Review of Biofuel Feasibility Study for Kiritimati Island, Kiribati – Gaps and Challenges Identified

Project

Objective:
The review was to provide further analysis on the Biofuel Feasibility Study Report and relevant comments and recommendations to complement the result of the Feasibility Study report.

Methodology
The review of the Biofuel Feasibility Study report was done against the Terms of Reference (TOR) for the delivering the consultancy and also highlight the gaps and challenges recommended by the consultant on the technical viability of the Biofuel Industry in Kiritimati.

Review of the Bio-fuel Study

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<th>Background</th>
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<tr>
<td>Summary</td>
<td>An increase in copra and CNO production is possible as stated in the background report but requires rehabilitation of the coconut research which is rather poor and unproductive shape. The current copra production of 1,500 tons is equivalent to 750,000 litre of diesel.</td>
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| Comments | - Consultation with Ministry of Agriculture and Agriculture Extension officers, farmers or copra cutters including organised networks such as youth, women, church groups on solutions to rehabilitation of the coconut on the islands could be carried out.  
- EPU to highlight the need and create awareness on coconut rehabilitation as a high priority that could contribute to improving energy security in Kiritimati island. However issues on increasing high production and quality of copra and the high subsidy of copra are solved. Economics of the coconut industry for biofuel should be further developed into simple analysis.  
- The conversion of copra to CNO should be highlighted in the Executive Summary. |

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<th>Methodology</th>
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<tr>
<td>Summary</td>
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| Data Availability and Data Quality | Lack of data from both KCCS and KCML limits the depth of the analysis on the power/fuel consumption to analyse the performance and efficiency of the operated power systems.  
- Generation data and financial records show serious inconsistencies.  
- Incomplete log sheets  
- Missing hourly loads and fuel consumption entries  
- No Billing Data could be obtained from MPLI |
| Consultant not able to possible to analyse the performance and efficiency of the current government operated power systems, nor it is possible to base load forecast for Kiritimati on units currently sold. |
Demand data are sketchy and require some interpretation and estimates to draw a consistent picture of the demand side of the energy balance.

KCML was not able to provide disaggregate data on their production cost and no data at all could be obtained with regard to their revenue, i.e., export value of CNO ex-Tarawa.

**Comments**

There was no consultation with Agriculture Extension officers in Kiritimati island and in Tarawa on future plans for coconut industry rehabilitation. At the initial stage of project planning, participation of major stakeholders (copra cutters/farmers, extension officers, and Department of Agriculture) is important and to provide initial reactions to continue the 1500 tons of copra production annually.

Subsidy of copra is a highly political issue and therefore the Office of the President should be informed first of the intentions and the benefits of the biofuel project as the financial viability of the biofuel industry depends on the world market price of copra - $400 per ton.

The consultation on the subsidy cost could have formed part of the Inception Report.

It was stated in the report that consultations and surveys results were used to develop both energy demand and load forecast over a 20-year planning horizon for Kiritimati, even though surveys were only limited to PUB data which were sketchy.

Maybe energy demand for households including business communities, government sectors/ministries, NGOs, CBOs can be obtained through household’s energy survey using past examples and UNDP supported households energy surveys in other Pacific Island Countries (PICs).\(^1\)

The survey can also include other social issues such as land allocation, perceptions on copra industry and rehabilitation programmes as well as awareness raising on biofuel industry.

KCML is a government entity and maybe able to provide required data and information from the Ministers’ and Board members directives and EPU can be tasked to provide these data for further analysis.

### 6 Kiritimati’s Energy Sector

**Summary**

CNO production should be allocated for power generation only as estimated production is 900,000 litres p.a while ADO consumption is 1.5 million litres. Pg 34

It was reported that a new 500 kW generator has been ordered for the system, but documentation on this project could be identified. Pg 36

There is no recording of daily fuel consumption or kWh send out from the 5 power locations and even sales and billing data could not be obtained from the electricity department of the MPLI. The only information obtained was total generation for each of the stations for 2007. Pg 36

No standardization of power supply in Kiritimati as supply systems of 130V/60 Hz run parallel to 240/50 Hz. Pg 37

All government generators seem to operate significantly below their rated capacity. Example, Tennessee, has a rated capacity of 60kW, but an average load of 13kW and a peak of 18kW. This resulted in high specific fuel consumptions. Pg 37

Energy demand is projected to be 2.6GWh for 2012 based on diesel consumption at the 5 government

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\(^1\) UNDP supported the Biofuel Feasibility Study in Vanuatu in 2010 including others in Fiji (2005), Solomon Islands, (2006), Samoa (2007/2008) and RMI (2008).
stations and private generators.
EDF 10 is providing funding for solar powered mini grid for Poland. Pg 39

The study report recommended overhaul change of existing old generator sets to replace by new, more efficient equipment, however there will be higher distribution losses will be occur once a single power supplies the entire London to Cassidy corridor.

Comment

There is a mention of SOE (pg 33) which is to buffer fluctuations and keep the prices stable, at least for a couple of months. SOE is not listed in the acronyms and will be good to elaborate it more.

EPU to look into the new project of procurement of the 500kW generator for London warehouse which was noted in the report pg 36

EPU in consultation with the MLPI and PUB to obtain data required, (include as part of short term plan for training on power generation and distribution data as well as efficiency measures within the power supply) this as it was noted that the last record was 2007 and maybe there was change of staff and no proper handing over or training occurred, etc. These data also needed for proper planning as it provides baseline indicators for the Energy Security in Kiritimati.

Pg 40 – 1,500 tons of copra equivalent of 800,000 litres of CNO - in previous readings it was approx to 900,00 litres.

3 General context of Kiribati and Line Group
Summary

Economic activities and Growth Prospects

Customary land ownership and land use for development was mentioned and all lands are state owned so no conflicts on land use. This statement could be referenced to the source as to rule out the assumptions. Otherwise some consultations with land owners on the land issue would be beneficial to justify the statement.

Comments

The TOR mentioned the need to describe the socio-economic context of Kiribati in general and Kiritimati however there was no sex disaggregated data on the economic activities at the informal sector marine, agriculture, tourism sector, etc and linkages to the energy uses. Also important the gender roles (men, women and youths/children’s roles) related to the copra production, processing and harvesting will be relevant. However a separate gender analysis of the Biofuel industry should be carried out where a Participatory Rural Appraisal may be carried out as this is not covered in this report. Understanding the divisional of labour is important so to target gender groups for training and awareness raising on the copra quality required for bio-fuel production.

The TOR includes the build on and update of the past studies and reports but this was not included in the Feasibility Study or if available was not provided for review.

However the following recommendations could complement past study or reports:

Recommendations

From the Feasibility Study, a short term (5 years) considering that coconut trees bears fruit after 5 years and Mid-term Strategy (10 years) and a Long term (20 years) Biofuel Master plan should be developed that will guide the EPU in implementing the Biofuel Industry and promotion of energy security and sustainability of bio-fuel production.

The first 5 year plan should include, gender analysis of copra production cycle, awareness raising on
quality of copra required, coconut rehabilitation and maintenance strategies, alternative strategies on copra price subsidy, establishing the mill and CNO production and trialling as well as value adding. The value adding will include experiences from the Women in Business Samoa work with targeting the market in Hawaii, which Kiritimati will have the potential due to its proximity to the Hawaii State. It was noted in the report that the mill which can be established in one year (pg 41).

One component of the 5 year plan is on capacity building and training assessments and needs and therefore it is important that the needs/request for Biofuel technicians and qualifications is included in student’s sponsorship through the Ministry of Education and Public Service Commission, NZAid and AUSaid.

All of the above strategies should include costs, stakeholders, timelines and indicators and coordination and planning. The plan should also identify key policies/guidelines needed and as well as changes in regulations and legislations required for complete implementation of the plans.

4 Resource Base for Substitute Fuel for CNO

Summary
Mentions of copra processing and drying

Comments

5 Technical feasibility of CNO use in the standard diesel gen-sets

Summary
Success of biofuel depends on:
- Securing a sustainable supply of feedstock for biofuel production
- Suitability of the technology packages
- Competitiveness of the substitute fuel in comparison with its conventional fossil rivals.

Main problem faced with existing bio-fuel production is – fluctuations in oil production due to unavailability of copra.

Comments
Proper analysis of decision making process or hierarchy structure of government, community and households could be elaborated to identify major stakeholder in the biofuel production.

Considerations of women agricultural extension officers and as bio-fuel technologies if the current work in not carried out properly.

Need for training on value added products such as soap making, body lotion and other coconut residue uses.

6 Energy Sector Assessment – Kiritimati Is.

Summary
Stakeholder consultations are not disaggregated or specific on who was consulted in terms of energy supply which is unreliable with frequent interruptions caused by planned and non-planned outages.

No mention of institutional capacity or training of personnel so to have a human/gender dimensions of people involved for sustainability of biofuel power generations.

Rehabilitation of coconut industry is important to meet the future demand.

Kiritimati tariff 0.33 cents – business and 0.32 cents for private household lower than Tarawa rate -
Electricity sales by commercial, Business and Domestic

In Vanuatu, Solomon Islands, women are responsible for replanting and harvesting as well as processing (cooking and storage, etc) as therefore if women have not been included in the planning stages of biofuel production and replanting of coconut trees, this may have contributed to lack of copra production which is a concurrent issue with biofuel production in these countries.

Similarly the recognition division of labour within a particular society is important for any energy intervention where it is for feedstock, maintenance, repayment, and uses. This will give energy planners an understanding of who to consult with about projects, creating awareness, engaging and people to have a feel of ownership if they are engaged or consulted.

In Kiribati, coconut gathering is a family work and everyone has to be involved since collection is manual and therefore all family members should participate. Working on lands usually out of the village is done by both husband and wife as wife also brings in food and cooks for the husband. Replanting of trees can be also done through cooperative groups or youth groups – this is also practiced in other countries such as the Solomon Islands –Northern Malaita so youth should be involved in the planning processes.

7 Design of CNO project – establishment of local CNO

Summary

A conventional CNO mill that uses dried copra as a feedstock with a production capacity for approx. 800,000 to 1 million litres p.a is required with high quality CNO and strict quality control.

7.2 CNO Production
- 4,200 litre of CNO per shift (8 hours shift)
- Moisture content of copra of not more than 6.5 moisture.
- Copra cutters need to be influenced to produce high quality copra.
- Suggested copra fuel quality parameters for CNO recommended in page 52 aligned to pacific experiences in PNG, Vanuatu and New Caledonia.

7.3 Upgrading of the Kiritimati Power System

5 power systems operated by MLPI is in very poor conditions (old, inefficient generators and the low voltage distribution systems do not allow expanding the electricity beyond the small service areas supplied at present.

7.4 Power Generation
Based on the 5% annual increase of load and energy output is the basis for power plant design.

7.5 CNO Use in Electricity Generation
Dual fuel mode – use at first instance 30% or less of CNO and move up the ladder to 90%

Stated the need for capacity building on CNO milling and operations and use for power generation.

7.6 Training Programme and ADO/CNO Blend
A plan on training for technicians (men and women) should be planned out with the first instance on the current power generation.

7.7 Cost Estimates
Capital cost CNO mill; $795,000
Did not mention freight costs and whether shipping is from Tarawa or Hawaii.

**Power System Expansion**
Assumption that the new power house is to be built at Tabakea area which ideally where the new CNO mill will be established as the CNO will would be one of the largest consumers of electricity. The electricity consumption of the CNO mill should be included in the forecasted energy demand.

Costs around AUD1,914,000 for building, generators, etc. Cost power distribution, incremental capital cost CNO use.

**Sizing of generators:**
Energy demand (see Palau case of oversized generator sets)

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<td>A proper stakeholders' analysis should be carried out at each level of copra/biofuel processing cycle identify stakes involved from replanting of coconut trees, cleaning and maintaining of plants, harvesting, copra production and processing (drying) and milling and refining and energy uses. Trainings on quality required should be carried out to the right stakeholders whether men, women or youth. Allocations of land for CNO production should be made a priority for the Ministry of Lines and Phoenix. These activities need to be included in the first 5 year plan.</td>
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A separate plan on the upgrading upgrading of the London power station, installation of three new generations sets (following N-1) and establishment of a high voltage (11 kV) distribution system ranging from London to Tabwakea. (wrong spelling in the report – Tabweka). The training programme for the CNO technicians will require further consultations and planning with relevant stakeholders, Agriculture, Education, KIT, donor agencies, SPC (for exchange of expertise) etc. The above activities should be included as part of the mid-term strategy (10 year plans).

Technical and financial benefits of 10%, 20% and 30%, etc of CNO blended can be analysed further that will include the benefits, disadvantages of the different blend mixes.
Case study from other countries could also be included and documented.

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<th>Competitiveness of CNO as a fuel</th>
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<td>For the analysis, 1.1 litre CNO is equivalent to 1 litre of diesel fuel</td>
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<td>The subsidised cost of copra is political and therefore an important first step is to consult with government on how to support the 0.40 cost for energy supply.</td>
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<td>The economic viability of the biofuel industry depends on reducing copra price to 0.40 cents and this may need a proper analysis and consultations on the impacts of reducing copra price to the copra cutters and the current government. What are the perceptions of the copra cutters as well as government and this should be done as part of the Inception Report and prior to carrying out the Feasibility Study.</td>
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<td>Whether other options such as Biofuel industry owning land and coconut plantation solely for biofuel production but with assistance from Ministry of Agriculture. In Samoa’s case of jatropha, the SROS,is planting their feedstock.</td>
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<th>9</th>
<th>Environmental and Social Impacts of CNO production and use</th>
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<td><strong>Summary</strong></td>
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<td>The emphasis was more on the problems associated with the technology but not on how men and women should be trained to reduce these challenges.</td>
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<td>CNO supply contracts and arrangements is highlighted as important for the sustainable of the bio-fuel.</td>
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The only impacts highlighted are the noxious diesel leakages into the environment, a diversified fuel market that increases security of supply, and reduced storage risks and less need for maintaining large fuel inventories. CER and VERs under the CDM of the Kyoto Protocol are additional benefits.

There is no mention of human dimensions in particular where people should be trained on waste management and containment of wastes such as oil spills and filters.

A gender analysis should be carried out to re-look at the benefits or the impacts of the biofuel production and uses on men, women and children.

The report does not highlight the human dimensions of how men and women should be involved in the decision regarding CDM or that they should be informed, awareness creating on CDM.

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<th>Findings and outlines recommendations on how to approach biofuel introduction</th>
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### Findings

Biofuel production is technically viable and feasible if the quality of copra is high compared to its current quality as stated in the report.  
The biofuel production is also financially viable if the cost of the copra is reduced to 0.40 cents a kg compared to a subsidised cost of 0.8- cents.

### Comments

The number of farmers was not mentioned but annual copra production was highlighted. The information on the number of families and copra cutter need to be included if one has to carry out a vigorous awareness programme to the farmers who are required to provide good quality required for CNO processing.

However this also needs proper consultation between government, farmers and CNO processors. Other options could be looked at where PUB or MPLI, employs youth and men and women to plant allocated land for the biofuel industry.
## GENDER MAINSTREAMING CHECKLIST FOR PROJECT, STUDY OR POLICY DOCUMENTS

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<th>Questions</th>
<th>Response</th>
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<tr>
<td>Overall: Are the following key words mentioned in the project documents?</td>
<td>No mention of men, women, gender</td>
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<td>– “Gender, women, men, youth, female headed household, women’s participation, women’s income generation, women’s empowerment”</td>
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| Background and Justification: Is the gender dimension highlighted in background information to the intervention? Does the justification include convincing arguments for gender mainstreaming and gender equality? Was gender analysis conducted as part of the social assessment/analysis or it was conducted separately. Were the different project-related needs of women and men, youth analyzed as a part of the social analysis? | Gender Analysis was not conducted as part of the Feasibility Study.  
*A recommendation will be put forward to carry out a gender analysis of the Kiritimati Proposal Biofuel Industry* |
| Goals: Does the goal of the proposed intervention reflect the needs of both men and women? Does the goal seek to correct gender imbalances through addressing practical needs of men and women? Does the goal seek to transform the institutions (social and other) that perpetuate gender inequality?   | No – even though the project – aims to assess the technical, social and economic viability of the CNO as bio-fuel, it did not address the gender roles of men and women in Kiritimati society. There was no mention of the society’s decision making process and no recognition of men, women and youth to the bio-fuel processing. The human/gender dimensions were not explicitly mentioned even though farmers who are mostly family members (men, women and children) are important stakeholders in this process. |
| • Target Beneficiaries: Except where interventions specifically target men or women as a corrective measure to enhance gender equality, is there gender balance within the target beneficiary group? | |
| Goals: Does the goal of the proposed intervention reflect the needs of both men and women? Does the goal seek to correct gender imbalances through addressing practical needs of men and women? Does the goal seek to transform the institutions (social and other) that perpetuate gender inequality? | No.  
Gender analysis carried out as part of the FS |
<p>| • Target Beneficiaries: Except where interventions specifically target men or women as a corrective measure to enhance gender equality, is there gender balance within the target | |
| Objectives: Do the intervention objectives address needs of both women and men? | No |
| Activities: Are measures incorporated to ensure women's inclusion and participation in project planning and implementation (e.g. interviewing women separately from men to get their views; contracting NGOs or other mobilizers to build support for women's participation and reach out to women; skill building training for women)? Do planned activities involve both and women? Are any additional activities needed to ensure that a gender perspective is made explicit (e.g. Training in gender issues, additional research, etc.)? | No, there was no mention of awareness raising or participation of copra cutters or farmers (men, women and youth) to get their views to on the production and quality of the copra. Additional study is required on other options other than reducing costs of copra for the time being such as buying of green copra, replanting scheme carried out by PUB or MLPI, where farmers (men, women and children) as well as landowners can participate and make decisions. |
| Indicators: Have indicators been developed to measure progress towards the fulfilment of each objective? Do these indicators measure the gender aspects of each objective? Are indicators gender disaggregated? Are targets set to guarantee a sufficient level of gender balance in activities (e.g. quotas for male and female participation)? | No indicators have been set in place except where the number of coconut trees required to produce 1,5000 tons of copra p.a. It does not provide numbers of farmers that is required to produce more coconut and which could be used as an indicator if copra production is to increase and possible target for awareness raising, education and rehabilitation schemes. |
| Implementation: Who will implement the planned intervention? Have these partners received gender mainstreaming training, so that a gender perspective can be sustained throughout implementation? Will both women and men participate in implementation? | Stakeholders identified for CNO production is mainly private sectors - there is no mention of existing network - such as women or youth or men's organisation or a cooperative that could be encouraged to process the CNO. |
| Monitoring and Evaluation: Does the monitoring and evaluation strategy include a gender perspective? Is the M&amp;E framework sex disaggregated (for the baseline, monitoring, impact evaluation) with reporting requirements? Will it examine both substantive (content) and administrative (process) aspects of the intervention? | No M&amp;E framework developed yet for the Biofuel Processing. |
| Risks: Has the greater context of gender roles and relations within society been considered as a potential risk (i.e. stereotypes or structural barriers that may prevent full participation of one or the other gender)? Has the potential negative impact of the intervention been considered (e.g. potential increased burden on women or social isolation of men?) | No Gender roles and relations highlighted in the FS. This can be done as a separate study since it was not conducted as part of the study. |
| Budget: Have financial inputs been &quot;gender- | No Gender Action plan but a Gender Analysis can be done as a separate study |</p>
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<td>proofed” to ensure that both men and women will benefit from the planned intervention? Has the need to provide gender sensitivity training or to engage short-term gender experts been factored in to the budget? Does the project explicitly allocate budget/resources for gender-related activities e.g. women's income, reducing gender disparity? Is there a gender action plan with resources allocated to implement it? If there is a separate component for women's advancement, how much is the budget for this separate component?</td>
<td>since it was not conducted as part of the study. There is no other mention of women advancement on value adding processes that could increase income for women in soap making, body oil and lotions.</td>
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<td>Annexes: Are any relevant research papers (or excerpts) included as annexes (particularly those that provide sound justification for your attention to gender)?</td>
<td>Biofuel experiences in other countries such as Vanuatu and New Caledonia highlighted that one of the main challenges is the insufficient copra from farmers. It was not determined whether a gender analysis or study of the copra cutters has been carried out but this could also justify why women are not involved with the decision making even thought they maintain the farm in most Melanesian societies.</td>
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<td>Communication Strategy: Has a communication strategy been developed for informing various publics about the existence, progress and results of the project from a gender perspective?</td>
<td>Not yet developed and could be done as part of the Gender Analysis Study.</td>
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Source: Adapted from UNDP, Gender Mainstreaming in Practice: A Handbook, 2002 and ToR, Review of gender mainstreaming in SDN portfolio, World Bank