
Reorganized structure

Most of the responsibilities lie with the Board but it is not functioning as it last met in 2012. There is a FJD 3,000 outstanding debt that has accumulated by the mill Cooperative and this affects the day to day operation of the business. There is no business or strategic plan for the mill.

The mill has a number of issues such as board members had last met in 2012 and transportation in terms of copra collection need to be resolved. On the leasing issue (site for the mill), the mill management and the FDoE have resolved lease agreement with I Taukei Land Trust Board (TLTB) and are in the process of formalizing the lease for the mill. Transportation is another issue which affects the demand of biofuel and copra on the island. The sub-standard road condition on the island and the distance from each village to the bio-fuel mill also exacerbate the current situation.

Operation

The mill was not under full operation as certain mechanical parts of the mills were sent to the mainland for repairs, hence the low production and sale due to the limited period of operation. The assessment by CATD also stated that all the village generators had reverted to diesel except for Mudu due to the unfounded advice from PWD officials that biofuel produced from the mill damages community generators.

Since there is no quality assurance test for the copra and also the CNO produced, the quality of biofuel[1] or essentially renewable diesel remains questionable. As a result it has failed to settle the curiosity of the islanders and the use of the biofuel in their respective generators. There is no diversification or value adding plan desired for the Koro Biofuel Mill despite the numerous training on value adding such as virgin oil and soap making conducted on the island by the FDoE and its associates.

Market

The demand for biofuel on the island has decreased since the inception of the project in 2010. Initially, 13 villages used the bio-fuel from the mill and now only three of these villagers, Mudu, Nasau and Nacamaki are using the bio-fuel from the mill. The volume has decreased from 1300 Liters per week in 2010 to 300 Liters per week in 2015.

Currently there is no other actual market apart from the three villagers mentioned above for the coconut oil (CNO) on the island hence there is an urgent need for market outside the island for the excess 2100 Liters per week. The mill has a capacity of producing 600 Liters per day. Like

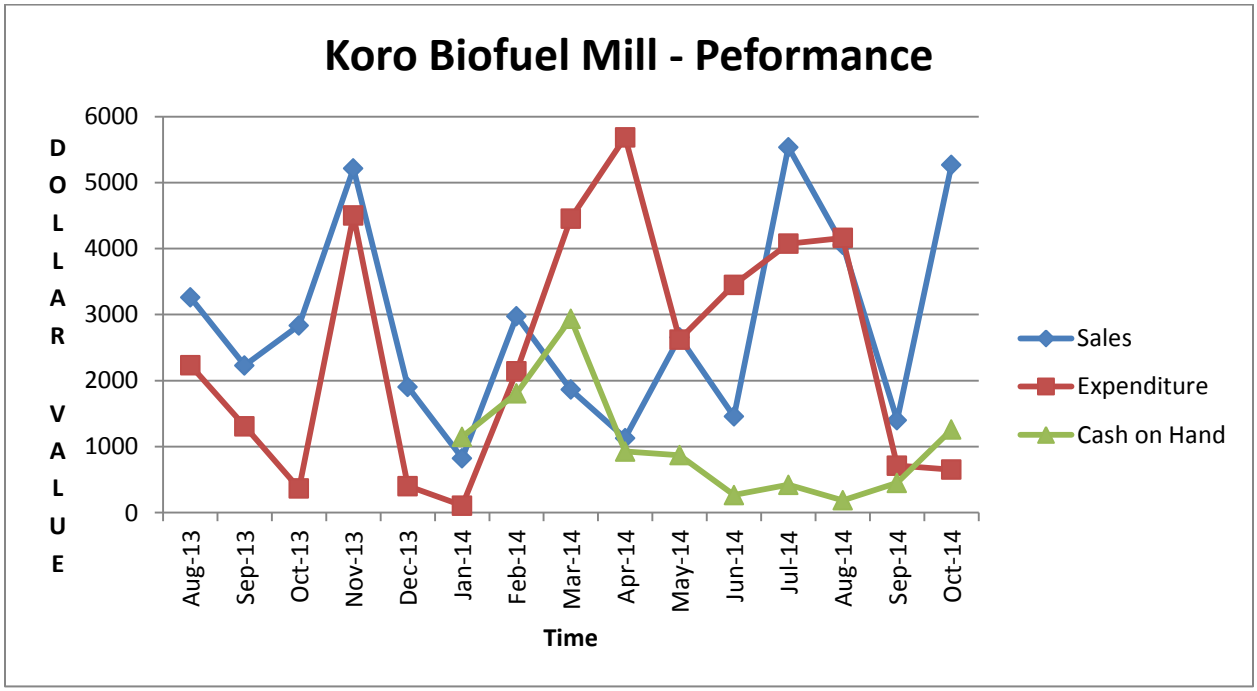
[1] The word "biofuel" is used interchangeably with "renewable diesel" but essentially takes up the meaning of the latter.

other product CNO meal also needs market outside the island. The mill has a capacity of producing an average of 400 kg of coconut meal per day.

The sale and expenditure for the mill for the period August 2013 to August 2015 is given below:

Months	Sales	Expenditure	Cash in hand	Stock value
Aug 2013	3261.75	2234.99		
Sept 2013	2230.35	1309.15		
Oct 2013	2835.10	365.36		
Nov 2013	5213.9	4501.94		
Dec 2013	1904.9	403.05		
Jan 2014	824.60	105.36	1148.25	CNO – 540.00
Feb 2014	2977.40	2141.58	1809.05	CNO – 140.00
Mar 2014	1864.66	4455.08	2938.80	R20 – 490.00 CNO – 1261.55 Meal – 175.00
Apr 2014	1129.10	5686.66	925.55	R20 – 952.00 CNO – 1000.00 Meal – 250.00
May 2014	2656.05	2623.05	869.60	R20 – 470.00 CNO – 2400.00 Meal –262.50
Jun 2014	1456.10	3451.61	267.50	R20 – 1596.00 CNO – 2490.00 Meal –87.50
Jul 2014	5536.72	4074.07	422.65	R20 – 1200.00 CNO – 600.00 Meal –79.00
Aug 2014	4057.20	4161.65	186.75	R20 – 3584.00 CNO – 600.00 Meal –87.50
Sept 2014	1402.00	712.07	450.05	R20 – 528.00 CNO – 600.00 Meal –200.00
Oct 2014	5268.79	650.74	1257.65	R20 – 960.00 CNO – 2400.00 Meal –280.50
Jan 2015	100	0		
Feb 2015	274	174		
Mar 2015	-	-		
Apr 2015	-	-		
May 2015	89	185.65		
Jun 2015	-	-		
Jul 2015	10	38.80	777.35	CNO – 3200.00 Meal – 105.00
Aug 2015	0	55.80	721.55	CNO – 3200.00 Meal – 105.00

Outlined below is a graph depicting the Performance of the Koro Biofuel Mill and more specifically the variations between the "Sales", "Expenditures" and "Cash on Hand". First and foremost it is noted that no data was recorded between March 2010 to August 2013 (from the commissioning of the plant). In addition with the information provided it is noted that from August 2013 to February 2014 that the sales figures were continually above the expenditures made by the mill for the duration of seven (7) months. This is somewhat unusual for the business. In addition from August 2013 to January 2014 there was no record of "Cash on Hand" collected from the Mills, despite the fact that transactions were all done through cash at that time. Therefore with the above it questions the accuracy of the data collected.



5.0 ROTUMA BIOFUEL COMPANY LIMITED (RBCL)

Introduction

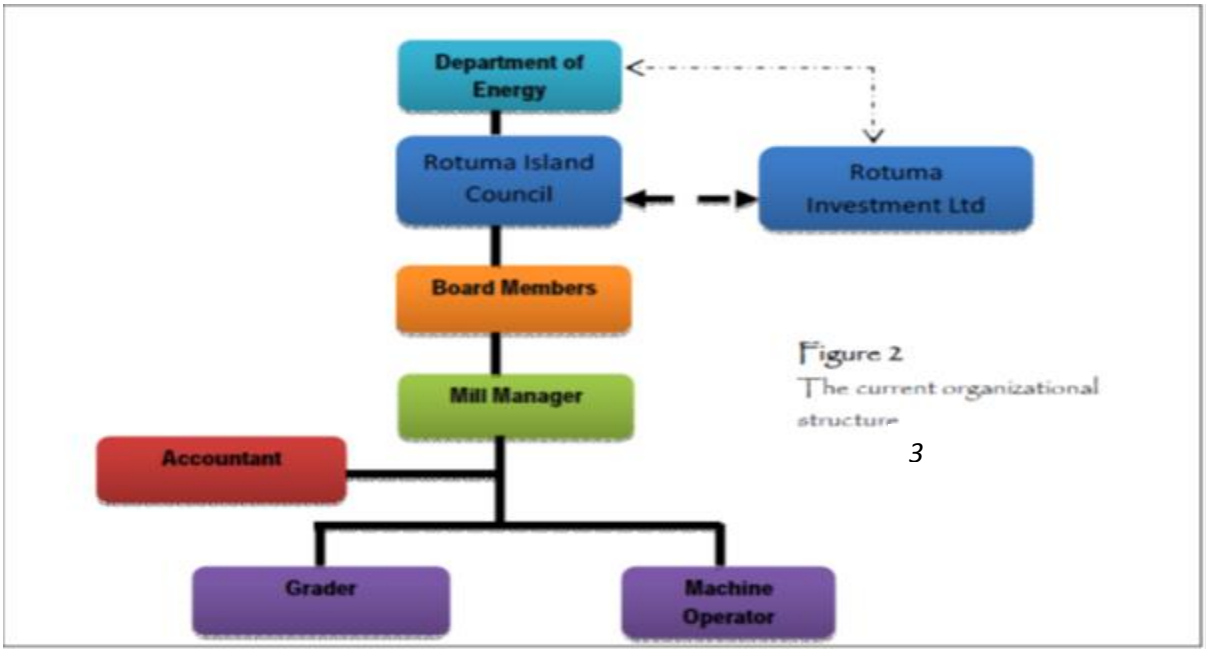
The mill was commissioned on the 13th May, 2011. The Rotuma Biofuel Mill is operating and registered as a company with the government as the majority shareholder and the minority shares owned by Rotuma Investment Limited (RIL). After three years of operation the FDoE commissioned a study to evaluate the performance of the mill. The CATD was awarded with the works to carry out the assessment works.

The total project cost of the Rotuma Biofuel Mill was FJD 468,192.00 which included the biofuel equipment FJD 229,900.00, the Biofuel Mill shed FJD 208,292.00 and start-up capital of FJD 30,000.00. The project was funded entirely by the Government of Fiji through the FDoE.

Management

Due to the distribution of shares (percentage ownership of the company) between the government and the island members, the business is less attractive and less appealing to the island members.

The initial organization structure planned by DoE of the business is outlined in Figure 1 above. This was later changed to the structure outlined in Figure 3 below;



The District Officer (DO) for Rotuma is currently trying to revive the Board which has not had a meeting for almost 3 years. Initially majority of the responsibilities were given to the Board which then reported the findings to the DoE but later the FDoE took over the responsibilities when the Board was not functioning.

Operations

From the inception of the mill only 3 out of 9 village generators used the biofuel (R20) or renewable diesel produced from the mill which essentially was a mix of 80% diesel and 20% coconut oil and other engines on the island use biofuel only when there is no diesel on the island due to delay in shipment issues. The current average demand for the three villages is 210 liters a week which requires about 42 liters of coconut oil a week. Based upon the mill production capacity of 1 ton of copra per day for 5 days, the current biofuel market is too small to absorb the output which the mill is capable to produce. This means there is an average of about 2,458 liters of excess coconut oil per week that need to market within and outside the island. The current product prices at RBCL are listed below:

Product	Price (FJD)
Biofuel (R20)	2.80 per liter
Coconut Oil (CNO)	2.00 per liter
Coconut meal	0.55 per kg

The cost breakdown of CNO from 1 ton of dried copra:

Items	Cost (FJD)
Dry copra 1 ton @ FJD600/ton	600.00
Labour (4 Labour @ FJD21/Labour/day)	84.00
Electricity (15 L R20 @ FJD2.70)	40.50
Total Cost (500 L CNO)	**724.50**
Unit Cost of CNO	**1.45**

The cost breakdown of 1000 L of R20:

Items	Cost (FJD)
Diesel (4x200 L drum @ FJD504/drum)	2,016.00
Bitron (2 L @ FJD19/L	38.00
Transportation	140.00
Freight (4 drum @ FJD30/drum)	120.00
CNO @ FJD1.45/L	290.00
Total Cost (1000 L R20)	**2,604.00**
Unit Cost of R20	**2.60**

The other product coconut meal, has very limited demand on the island but has huge industrial demand such as the piggery owners, Rewa Diary and other individual farms in Tailevu (dairy and beef farming). Transportation, confirmed markets and other logistics make it uneconomical. The mill has a capacity of producing an average of 400kg coconut meal per day and is sold at a price of $0.55 per kg in Viti Levu.

The Mill has a BSP account that was recently opened and awaiting the fund to be transferred from RIL account that was used operating RBCL. Due to the missing report from both parties the DoE and mill managers, it was difficult to work out the financial status of the mill over the years. The delays in repairing the mill's computer has led to the records not updated.

Market

The assessment done by CATD, reported that Savalei village has been the lone supplier of copra to the Biofuel mill. The copra production occurs twice a week and the villagers sell the kernel to the cooperative store at FJD 0.25 per kg. The cooperative then dries the kernel and sells it to the Biofuel mill at FJD 0.60 per kg whilst excess are sold to other buyers at various prices.

To increase the market an effort must be forged to all potential customers in Rotuma and these could be the ten villages stated below in Table 1 and the government stations. The weekly estimate of Renewable diesel (R20) consumption from potential customers is given below in Table 2.

Table 1: Village generators and their conditions

Village	Generator	Remarks
Losa	1	Running. Needs minor maintenances and servicing
Itumuta	2	Running. Oil leakage and needs minor repairs
Motusa	1	Running but need servicing
Savalei	1	Running but need minor repairs and servicing
Tuakoi	1	Running but villagers use solar for power
Juju	1	Old generator, electrical board not working. Needs new one
Sumi	1	Running. No log book
Kalvaka	1	Running but needs servicing
Noatau	1	Running but servicing behind schedule

Table 2: Potential estimate biofuel demand for Rotuma

Potential Customers	Number of Machines	Estimate weekly R20 consumption (L)
Village	10 generators	518
Government Station	1 generator	600
Water Authority	3 generators	1400
Government vehicles	12 vehicles	420
Digicel Tower	1 generators	420
Total		**3358**

The total CNO component from this potential biofuel demand is 672 Liters and the remaining 2,686 Liters is diesel. With this demand the mill has the potential of making a profit of FJD 3,313.97 weekly or FJD 149,526.54 annually.

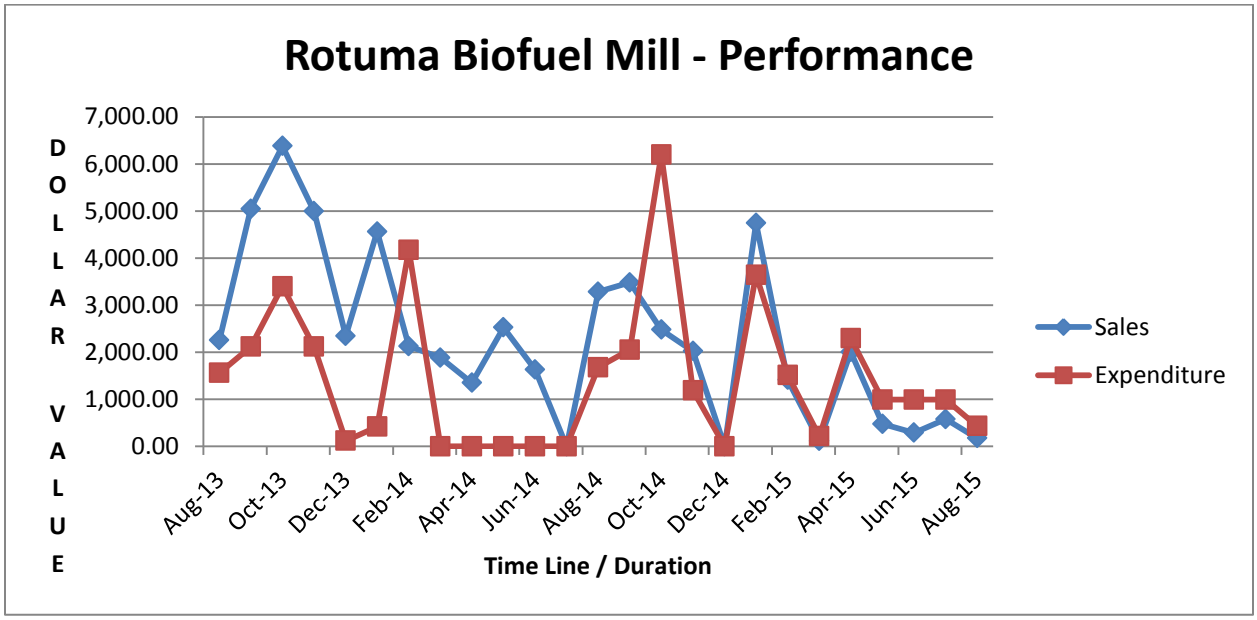
According to the study by CATD, there is notable management and administrative inefficiencies such as the inconsistency and absence of important business data and the business and strategic plans that have contributed to the substandard performance of the mill over the years. The CATD have suggested more training (management, value adding, etc.), awareness (on the products; Renewable diesel (R20), coconut oil and meal, etc.) and capacity building initiative to the whole organizational structure. However, it is also important to create demand outside of Rotuma such as selling of the CNO to the Soap Making Factory at Punjas and also at the Copra Millers in Savusavu. It is also taken that there is a need to improve on the standard of CNO produced from the mill.

Also from their study, it is found that most coconut trees are senile and bearing few fruits and hence there is a need for a replanting program. There are suitable vacant lots available for the replanting program which will cater for the potential increase in CNO demand on the island and also sustain the biofuel projects in future.

The sale and expenditure for the mill for the period August 2013 to August 2015 is given below:

Months	Sales	Expenditure	Cash in hand	Stock value	Remarks
Aug 2013	2,255.40	1,560.00			
Sept 2013	5,044.20	2,120.00			
Oct 2013	6,379.60	3,400.00			
Nov 2013	4,995.40	2,120.00			
Dec 2013	2,345.50	120.34			
Jan 2014	4,564.00	420.00	-	CNO – 17,140.00 R20 – 7,200.00 Meal – 379.50	
Feb 2014	2,130.00	4,173.60	400	CNO – 20,260.00 R20 – 2,762.40 Meal – 1.463.00	
Mar 2014	1,885.80	-	129.7	CNO – 15,860.00 R20 – 1,357.30 Meal – 60.00	
Apr 2014	1,350.40	-	-	-	No Report submitted to DoE. Manager was in Suva
May 2014	2,525.80	-	-	-	Report did not clarify cash and stock.
Jun 2014	1,629.80	-	-	-	Report did not clarify cash and stock.
Jul 2014	2.572.20	-	-	-	Report did not clarify cash and stock.
Aug 2014	3,284.60	1,680.00	2,594.20	CNO – 13,927.00 R20 – 247.20	
Sept 2014	3,480.60	2,055.40	1,203.35	CNO – 2,400.00 R20 – 960.00 Meal – 90.00	
Oct 2014	2,477.40	6,201.90	126.25	CNO – 14,140.00 R20 – 1,310.40 Meal – 280.50	
Nov 2014	2,024.80	1,187.00	2,347.80	CNO – 11,662.00 R20 – 968.80 Meal – 280.00	
Dec 2014	-	-	-	-	Mill under maintenance
Jan 2015	4,746.00	3,646.00			
Feb 2015	1,412.00	1,516.90			
Mar 2015	112.00	216.00			
Apr 2015	2,006.00	2,293.70			
May 2015	476.00	992.00			
Jun 2015	291.00	992.00			
Jul 2015	580.00	992.00			
Aug 2015	176.00	432.00	4.35	CNO – 2,700 L R20 – 350 L Meal – 120 kg Bitron – 22 L	Cash and stock as at 3/9/15

Outlined below is a graphical representation of the data obtained from the information provided by the Rotuma Biofuel Mill. Firstly, the information provided is recorded from August 2013, this is despite the fact that the mill was commissioned in May 2011. Secondly, the graph has not taken into account the "Cash on Hand" as there had been consistent absence of the data for "Cash on Hand" for first 6 months of the report. In addition the standing stock value does not show in terms of the sales for the next months. Again this shows or rather questions the reliability of the data that was collected from the mill. Finally, despite the unrealiability in the data collected it does indicated the diminishing trends in terms of the business.



6.0 CICIA BIOFUEL COMPANY LIMITED (CBCL)

Introduction

The Cicia Biofuel Mill was commissioned on 8th September, 2011. After three years of operation the FDoE commissioned an assessment to gauge the mill's performance, financial viability and prospects and 44the CATD was appointed to carry the assessment.

The total Cicia Biofuel Mill project was set up at a cost of FJD 468,192.00 which includes biofuel equipment FJD 229,900.00, Biofuel Mill shed FJD 208,292.00 and start-up capital of FJD 30,000.00. The funding of the mill was provided by the Fiji Government through the FDoE. Currently the mill was not operating when the CATD Study was being carried out, however operation has been intermittent from that time.

Management

The Cicia Biofuel Mill is operating and registered as a company with the government as the majority shareholder. Like other mills the Cicia Bio Fuel mill has been operating without any business or strategic plan for the past few years.

The initial organization structure planned by DoE of the business is outlined in the Figure 1 above and still exists today. The Board with whom the majority of the responsibilities lie last met in 2012 according to the study by CATD.

Operation

According to the study by CATD only Mabula and Tarukua village generators occasionally used the biofuel until now with average of 20 Liters daily for both generators. This means there is a demand of 7000 Liters of biofuel (R20) per year which has 1400 Liters of CNO component. Based upon the mill capacity (2 ton copra per day), this can be achieved in 2 days.

With average production of 1000 Liters CNO per day, there is about 4600 L of excess CNO per week that need a market outside the island since there is limited local demand for CNO within the island. There is no local demand for, coconut meal, which needs a market outside the island. The Mill is capable of producing an average of 1 ton CNO meal per day.

Market

There is an urgent need for the market outside the island as there is very little to zero demand for Renewable diesel (R20), coconut oil and coconut meal produced at the mill on the island. This is largely attributed on perception of the community with respect to products from mills. Hence in this regard there is a need to regain confidence of the community to promote the use of the products from the mill.

The villagers with generator and its' condition / status on the island are listed on Table 3 below:

Table 3: Village generators and their conditions

Village	Generator	Remarks
Mabula	1	Running but need minor repairs (operator needs training)
Lomati	1	Running but needs urgent servicing (no log book)
Tarukua	1	Running on diesel (24/70 houses consuming electricity)

To boost the local market, the study by CATD recommends the installation of generators at Cicia High School, Natokalau, Lomati and Selavo settlement. Also the Digicel generator between Tarukua and Lomati could be a good market for the biofuel from the mill which currently uses diesel.

The market for excess (quantity unknown) CNO on the island is utilized for soap production according to the study by CATD for which training was conducted on Soap Making on 7th July, 2014 and representatives from all five villages took part. The dual fuel kit project that will improve the use of the local coconut oil in the diesel generators will also enhance the CNO market on the island. Basically the dual fuel kit is a device that will allow community generators to use straight CNO to produce electricity.

For project sustainability, the study suggests that diversification plans and value adding must be incorporated into the project. For diversification Virgin Coconut Oil production could inject extra FJD 1000 weekly into CBCL based upon the estimate given in Table 4 below.

Table 4: Potential estimate of VCO production

Descriptions	QTY	Unit Cost	Total Cost	Weekly Cost
Production Number of CNO/day	1,000	0.20	200.00	1,000.00
14 Laborers working 8hr/day @ FJD3/hr	14	3.00	336.00	1,680.00
Factory overhead				500.00
Total Production costs				**3,180.00**
Income VCO produced (1 L VCO per 15 CNO)	66.67	13.00	866.67	4,333.33
Profit				**1,153.33**

According to the study by CATD, there is notable management and administrative inefficiencies such as poor record keeping and continual use of cash in the business have contributed to the substandard performance financially of the mill over the years. CATD have suggested more training, awareness and capacity building initiative to the whole organizational structure.

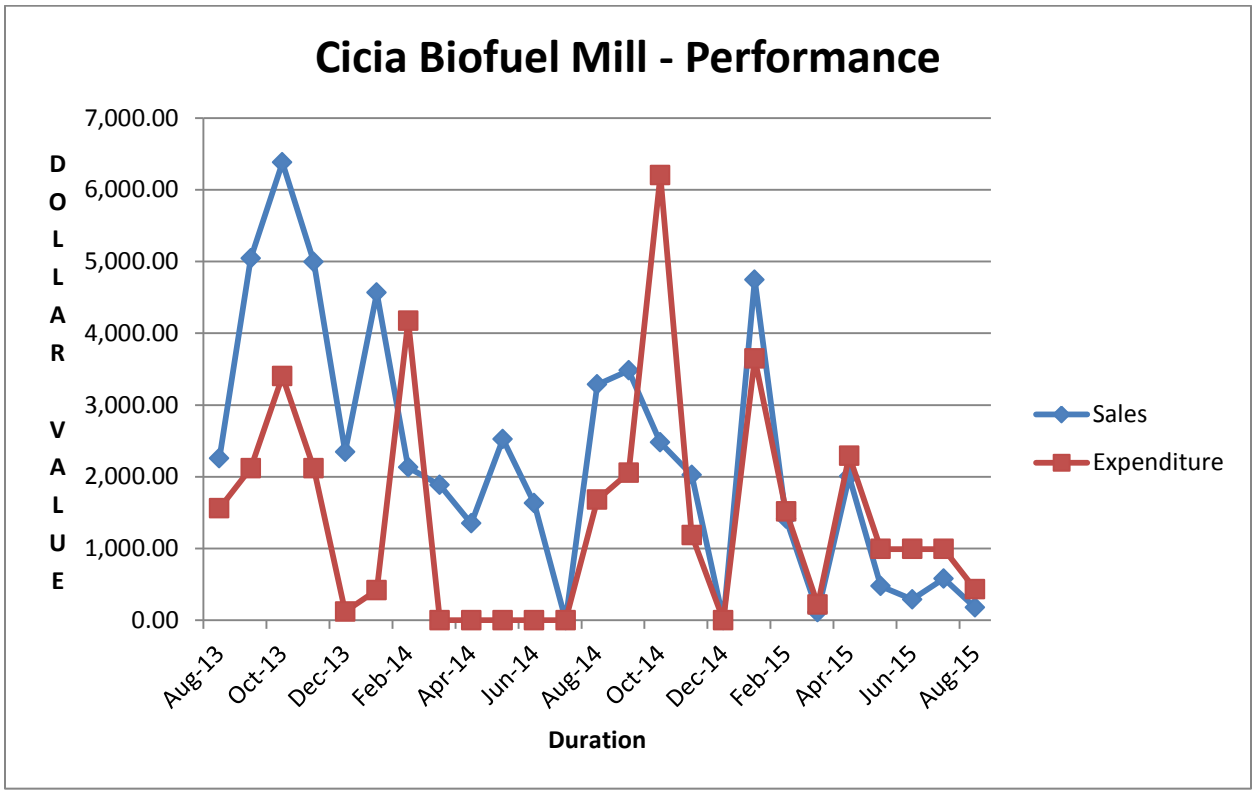
Also from the study, it is noted that most coconut trees are senile and bearing few nuts and hence there is a need for a replanting program. There are suitable vacant lands available for the replanting program which will increase copra production on the island and also sustain the biofuel project in future

The sales and expenditure from August 2013 until August 2015 is given below:

Months	Sales	Expenditure	Cash in hand	Stock value	Remarks
Aug 2013	2,255.40	1,560.00			
Sept 2013	5,044.20	2,120.00			
Oct 2013	6,379.60	3,400.00			
Nov 2013	4,995.40	2,120.00			
Dec 2013	2,345.50	120.34			
Jan 2014	4,564.00	420.00	-	CNO – 17,140.00	

Months	Sales	Expenditure	Cash in hand	Stock value	Remarks
				R20 – 7,200.00 Meal – 379.50	
Feb 2014	2,130.00	4,173.60	400	CNO – 20,260.00 R20 – 2,762.40 Meal – 1.463.00	
Mar 2014	1,885.80	-	129.7	CNO – 15,860.00 R20 – 1,357.30 Meal – 60.00	
Apr 2014	1,350.40	-	-	-	No Report submitted to DoE. Manager was in Suva
May 2014	2,525.80	-	-	-	Report did not clarify cash and stock.
Jun 2014	1,629.80	-	-	-	Report did not clarify cash and stock.
Jul 2014	2.572.20	-	-	-	Report did not clarify cash and stock.
Aug 2014	3,284.60	1,680.00	2,594.20	CNO – 13,927.00 R20 – 247.20	
Sept 2014	3,480.60	2,055.40	1,203.35	CNO – 2,400.00 R20 – 960.00 Meal – 90.00	
Oct 2014	2,477.40	6,201.90	126.25	CNO – 14,140.00 R20 – 1,310.40 Meal – 280.50	
Nov 2014	2,024.80	1,187.00	2,347.80	CNO – 11,662.00 R20 – 968.80 Meal – 280.00	
Dec 2014	-	-	-	-	Mill under maintenance
Jan 2015	4,746.00	3,646.00			
Feb 2015	1,412.00	1,516.90			
Mar 2015	112.00	216.00			
Apr 2015	2,006.00	2,293.70			
May 2015	476.00	992.00			
Jun 2015	291.00	992.00			
Jul 2015	580.00	992.00			
Aug 2015	176.00	432.00	4.35	CNO – 2,700 L R20 – 350 L Meal – 120 kg Bitron – 22 L	Cash and stock as at 3/9/15

Outlined below is a graph showing the performance of the Cicia Biofuel Mill. The graph has omitted information with respect to "cash on hand" and "stock" that is largely due to the inconsistency in the information provided. In addition the mill was commissioned in September 2011, however data provided begins from August 2013. Summarily with the graph below it is clear that "sales" is on a decreasing trend that largely explains the lethargic performance of the mills. Similarly, the "expenditure" follows the same trend as the manufacturing of CNO largely depends on demand and without demand the production of CNO is also restricted.



7.0 GAU BIOFUEL COMPANY LIMITED (GBCL)

Introduction

Gau Island is located at 18.00° S and 179.30 °E with a total land area of 136.1 km^2. The maximum elevation of the Island is 738 meters and the total population in 2012 for 16 villages is 2900. These are permanent villages that are located on the island. There is 1 secondary school and 9 primary schools. The government station in Gau includes the Police Station, Post Office, and Agriculture Office. The copra production in 2012 on the island is approximately 28.3 tons per month and the fuel demand is 5036 Liters per month.

The Gau Biofuel Mill is located in Qarani village, on a piece of land owned by Mataqali Naivi. The mill is accessible by road and is near the new jetty. The project was commissioned on 16th March 2013. The total project cost was FJD 411,842.73 which includes biofuel equipment FJD 85,690.73 Biofuel Mill shed FJD 296,152.00 and start-up capital of FJD 30,000.00. The project was funded entirely by the Government through the FDoE. Currently the mill is operational.

Market

The total fuel consumption for electricity on the island is about 5036 Liters per month in 2012 and the cost of diesel on the island range from FJD 2.70 to FJD 3.10 in 2012. There is a Digicel tower in Qarani where the mill is located and it consumes about 7 drums of diesel per month. The fuel demand in 2012 for each village is given below:

NO.	Village	Gen-set Size (kVA)	Date Installed	Operation hour per night	Fuel Consumption (Liters)	No of houses	Copra supply (ton)
1.	Sawaieke	80	2004	6	3.33	70	2.5
2.	Somosomo						.75
3.	Nawaikama	13.5	1984	3.5	5	51	.5
4.	Nukuloa	54	2004	3	2.86	29 + school	1-2
5.	Levuka I Gau	40	1996	3	3	26	3
6.	Lovu	22	1999	3	2.38	40	1.5
7.	Vadravadra	18.5	1999	3	1.67	48	1.25
8.	Yadua	31	1999	3	1.67	42	2
9.	Lamiti	20	2001	4	5	52	1.5
10.	Malawai	10.5	1997	3	3	46	2-5
11.	Nacavanadi	10.5	2007	3	3	30	5

NO.	Village	Gen-set Size (kVA)	Date Installed	Operation hour per night	Fuel Consumption (Liters)	No of houses	Copra supply (ton)
		27	1995				
12.	Vanuaso	35	2009	3	3	33	1.25
13.	Lekanai						1
14.	Vione	10.5 34	2007 2004	3	2.22	30	1
15.	Qarani	14.3	1990	4	2.5	34 + Gov. Quarter & Stations	2
16.	Navukailagi	9	2004	3	1.67	34	0.6

Management

The Gau Biofuel Mill is operating and registered as a company with the government as the majority shareholder. Like other mills the Gau Bio Fuel mill has been operating without any business or strategic plan. The initial organization structure planned by DoE of the business is similar to the above mills (figure 1 above) and still exists.

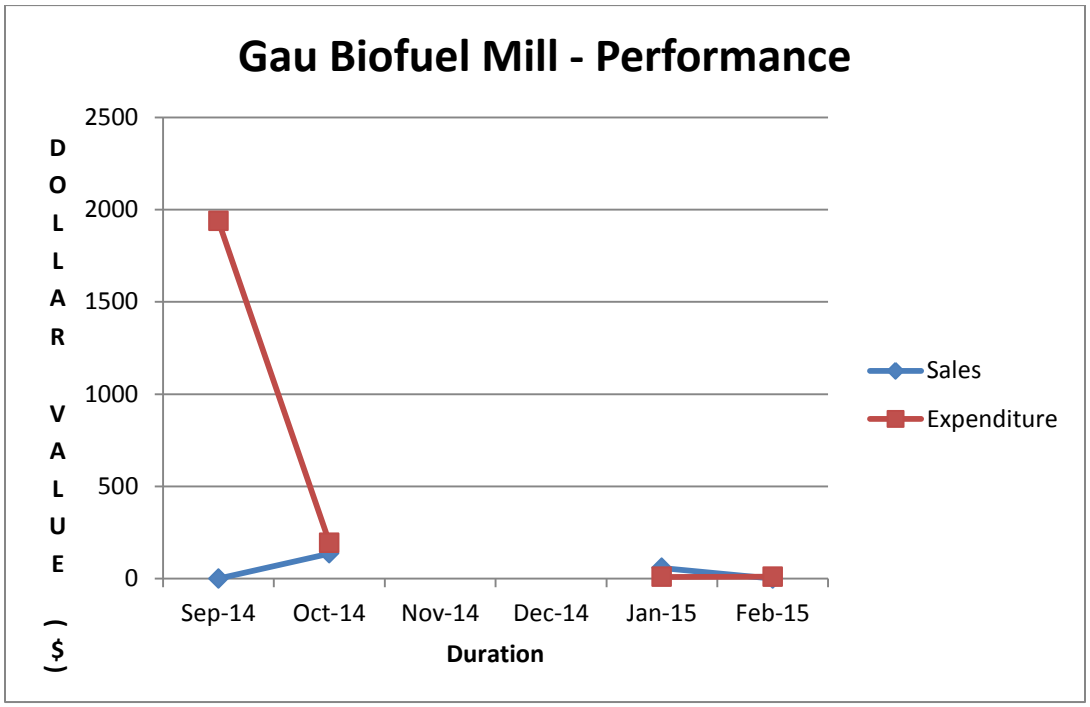
Operations

The sales and expenditure from September 2014 until Feb 2015 is given below:

Period	Sales	Expenditure	Cash in hand	Stock value	Remarks
Sept 2014	0	1938.20	1110.25		Bank Bal: 6,701.89
Oct 2014	136.10	194.95	1099.45		
Nov 2014					
Dec 2014					
Jan 2015	58.00	9.90	2508.20		
Feb 2015	0.00	10.95	2519.20	R20 – 1080.00 CNO – 40.00	

Outlined below is a graph outlining the performance of the Gau Biofuel Mill. Unfortunately with the restrictions in the data provided it is difficult provide a conclusion on the performance of

the Gau Biofuel Mill. In addition it is also noted that the Mill was commissioned in March 2013 and the information provided is only from September 2013.



8.0 RABI BIOFUEL COMPANY LIMITED

Introduction

Rabi Island is located at 17° latitude and sits on the International Date Line at 180° longitude with the land area of 66.3 km^2. The maximum elevation of the island is 463. There are 4 primary schools and 1 secondary school and the government station includes a Health Center, Post Office, Police Office and Agriculture Office. There are 10 generators on the island with the copra production in 2012 of approximately 6 tons per week.

The Rabi Biofuel Mill is located in Tabiang village on a piece of land owned by the Rabi Island Council. The project was commissioned on 14th August 2013. The site is accessible by road and is near the new wharf. The total cost of the project was FJD 596,363.88 which includes the biofuel equipment FJD 260,768.88, Biofuel Mill shed FJD 305,595.00 and start-up capital of FJD

30,000.00. The project was wholly funded by the Government through the FDoE. Currently the mill is operational.

Market

There are four (4) main village farms located on the lesser inhabited side of the island. Each village has been given specific farming area by the Council of Rabi to carry out farming. The land on each farm has been further sub-divided for each household per village.

There are no coconut estates or coconut plantations on the island of Rabi thus copra farming is limited to the available standing coconut trees from which the dried nuts are collected on daily basis by farmers.

Village	No of Farmers	Copra Supply (ton)	Gen Set Size (kVA)	Fuel Consumption (L/hr.)	Operation Hours Daily (hrs.)	Fuel Demand Monthly
Uma Village						
• Uma Nuka			16	2	4 -5	300 L
• Naidoi	17	0.3	14	1.5	4	180 L
• Kesukesu			14	2	4	240 L
• Fatima			14	1.8	4	215 L
Buokonikai						
• Village Set			25	3.5	4	420 L
• Matanituku	16	0.5	14	3	4	360 L
• Private			6	1	4	120 L
Tabewa						
• Tabewa Village			14	3	4	360 L
• Nuku	24	0.2	70	7.5	5	1125 L
• Rabi Health			5	1	8	240 L
• Private			6	1	9	270 L
Tabiang	9	1	18	2.5	3	315 L

Village	No of Farmers	Copra Supply (ton)	Gen Set Size (kVA)	Fuel Consumption (L/hr.)	Operation Hours Daily (hrs.)	Fuel Demand Monthly
Total Diesel Consumed						**4145 L**

The total demand for diesel fuel in 2012 on the island is around 4,000 Liters per month which means that the volume of CNO required for the biofuel mix (R20) would be 800 Liters per month. The excess which the mill produces could be sold to Copra Millers Fiji Limited in Savusavu (in view of the short distances between the two mills).

Management

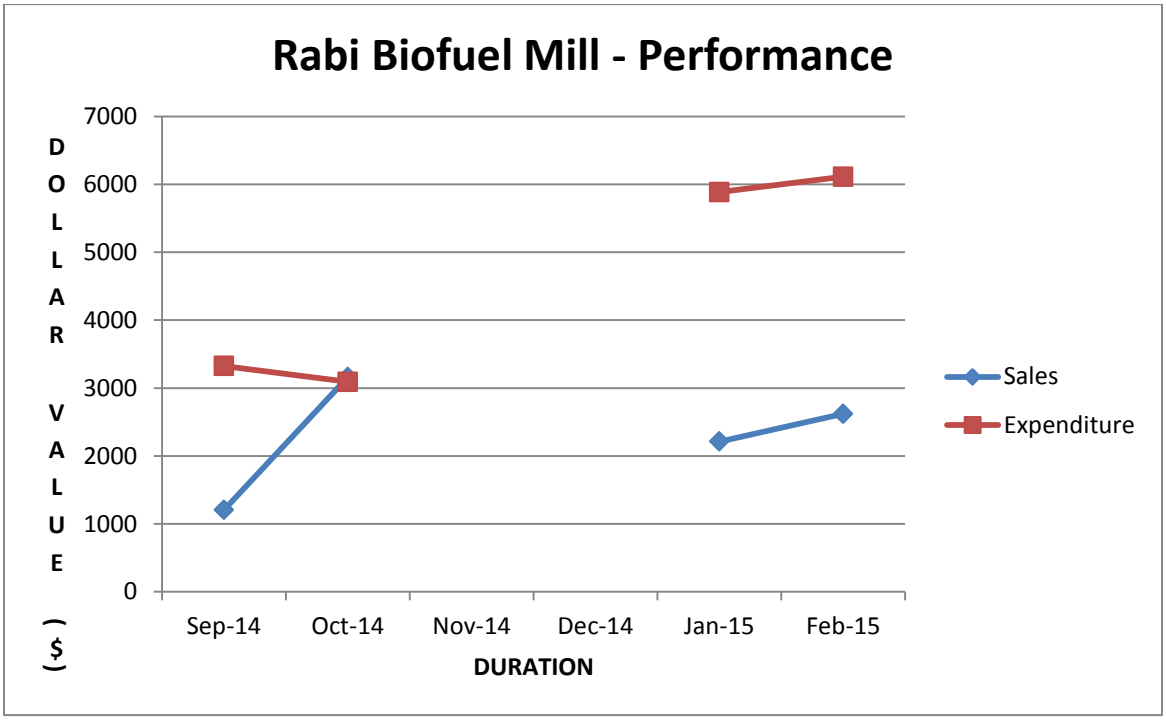
The Rabi Biofuel Mill is operating and registered as a company with the government as the majority shareholder. Like other mills the Rabi Bio Fuel mill has been operating without any business or strategic plan for the past few years. The initial organization structure planned by DoE of the business is outlined in the Figure 1 above and still exists to this day. Initially the Rabi Island Council comprised of 4 members, was tasked with the administration of the project and liaised with the government on the project. However, for the past five years, the Government had taken over most of the affairs and administration issues of the project.

Operation

The sales and expenditure from September 2014 until Feb 2015 is given below:

Period	Sales	Expenditure	Cash in hand	Stock value	Remarks
Sept 2014	1206.10	3324.75	835.00		Bank Bal: 2,493.02
Oct 2014	3162.00	3091.35	1267.45		
Nov 2014					
Dec 2014					
Jan 2015	2213.00	5884.8	831.30		
Feb 2015	2620.50	6111.85	589.65	R20 – 1596.00 CNO – 2400.00 Meal – 852.50	

Outlined below is graphical representation of the Rabi Biofuel Mill. Even though the record of production is up to date, unfortunately there are serious gaps for the three months following the commissioning of the mill.



9.0 VANUABALAVU BIOFUEL COMPANY LIMITED (VBCL)

Introduction

Vanuabalavu is located at 17.22° South and 178.95° West with total land area of 53 km^2. The maximum elevation of the Island is 283 meter and the total population in 2012 was around 4000 people. There is 1 secondary school and 5 primary schools. The government station includes the Police Station, Fisheries, Agriculture, Water Authority and i - Taukei Administration. The copra production in 2012 on the island is approximately 17 tons per week.

The Vanuabalavu Biofuel Mill is located in Boitaci which is near to government station and airport and the mill was commissioned on 15th August 2013. The total project cost was FJD616,001.58 which included the biofuel equipment FJD 260,768.88, Biofuel Mill shed FJD325,232.70 and start-up capital of FJD 30,000.00. The project was wholly funded by the Government through the FDoE. With the devastation of the recent Cyclone Winston on the

Island, the Mill had sustained extensive damages. The mill equipment has been dismantled and taken to Suva.

Management

The Vanuabalavu Biofuel Mill was operated and registered as a company with the government as the majority shareholder. Like other mills the Vanuabalavu Bio Fuel mill had been operating without any business or strategic plan for the past few years. The initial organization structure planned by DoE of the business is outlined in the figure 1 above.

Operation

The sales and expenditure September and October 2014 are given below:

Period	Sales	Expenditure	Cash in hand	Stock value	Remarks
Sept 2014	1230.05	1213.00	92.30		Bank Bal: 4,678.58
Oct 2014	141.75	0	245.45		

After Cyclone Winston a team of FDoE officers was dispatched to the island and reported that 98 % of coconut plantations in Vanuabalavu suffered extensive damages and will take 14 months to recover. A total of 2 % of the plantations have been completely wiped out. With the above said, the copra production may be able to recommence in early 2018 and will reach normal production by 2023.

The table and photo below shows;

a. the area covered by coconut and the numbers of trees damaged.
b. the damages sustained by the mill following the devastation on the island by Cyclone Winston.

Total CNO area (ha)	No of trees	Area damaged (ha)	No of trees	Area completely damaged (ha)	No of trees
2,157	26,5321	2,113.86	26,0005	43.14	5,306

With the destruction the future of the Vanua Balavu Mill is uncertain following the use of the certain machinery parts in the Lakeba Mill.

10.0 LAKEBA BIOFUEL COMPANY LIMITED (LBCL)

Introduction

Lakeba is located at 18.2° South and 178.8° East with total land area of 60 km^2. The maximum elevation of the island is 219 meters and the total population in the year 2012 is 2100 in 8 permanent villages. The copra production on the island in 2012 is approximately 37 tons per month.

The Lakeba Biofuel Mill is located in Nasaqalau village belonging to Mataqali Nautoqumu and was commissioned on 16th August 2013. The site is accessible by road and is near the new jetty. The total project cost was FJD 598,252.88 which included; Biofuel Equipment FJD 260,768.88, Biofuel Mill shed FJD 307,484.00 and start-up capital of FJD 30,000.00. Like other projects the project was funded by the Government of Fiji through the FDoE. The mill has some problems with the expeller that has been resolved following the availability of parts from the Vanua Balavu Mill.

Market

The initial feasibility study conducted by FDoE in 2012 outlined that the villages on the island are powered through generators installed by government through the Department of Energy Rural Electrification scheme. The two villages of Tubou and Levuka along with the government station are connected to the same grid which was installed and is been looked after by government through the PWD-Electrical Division.

All houses and stations are metered and the current rate charged to the consumers is $0.22/kWh. This is subsidized rate provided by government as it does not truly reflect the current cost of production of electricity using diesel generators. The Rural Electrification Policy 1993, has quoted the calculated tariff rates at FJD 0.8120 per kWh.

The remaining villages on Lakeba have adapted the non-metered system where each household contributes towards the cost of diesel to run the community generator. The initial feasibility survey undertaken on the island initially stated that demand for diesel on average is about 12,000 Liters per month. This volume when switched to biofuel (R20) would require a total volume of 9600 Liters of diesel and 2400 Liters of CNO. The extra produced by the mill is will be available to be sold in other markets or to the mainland.

Until 2012 the list of generators on each village is given in the table below.

Village	Year Installed	Gen Set Size (KVA)	Fuel Consumption (L/hr)	Operation Hours Daily (hrs)	Fuel Demand Monthly in Liters
Nasaqalau	99	10.5	5	4	600
Waciwaci	02	15	5	4	600
Tubou/Levuka/ Government Stations (Gen- 1)	-	515	17.178	18	9600
Vakano	08	20	6	4	720
Waitabu	98	20	4	4	480

Yadrana	98	40	7	4	840
TOTAL					**12, 840**

Management

The Lakeba Biofuel Company is operated and managed the same way as the other three mills mentioned above.

Operation

The sales and expenditure the month of September and October 2014 is given below:

Period	Sales	Expenditure	Cash in hand	Stock value	Remarks
Sept 2014	2,289.00	3,059.56	1,300.00		Bank Bal: 3,459.63
Oct 2014	1,082.00	283.00	670.05		

11.0 MOALA BIOFUEL COMPANY LIMITED

Introduction

The island of Moala is located at 18°36′ South and 179°52′ East and is one of the largest islands in the Lau group with the total land area of 62.3 km^2. The maximum elevation of the island is 468 meters with the total population over the 8 villages in 2012 is around 1501. The total copra production in 2012 on the island is around 2 tons per day and the fuel demand of 1600 Liters per month.

The Moala Biofuel Mill is located in Naroi village on a piece of land that belongs to the Mataqali Turaga Ulu and is opposite the airstrip. The site is assessable by road, and is close to the wharf and the Post Office. There are 6 Primary schools and 1 secondary school and the government station includes the Provincial Office, Agriculture Office, Police Station, PWD Depot, Post Office and the Water Authority of Fiji. Four villages in Moala have government - funded generators. There is also a small oil processing plant in Vunuku operated by Origin Pacific Limited processing 750 Liters of virgin oil per week.

The total project cost was FJD 796,816.08 which includes biofuel equipment FJD 201,058.04 Biofuel Mill shed FJD 595,758.04. The mill is yet to be commissioned and according to FDoE, it requires Cabinet Approval for the start-up capital. The poor performance of the operation of other mills has affected the funding for the start-up capital for this mill. The project was wholly funded by the Government through the FDoE.

Management

The Moala Biofuel Mill is registered as a company with the government as the majority shareholder.

12.0 MATUKU BIOFUEL COMPANY LIMITED

Introduction

The island of Matuku is located 19.18° South and 179.75° East of Viti Levu with the total area of 57 km^2. It has a maximum elevation of 385 meters and the total population in the year 2012 is 1069 and spread over the 7 villages. The total copra production in 2012 is around 2.5 tons per day and fuel demand of around 1000 Liters per month.

The Matuku Biofuel Mill is located in Yaroi village which is near the wharf and accessible by road. There are 4 primary schools and government station that includes a Health Center, Postal Agency, Jetty and a weather station in the same village. The total project cost was FJD 798,281.08 which included; Biofuel equipment FJD 201,058.04, Biofuel Mill shed FJD 597,223.04. The mill is yet to be commissioned and according to FDoE it requires Cabinet approval for the release of the start-up capital. The poor performance of the operation of other mills has affected the funding for the start-up capital for these two mills. The project was funded by the Government of Fiji through the FDoE.

Management

The Matuku Biofuel Mill is registered as a company with the government as the majority shareholder.

13.0 FINDINGS & RECOMMENDATION

The table below broadly summarizes the amount of capital that have been invested by the Government on the nine biofuel mills that have been installed in maritime zones around the country. To this effect, a total of FJD 5, 097, 045.49 has been 33utilized for this purpose.

NO.	MILL	COST OF BUILDING	COST OF MACHINES	OPERATING CAPITAL	CAPITAL COST
1.	Koro Biofuel Mill Project	52,453.26	267, 650.00	23,000.00	343,103.26
2.	Rotuma Biofuel Mill Project	208, 292.00	229, 900.00	30,000.00	468,192.00
3.	Cicia Biofuel Mill Project	208, 292.00	229, 900.00	30,000.00	468,192.00
4.	Gau Biofuel Mill Project	85, 690.73	296, 152.00	30, 000.00	411,842.73
5.	Rabi Biofuel Mill Project	305, 595.00	260, 768.00	30, 000.00	596,363.88
6.	Vanua Balavu Biofuel Mill Project	325,232.70	260,768.88	30, 000.00	616,001.58
7.	Lakeba Biofuel Mill Project	307, 484.00	260, 768.88	30,000.00	598, 252.88
8.	Moala Biofuel Mill Project	595,758.04	201,058.04	NA	796,816.08
9.	Matuku Biofuel Mill Project	597,223.04.	201,058.04	NA	798,281.08
TOTAL COST		2,686,020.77	2,208,024.72	203, 000.00	5,097,045.49

In terms of the cost of the project the cost of the building ranges from FJD 52, 453.26 – FJD 597,223.04. With this variation it was noted that for Moala and Matuku there were serious workmanship problems on the construction of the mill and as a result the contract was terminated and a new contract had to be let for the two projects. It is also noted that the working capital ($60,000.00 between the two projects) have yet to be released even though the mill buildings have been completed. The main reasoning provided by the FDOE is that Cabinet approval is required for the release of the working capital. Unfortunately, the reasoning lacks justification as a total of $ 1.595 Million have been expended on construction of the mill buildings.

It is also noted that basic business procedures for the mill in terms of the provision of data has been wanting for all of the mills. This is a serious issue and it has also been noted that it is prevalent for the six mills. The tables above are a sign of very poor reporting from the mill manager. The omission of critical information such as cash on hand and stock value is a normal practice from the manager even though according to the FDOE warning letters have continually been issued to mill managers. Some managers have even threatened to quit when the FDOE tried to enforce proper reporting into the business. As a result, there is significant deterioration in the information that is coming from the mills. For the project to survive it is important that staffs are recruited from outside the communities for the survival of the business.

The attempts by the FDOE to install Duel Fuel Kits to facilitate the use of straight CNO into the communities Diesel Generators needs to be commended. It is hoped once this is done the demand of CNO from the villages for their energy needs will improve and hopefully it will bring about more profitability of the mills.

In addition there needs to be more cohesiveness and meaningful interactions between the mill management and the village committees that operate or run the village generators. This is because the two do have a common role in the provision of fuel or energy for the villages. Still on electricity, it has also been recently noted that communities that have diesel generators can also apply or become eligible for solar home systems. With the new arrangement it may bring about a challenge in terms of operating the community diesel generators and also the profitability of the mills.

14.0 CONCLUSION

Finally is noted that the Government of Fiji through the FDoE has injected a total of close to $5.1 Million FJD for the set up (capital, construction and operation) of the nine Biofuel Mills in the islands. The mills were set up with the intention of meeting the energy requirements on the islands. With the venture there was also a longing for providing a means of income generating activities for communities in these locations. Unfortunately, through operational and management inadequacies the overall profitability and sustainability of the mills are at stake. Sadly, the communities themselves are not using the products produced by the mills. Notwithstanding the above, it is hoped that through this particular assignment and other restorative works, the Government may be able to bring back life into the operations and intentions of these projects.

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END