BIOFUEL ASSESSMENT PROJECT

INCEPTION REPORT

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Table of Contents

Abbreviations & Acronyms

1.0	**INTRODUCTION**	**4**
2.0	**BACKGROUND**	**4**
3.0	**RATIONAL & OBJECTIVE FOR THE ASSESSMENT OF THE BIOFUEL MARKET POTENTIAL PROJECT**	**6**
4.0	**RESOURCES & RESPONSIBILITIES BETWEEN GOVERNMENT AND THE COMMUNITY & PRODUCTS PRODUCED FROM THE MILLS**	**7**
5.0	**UNDERSTANDING OF KEY ISSUES**	**9**
i.	The Quality of Coconut Oil & Subsequently the Renewable Diesel Produced at the Mill	**9**
ii.	The Prevailing Conventional Fuel Prices and the Price of Coconut Oil	**9**
iii.	The need for more Awareness of the Products Produced at the Mills	**9**
iv.	The ease on the availability of substitutes of electrification options for rural Communities	**10**
6.0	**ASSUMPTIONS AND RISKS**	**10**
a	Data / Information Requirements	**10**
b.	Mill Process Improvement & Quality Assurance	**10**
c.	Advertisement in the local dailies	**11**
7.0	**APPROACH AND WORK PLAN**	**11**
i.	Task 1 : A Situation Analysis of the Biofuel Industry	**11**
ii.	Task 2: Discussions with Staff of all existing Biofuel Mills	**12**
iii.	Task 3: Discussions with relevant stakeholders to identify the demand for Biofuel outside of host islands as well as potential for Biofuel Refuelling Stations in Viti Levu and Vanua Levu	**12**
iv.	Task 4 : Formulate a strategy for Procurement, Transport & Distribution	**13**
v.	Task 5 : The effective assessment of the Biofuel Market in Fiji	**13**
	Work plan	**16**
References		**17**

ACRONYMS

CCCPIR	Coping with Climate Change in the Pacific Island Region
FDoE	Fiji Department of Energy
FNEP	Fiji National Energy Policy
FREPP	Fiji Renewable Energy Power Project
GEF	Global Environment Facility
GIZ	German Agency for International Cooperation
PALM	Pacific Leaders Meeting
PMU	Project Management Unit
RE	Renewable Energy
REP	Rural Electrification Policy (1993)
RESCO	Rural Energy Service Company
SE4ALL	Sustainable Energy for All
SIDs	Small Islands Developing States
SPC	Secretariat of the Pacific Community
TOR	Terms of Reference
UNDP	United Nations Development Program

1.0 INTRODUCTION

This inception report sets the background and context for the assignment / project on the "Assessment of the Biofuel Market Potential" under Fiji Department of Energy's (FDoE) – Biofuel Development Programme. The project is implemented under the Fiji Renewable Energy Power Project (FREPP), in accordance with the GEF-4 Strategic Programme 3 on promoting market approaches for the supply of renewable electricity in utility scale grid-based power systems and Strategic Programme 4 on promoting sustainable energy production from biomass and modern uses of biomass.

The Fiji Biofuel Development Programme was initiated following the Mauritius Conference of the small islands developing states (SIDS) in early 2005. The programme was initiated between Fiji and the United Nations Development Programme (UNDP) through a memorandum of understanding to establish a "Resilience Building Program" to address issues that have contributed to the growing vulnerability of the Fiji economy. The UNDP office and the Government of Fiji's Resilience Building Project identified the need to develop the biofuel industry in Fiji as the most appropriate action for building economic, social and environmental resilience for Fiji by using locally available biomass, biofuel and other renewable energy resources.

In addition the programme was also initiated as part of the Government's ongoing effort to combat the rising cost of petroleum imports into the country. Apart from other programmes such as renewable energy and energy efficiency, the biofuel program has a significant potential to make a leverage on the energy sector in the country. The approach for the biofuel development programme was two pronged; focussing on i) ethanol from molasses, a by-product from the sugar mills and ii) venturing into biodiesel. With the latter there have been a number of initiatives that included the implementation of the so called biofuel mills in the maritime regions in the country. The main purpose for this particular project was to address the energy needs for the rural and maritime communities.

This particular assignment will focus entirely on the biofuel mills that have been implemented in the maritime regions in the country. This inception report intends to briefly describe the issues surrounding the project and more importantly discuss the potential for Biofuel Mills in the country. It will also outline the proposed approach that is intended to be adopted as part of this work. The report is also based following a thorough review of relevant documentation and information provided through discussions with the FDoE.

2.0 BACKGROUND

The FREPP is currently being implemented by FDoE and supported by UNDP-Fiji Multi-Country Office. The project is funded by the fourth cycle of the Global Environment Facility (GEF-4). Specifically the FREPP is basically intended to remove major barriers that prevent

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 clear and generally 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 RE resources to sustainably meet the country's target towards further augmenting its RE component in its energy mix. At the same time such approach is endeavoured to lead to a cost-effective way of contributing to the reduction of CO_2 emissions in the power sector. 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 review of the Fiji National Energy Policy (FNEP) in 2013, the Fiji Government has maintained its vision for a "resource efficient, cost effective and environmentally sustainable energy sector in Fiji". The new or revised policy intends to set out the Government's direction for the energy sector in Fiji. The new policy accentuates the new trends and also reflects recent changes in the energy sector. The energy policy review process was possible and ably supported by the German Government's GIZ under the "Coping with Climate Change in the Pacific Island Region" (CCCPIR) programme and the UNDP Fiji Office.

The primary objective of the policy is to achieve affordable energy for all and with the secondary objective of achieving sustainable energy supplies and reduce energy import costs.[1] The review process has been closely coordinated in order to ensure that targets, policies and strategic actions are dovetailed and consistent with overall national plans. Summarily the policy has six key strategic areas namely;

i. Grid Based Power Supply;
ii. Rural Electrification;
iii. Renewable Energy;
iv. Transport;
v. Petroleum & Substitute Fuels &
vi. Energy Efficiency.

With the policy, Fiji has set itself a number of targets that are aligned with the Sustainable Energy for All (SE4ALL) initiative of the United Nations. Specifically under the category of "Access to Modern Energy Service" on percentage of population with electricity access, Fiji has set a target to achieve 100 percent electrification by 2020. On the same token in terms of share of renewable energy in the energy mix, a target of 99% and 25% of renewable

[1] The new or revised FNEP was finalized in late 2013 and is still currently before Fiji Government Cabinet for endorsement.

energy share in electricity generation and total energy consumption is targeted for 2030, respectively.

Specifically with respect to the targets, the FDoE in earlier noting the changing market scenario for the supply of fossil fuels has ventured into including the Biofuel Programme under the "Petroleum and Substitute Fuels" strategic area as part of its overall intention of adopting strategies to manage the situation at both the local and national level.

3.0 RATIONALE & OBJECTIVE FOR THE ASSESSMENT FOR THE BIOFUEL MARKET POTENTIAL PROJECT

As set out in the terms of reference for this particular assignment, the target of the Biofuel Development Unit with the FDoE is to replace 25,000 kilolitres of imported fuels by locally produced fuels (biofuel) by 2030 and subsequently reduce the cost of imports by 5%. It has been an arduous task in trying to work towards this important milestone over the years. As part of this important effort, the FDoE works on the setting up of biofuel mills in rural and maritime areas of Fiji that have sufficient copra resources and fuel demand. It has been instrumental in the setup of these mills basically providing funding and training local community cooperatives to operate and manage the mills. The mills were set up to basically meet the energy demand in the islands. More specifically the project was intended to compliment the rural electrification programme through the provision of fuel for the generators that were installed under the Government's policy. In addition it was also hoped to assist the communities in terms of transportation fuel needs that quite often become a challenge in these islands. In addition, the project was to ensure that people have a sustainable and affordable fuel source and at the same time ensuring sufficient returns for their resources (copra in this regard).

Today a total of nine mills have been implemented in the following islands;

i. Koro
ii. Rotuma
iii. Cicia
iv. Rabi
v. Gau
vi. Lakeba
vii. Vanua Balavu
viii. Moala **
ix. Matuku **

** Mills that have been constructed but yet to be commissioned.

Despite the good intentions, the operations of the mills have been affected by numerous problems. The recent studies have largely attributed the problem to the lack of demand for the products produced by the mill. In addition other issues affecting the mills include, the quality of products produced, land lease and transportation issues. With the situation, the

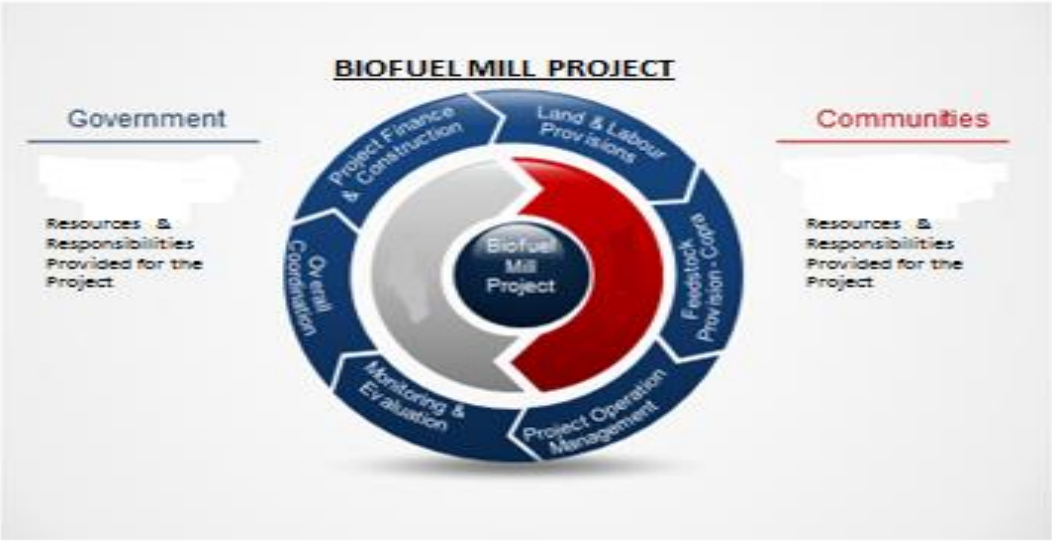
FDoE reckons that apart from the operation and management issues there needs to be proactive marketing of the products produced from the mills within the host islands and also to other parts of the country (Viti Levu and Vanua Levu). In this regard it has formulated this particular project work with the objective to;

> "… carry out 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 study implications. The study will also develop a programme for proactive and meaningful awareness-raising to successfully market the locally produced biofuel.

It is important to note that the products produced at the mills are largely coconut oil and renewable diesel together with coconut meal as a by-product. The mills do not produce any biofuel. It would be counterintuitive to assess the biofuel market and the demand for biofuel let alone carrying out awareness on Biofuel when there is no biofuel produced at the mills or even elsewhere around the country. Therefore the focus of the study will be on the overall products that are produced from the so called FDoE Maritime Biofuel Mills.

4.0 RESOURCES & RESPONSIBILITIES BETWEEN GOVERNMENT & THE COMMUNITIES & PRODUCTS PRODUCED FROM THE MILLS

In attempting to resolve the problems surrounding the Biofuel Mill Project, it is important to delve into the resource inputs, responsibilities between the Government and the Community and the overall supply chain of the mill which essentially dictates the implementation and operation of these projects. The figure below tries to illustrate this important situation.



Essentially with the project the Government provides or is responsible for the; i) Project Finance and Construction, ii) Overall Programme Coordination and the iii) Monitoring and Evaluation of the project. On the other hand the communities are responsible for the; i) Land & Labour Provisions, ii) Supply of Feedstock to the Mill and the iii) Project Operation and Management.

In terms of process the community through specific village cooperatives supply the feedstock to the mills. The mills are expected to produce coconut oil with very specific quality or specifications and coconut meal which is also used as an animal feed. The coconut oil is stored in large holding tanks before it is mixed with petroleum that is supplied from the main centres (Viti Levu and Vanua Levu) at a ratio of 80:20 for petroleum or diesel to coconut oil.

The products produced from the mills essentially include;

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

To reiterate, it is important to note that the end product produced from the mills or the mixture of coconut oil to diesel is called "Renewable Diesel". According to Yoon. J (2011) of Advanced Biofuels, USA, Renewable Diesel is also referred to as "second general diesel" that is derived from biological sources through either hydro treating, thermal conversion or biomass to liquid conversion. Renewable Diesel refers to all diesel fuels derived from biomass that meet the standards of ASTM D975 and are not mono-alkly esters.

On the other hand biodiesel (loosely used to label the products from the mills) is produced through a chemical interaction widely known as "transesterification" process that is achieved through combining vegetable oils or animal fats catalytically with alcohol (mostly methanol or ethanol) where glycerol is a by-product. It is defined under the standard of ASTM D6751 as "a fuel comprised of mono-alkyl esters of long-chain fatty acids derived from vegetable oils or animal fats." The biodiesel is chemically different from petrodiesel and renewable diesel because it contains oxygen atoms. This leads to the different physical properties for biodiesel.

5.0 UNDERSTANDING OF KEY ISSUES

The main issue confronting the Biofuel Maritime Mill projects is profitability. There is a need to inject profitability for the mills to bring about overall sustainability. The lack of demand for the mill products is affecting the profitability of the mills. In order to leverage this situation there is a need to diversify and also to market the products from the mill beyond the island communities. These are the two important issues that will bring about the profitability of the mills. This does not mean that the original intentions / objective of the mills will be lost but rather to complement these intentions.

With respect to diversification it specifically relates to the diversifying of the coconut oil produced from the mill to other markets such as the food and cosmetic markets. The focus will not be on producing these products (food and cosmetics) on the islands but to improve the quality of coconut oil produced from the mills and ensuring it is packaged and delivered to customers whilst maintaining very high standards. This will include, apart from addition mechanical process improvement, improving downstream processes with respect to the drying and overall preparation of copra to be crushed. In addition appropriate marketing and awareness needs to be conducted within the islands and also with the relevant industries (cosmetic and food) that use coconut oil in their processes.

In addition a number of very important issues have been unearthed as a result of the lackadaisical demand of the products produced from the mills. Generally the problems are consistent with all the mills, these issues are discussed below;

i. The quality of coconut oil & subsequently the renewable diesel produced at the mill

The quality of coconut oil is a very important element in the biofuel process. Unfortunately very little attention has been directed to maintaining the highest standards of products produced from the mills. To date, tests have been intermittent and only carried out in the initial years of the mills. This important aspect affects not only the coconut oil but the renewable diesel produced and also the moisture content of the coconut meal. With the current situation at times the coconut meal from some of the mills is not even fit for animal feed.

ii. The prevailing conventional fuel prices and also the price of coconut oil

The prevailing mineral fuel price is an important aspect of the industry and also vital for the profitability of the venture. When the biofuel mill projects were initiated the price of crude oil (Brent) was above the USD$100 per barrel however, for the last 12 months it has reduced significantly and has largely been below the USD$50 mark. This is an important consideration particularly when there is a very effective, efficient (energy content) and economical product.

On the other hand the prevailing coconut or copra prices also have its impact on the industry. With the high copra prices the cost of the products from the mills will also increase and this also drastically affects the demand on the products.

iii. The need for more awareness of the products produced at the mill

With the commencement of the project at the various locations it has been noted that there has been an influx in terms of the use of the fuel by communities. Unfortunately, with the baseless insinuations from the Public Works Department (PWD) Technicians, communities had shied away from using the products from the mill as they were informed that problems

sustained by the community generators were attributed to the use of fuels from Biofuel Mill (CATD, 2014).

iv. The ease in terms of availability of substitutes of electrification options that is available to the rural communities

Rural maritime communities largely require fuel for their energy needs which was mostly through the provision of generators. The generators were installed through the Government Rural Electrification Programme. The option of generators from communities was largely preferred as a result of the prevailing low cost of fuel during late eighties to around mid-2005. The situation was also complemented by the favourable policy conditions at that time. Alternatively in those early years renewable energy particularly solar was expensive. However, in recent years there has been a dramatic decrease in the price of solar accompanied by significant improvement in the technology. This has vastly improved the appeal of the technology for lighting purposes.

6.0 ASSUMPTIONS & RISKS

As highlighted on a number of occasions as part of this document there is no Biofuel produced at the mills. Therefore, the focus of the assessment will be on the overall products produced at the mill. This will include; Coconut Oil, Renewable Diesel and Coconut Mill.

a. Data / Information Requested

An important aspect of the project is the provision of information from the FDoE on the Biofuel Development Programme. It is assumed that the FDoE and other key stakeholders will freely provide all relevant data, information, reports and documents that are related to the programme. However it is also noted that there may be some confidential information, but nonetheless it is assumed that access will be given for all the information requested. The confidentiality of any information will be respected and maintained on any material provided. The success of the project will rely on working closing together with the FDoE to ensure effective knowledge transfer and exchange of information.

b. Mill Process Improvements & Quality Assurance

With the on-going discussions with the FDoE it is noted that necessary improvements in the processes of three of the mills (Lakeba, Rabi & Gau) will take place by August 2016. The improvements desired will basically be the inclusion of “double expelling” of the coconut oil and the accompanying processes that will be effected into the overall system. This is an important aspect of the project.

In addition, apart from the improvement in the mill processes, is the need to carry out relevant tests on the products produced from the mill. This information will be provided to

interested customers / markets that would like to access the products that will be provided from the mill.

c. Advertisement in the local dailies

In addition the assistance of the FDoE is also desired in terms of advertising the products from the mills. It is important that the products from the mills are widely advertised for a month (4 – 6 placements) to attract all potential or interested customers in the country. A cost of a quarter page advertisement in the local dailies is about FJD 600.00. Unfortunately, funds earlier allocated for this exercise has been exhausted. Therefore, the assistance of the FDoE in this regard will be sought.

7.0 APPROACH & WORK PLAN

The TOR is clear in regards to the scope and content of the work. In terms of coordination and project management, we will be liaising directly with the FREPP Project Management Unit (PMU) currently located within the FDoE on all aspects in relation to the actual work required under the project. With the recent staff development within the FREPP PMU, we generally will be working very closely with the FDoE Biofuel Unit and the Staff of the Department.

The tasks defined follow a logical progression in meeting the stated objectives of the assignment; first the inception report, the biofuel status report, a report on consultation with biofuel mill staff, report of biofuel demand outside host islands and finally a strategy for the procurement, transport and distribution of biofuel from islands to the main islands Viti Levu and Vanua Levu.

Details of the tasks are outlined below;

i. Task 1: A situational analysis of the biofuel industry in Fiji.

In close liaison with the FDoE Biofuel Unit and senior management of the FDOE, the activity will involve the following.

- A thorough discussion on the history and status of the biofuel industry in Fiji. Firstly, as part of this exercise, the various literatures on Biofuel Development in Fiji will also be consolidated. This will focus on the work that has been carried out on the local level (mills on the islands) in terms of investigations, / resource assessment, training reports and so forth.

  Nonetheless as part of the discussions, it will entail all the initiatives both private and public that have been pursued on Biofuel Development in the country. Some of the issues that will be discussed will include the biofuel policy work, the biofuel standards and its current status (mandating the standards), the ethanol initiative

with the FSC and other initiatives such as the; Biofuel International Program on Pongamia Pinniatta, the Jatropha initiatives and other new initiatives.

- In addition the discussions with the DoE Team will also focus on all the in-house programs that are; the Biofuel Lab, the staffing of the Unit, the Biofuel Mills and the Operational status of the mill that includes; the machinery, the business and technical operation of the mills, feedstock supplies, local marketing and awareness undertaken on the island. Other issues include; the staffing of the mill and their training and whether capacities are available to meet increasing demand, the dual fuel kit program, the jatropha initiative and others.

  The discussion with the FDoE Rural Electrification Unit will also focus on the number of Diesel Schemes (operational status etc.) that are present in each of the Biofuel Mill locality and the plans and future of diesel schemes and rural electrification in general in Fiji.

  In terms of the actual reporting it will focus on the development of the Maritime Biofuel Mills which is central to this particular project.

ii. Task 2 : Discussions with staff of all existing bio-fuel mills

This discussion is intended to be conducted either face to face or through the use of telephone communications. The discussions is basically intended to obtain first-hand information on issues surrounding the mill; i) the operations of the mills (business and technical), ii) the level of demand and supply on the biofuel mill products, iii) the supply of feedstock (copra) and its price and the retail prices of the products and iii) the existence of competition for feedstocks on the island. The various data collected will also be analyzed.

iii. Task 3 : Discussions with relevant stakeholders to identify the demand for bio-fuels outside of the host islands, as well as the potential to establish sites for bio-fuel re-fuelling stations in Viti Levu and Vanua Levu;

Prior to embarking on this, firstly there needs to be a discussion with Biofuel Unit (this will also be brought up during the discussions that will be undertaken during Task No. 1) and project supervisors on the agreed steps in terms of the processing of the commodity brought from the Biofuel Mills that are located on the islands. At the moment the products that are currently produced on the islands are coconut oil and coconut meal. Renewable diesel (which is basically a mixture of diesel and coconut oil) is produced but used in the islands.

As mentioned earlier it is recommended that a two pronged approach consisting of a i) short term and ii) long term, is adopted. The short term is basically to see to the

retailing of the commodities produced from the mills and the long term will be basically an approach to see to the setting up of a "Biodiesel Plant" in Suva.

Therefore as part of the short term approach and this assignment, the various stakeholders will be identified. An "Expression of Interest" will also be conducted through the newspapers in order to have a wide coverage and also inform the community at large of the availability of these commodities (coconut oil, coconut meal and renewable diesel). With the identification of the stakeholders, their needs will be quantified to ascertain the total volume required and also the times when the commodity will be required and also the issue of refueling and refueling stations will be assessed.

As for the long term approach this will involve discussions with the FDoE, the Ministry of Industry and Trade and the Oil Companies in terms of mandating of the standards (which is believed to be voluntary at this point in time). It is endeavored that as soon as the standards are mandated, the oil companies will be duty bound to add biofuel in their fuel and have it retailed all throughout the country.

iv. Task 4 : Formulate a strategy for the procurement, transport, and distribution of bio-fuel from host islands and meaningful awareness to successfully market the locally produced fuel.

Firstly the moving of the commodities from the various mills to the main island would entail a thorough discussion between the FDoE, the Department of Transport and the Shipping Companies that service the biofuel islands so to speak. It is important to note that the shipping companies originate from Suva en-route to the various islands and return to Suva. Therefore with the discussion with the shipping companies there is a need to ascertain their monthly schedules to the islands. It is believed that the shipping companies do make at least a single trip to a nominated island on a weekly or monthly basis. In terms of the discussion with the Department of Transport, they are responsible for the movement of the Government Franchise Scheme. Therefore the movement of commodities from the islands to the mainland (Suva) needs to dovetail with the shipping schedules so as to minimize overall transportation cost of the commodity. This will also include constructing the strategy for procurement, transport and distribution of the mill products from the host islands to Viti Levu and other destinations.

On the awareness, a marketing plan will be constructed to promote the uptake of commodities from the mills.

v. Task 5 : The effective assessment of the biofuel market in Fiji.

The overall purpose of this assignment is to assess the biofuel market potential focusing on the biofuel mills that have been implemented on seven islands in Fiji. With the consolidation of all reports required under the assignment it will also take into consideration economic, social and environmental issues inherent with the project.

Finally, the main outputs for the consultancy together with the due dates are as follows;

NO.	DELIVERABLE	DUE DATE
1.	Inception Report	27/05/2016
2.	A Biofuel Status Report	27/05/2016
3.	A report on the consultation with biofuel mill staff and verified / analyzed data on the demand and supply	30/08/2016
4.	Report on biofuel and other mill products demand outside of the biofuel islands	28/10/2016
5.	Strategy for the procurement, transport and distribution of the biofuel and other mill products from host islands to the main islands.	28/10/2016

ASSESSMENT OF BIOFUEL MARKET POTENTIAL

Time		1st Month				2nd – 3rd Month					4th – 5th Month				
Activity		W-1	W-2	W-2	W-3	W-4	W-6	W-8	W-10	W-12	W-14	W-16	W-18	W-20	W-21
Activity 1	**Identification and Collection of Existing Data and Information & Preliminary Review of available Biofuel Information**														
Sub Activity 1.1	Compilation & Submission of Inception Report														
Sub Activity 1.2	Meet with FDOE Biofuel Unit, Finance Dept and Rural Electrification – Identification and Collection of Data and Information														
Sub Activity 1.3	Preliminary review of collected data														
Sub Activity 1.4	Data Analysis to verify extent of the problem in relation the financial situation of all the mills.														
Sub Activity 1.5	Expression of Interest advertised in the local dailies on the various products of the Biofuel Mill														
Sub Activity 1.6	Situational Analysis of the existing policies & programs for the Biofuel Program														
Sub Activity 1.7	Compilation & Submission of Biofuel Status Report														
Activity 2	**Consultation with Biofuel Mill Staff and Stakeholders**														
Sub Activity 2.1	Discussion with Biofuel Mill Staff.														
Sub Activity 2.2	Identification and communication with other stakeholders.														
Sub Activity 2.3	Stakeholder consultation and feedback assessment.														
Sub Activity 2.4	Compilation & Submission of Report on Consultation with Biofuel Mill Staff														
Activity 3	**Ascertain level of demand on biofuel and other products produced by the Biofuel Mills on the islands.**														
Sub Activity 3.1	Part of this activity is addressed in 1.4 above. Basically it will involve consolidating information on the Biofuel Mills to serve as TOR for Expression of Interest														
Sub Activity 3.2	Analysis and evaluation of information to ascertain the demand for biofuel and biofuel mill by products.														
Sub Activity 3.3	Compilation & Submission - Report on Biofuel demand outside of host islands														
Activity 4	**Formulate a strategy for the procurement, transport, and distribution of bio-fuel to the main islands.**														
Sub Activity 4.1	Identification and discussion with all shipping companies travelling to the seven biofuel islands.														
Sub Activity 4.2	Discussions with the Department of Transport														
Sub Activity 4.3	Feedback assessment.														
Sub Activity 4.3	Compilation & Submission of Strategy for procurement, transport and distribution of biofuel to the main islands														

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1. CATD - Nadave, 2014, Koro Biofuel Plant – Assessment Report June 2014, An Assessment by the Centre for Appropriate Technology & Development as sanctioned by the Department of Energy, Government of Fiji.

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4. Biofuel Unit, 2005 (Unpublished) Cabinet Paper - Biofuel Formation / Development in Fiji

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