FIJI NATIONAL UNIVERSITY

Rolling out Biogas Digester Technology for Clean Cooking Energy Access in Kavewa Island in Fiji

CONTEXT

Recent progress in clean cooking in Fiji, but more still needs to be done

Cooking energy access is a challenge for developing countries and most especially for small island states such as Fiji that has many dispersed small maritime islands where grid-connected electricity is not present and delivery of fuels such as diesel and gas are intermittent or interrupted. According to Fiji Bureau of Statistics, 2017 census data shows a change in household cooking fuel usage in recent years; 57% of all households in Fiji utilize clean cooking fuels, which is a 19% increase from 2007 data. However, according to the 2019-20 household income and expenditure survey (HIES), 31.2% of the population still primarily rely on wood fuel for cooking and this challenge is more pronounced in rural areas and poor population in urban settings. These statistics suggest that there is significant work that needs to be done for transitioning households to clean cooking fuels and technologies to meet national goals such as Fiji's National Development Plan targets that by 2036 primary reliance on wood fuels for cooking will be nil.

A need to support the poor and near poor populations in transitioning towards cleaner fuels for cooking

The recent 2019-20 HIES reveals more about the different types of cooking fuels used at national level and the consumption thereof by poor and near poor populations[1] (Fig. 1). 43% and 25% of the kerosene fuel used for cooking in Fiji is consumed by the near poor and poor populations respectively. Similarly, 81% of population that are using wood are poor or near poor. This indicates that a large share of the population that is using polluting fuels for cooking is near poor or poor. This implies that there is a need to make cleaner fuels affordable for these populations.

[1] As defined by FBoS HIES 2019-2020 poor populations are below the poverty line and near poor are ones just at or slightly above the poverty line.

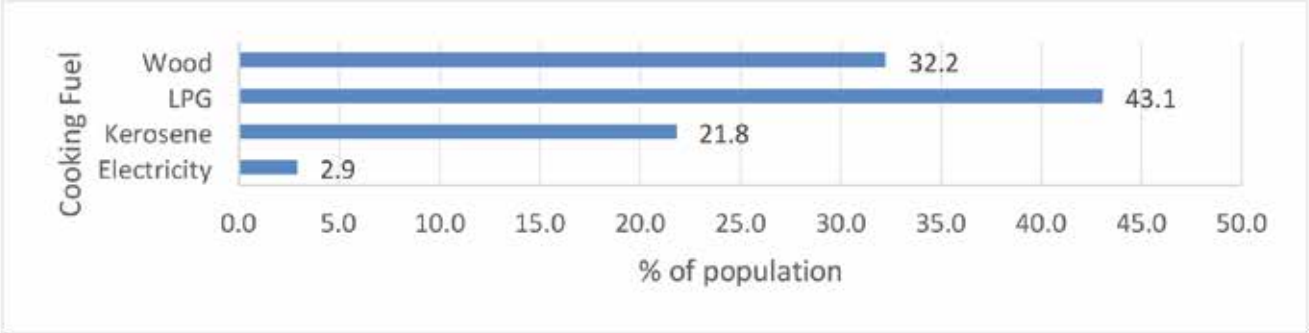

Fig.1 (a) Main cooking fuel used at national level

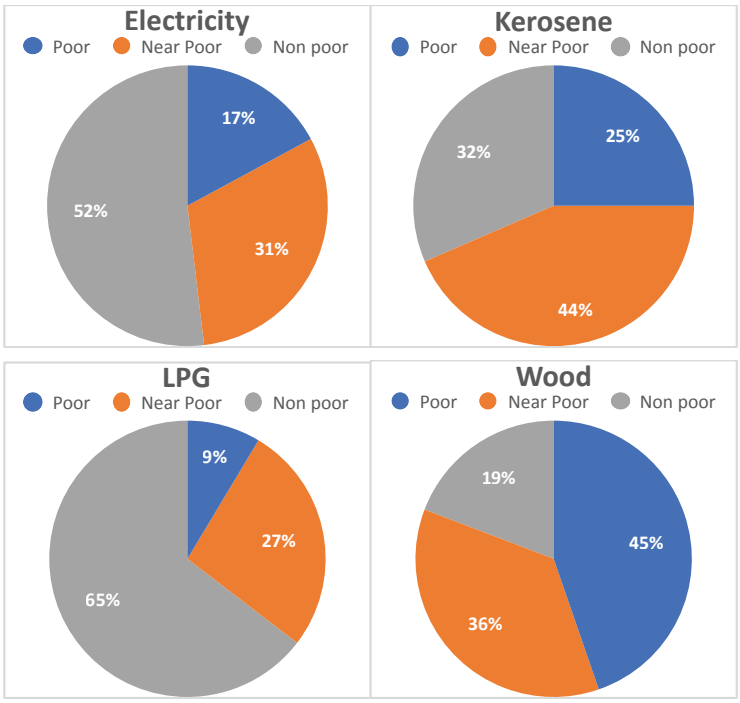

Fig.1 (b) consumption of types of fuels by the Fijian population *Data Source: [2] (FBoS, n.d)*

Slow development of clean cooking policies in Fiji

The policy direction set by the Government of Fiji with regards to the clean energy transition focuses mainly on decarbonising grid-connected electricity generation and providing electricity access to populations through off-grid electrification or rural electrification programmes. But there is a lack of emphasis in current policies on supporting the transition towards clean cooking practices in Fiji.

This brief presents the findings of a research project conducted to rollout biogas digesters for clean cooking access in Kavewa Island, Fiji. The study sought to map energy consumption patterns in households in Kavewa Island with an emphasis on their use of cooking energy, and to evaluate responsiveness levels following the installation of biogas digesters. The research project aimed to inform local, national, and regional policymakers on what can be achieved in rolling out clean cooking technologies in rural communities. The study's sample included all 22 households that benefited from the biogas digester installation. The research involved two rounds of questionnaires, the first of which aiming at gathering information about the energy needs of households, and the second of which aiming at gathering feedback after the implementation of the biogas digesters.

[2] 2019-20 Household income and expenditure survey: Main Report. Fiji Bureau of Statistics, https://www.statsfiji.gov.fj/images/documents/HIES_2019-20/2019-20_HIES_Main_Report.pdf (accessed on 4th May 2023).

KEY FINDINGS

Before biogas digester technology installation and use – Round 1 survey

1. Demographics: The total population of Kavewa island within the 22 households is 124; where 83% are women and children who are largely affected by cooking energy decisions.

2. Decision makers: Men are head of the family for 82% of the households. Assuming that the final cooking energy decision rest with the head of the family, this suggests a mismatch between cooking energy users and decision makers.

3. Energy usage on the island: 100% of households do not have refrigerators or pressure cookers. The absence of refrigerators shortens the shelf life of cooked food and other staples while absence of pressure cooker means more cooking time and energy/fuel usage.

4. Fuel/stove stacking: Altogether 95% of the households use firewood (open-fire cooking) for all their cooking needs. In addition, 50% of these households also use LPG (either 2 burner or 4-burner stove) showing the case of fuel-stacking/stovestacking. Households use LPG for three reasons (i) when it is a rainy season, (ii) unavailability of firewood and (iii) for tea preparations. Furthermore, 95% households have also reported having improved biomass cookstoves while just one household also had kerosene stove.

5. Spending: economic constraints, and the lack of alternative energy sources are among the drivers for this emphasis on firewood as the cooking energy in rural communities. It's highlighted that on average, if a household uses 18 kg LPG monthly for all their cooking energy needs, then it will spend about US$36. However, fuel needs to purchased on mainland and the boat fare is US$100 per trip and this would add to the energy cost for households. This prohibits the wide use of LPG and making firewood use more practical for the island people.

6. Cultural constraints: the preparation of "lovo" (earth-oven) during village functions and family gathering also relies on firewood which all 22 households of Kavewa island affirm on practicing.

7. Firewood Collection: on average each household spends around 4.5 hours per week (equivalent to 234 hours per year and if working would earn using minimum wage in Fiji value of FJ$4/hour[3] of FJ$936) to collect firewood which is mostly native trees (such as Dogo, Doi, Taraga, Nokonoko, etc.). People travel approximately 500 m (collection site to the house) to collect firewood which is done by both genders (mothers and fathers with the help of their sons and daughters). 67% of the women said that they go out in groups to collect firewood.

8. Health: even though firewood is freely available, nearly all survey respondents report body ache and knee pain when collecting and transporting and these challenges are even more pronounced when it is rainy reason which makes the wet wood even more difficult to carry. 43% of the respondents also reported of at least one family member (mostly mothers or grandmothers) in their households have breathing problem while 91% of the respondents reported having itchy eyes that started when they started cooking.

9. Income: nearly all households are either involved in agriculture or being a merchant to generate income where they do their business either within the island or take their produce to mainland. In addition, 64% of the households are receiving money (on average received FJ$78 per month) from their family members who are working either on the mainland or overseas.

10. Practicing mostly subsistence living and small-scale farming: 95% of the households reported using the planted crops for their family consumption while all households reported fishing practices for consumption at home and sale in the market on the mainland for income generation. The island's farms are currently not using any fertilizer. This creates an opportunity for using the byproduct of biogas digesters (organic slurry) to improve crop yields or selling it on the market.

[3] *https://www.fijitimes.com/revised-2021-2022-budget-fiji-announces-4-an-hour-minimum-wage-by-2023/ (accessed on 30 August 2023).*

11. Women empowerment: 77% of women reported having secondary school education while 14% only received primary school education and 2% received tertiary education. All respondents reported that women in their households are involved in income generation activities that involve sales of various items, most notably seafood. The survey also highlighted that only few women own capital assets while around 60% of women own a smart phone implying that women are financially empowered.

12. Children education levels: on the island, 4 children go to early childhood education school, 15 to primary school while 8 children go to secondary school. The survey highlighted that children spend on average 1.4 hours daily on studying.

13. Knowledge on biogas digester before installation and operation: 45% of the respondents did not know about the homebiogas units, while none of the respondents knew about the operation of the technology. All agreed that biogas is a good technology to be used for cooking, stating various reasons with reduced challenges to firewood use mentioned by majority respondents.

After biogas system use – Round 2 survey

1. Changes in sources of energy relied upon for cooking: 50% of the households still use firewood daily while 50% use it occasionally. This is a significant improvement from before the installation of biogas digesters on the island, where 95% of the households were using firewood daily for most of their cooking energy demand. 50% of the households that are still using firewood daily stated that firewood is freely and widely available and some local cuisines require firewood cooking.

2. Consumption patterns: all the households where the biogas system has been installed are using the biogas stoves at most 2 hours daily and none of the households have said that they are not using them, indicating that the new users are open to the idea of using a new technology for cooking.

3. Know how: the users have a general idea of how to use the biogas digester. However, more training is needed in terms of the ratio of feed to water input and the type of feedstock put into the digester.

4. Income generation or household income savings: 50% of the respondents are able to save FJ$50-100 per month while using biogas for cooking, while another 5% are saving FJ$100-150 and the remaining 45% are saving less than FJ$45 per month. This indicates that the reliance on biogas for cooking can support with income generation and savings, but also that more training is needed on income generation activities that users could do while using biogas stoves.

5. Receptivity: all respondents saw numerous benefits of home biogas digesters and stoves as seen from Fig. 2.

6. Longevity: digesters left in the open are likely to be damaged by human activities, animals and possibly by natural disasters such as tropical cyclones. Also, non-adherence to the user manual can contribute to damaging the digester.

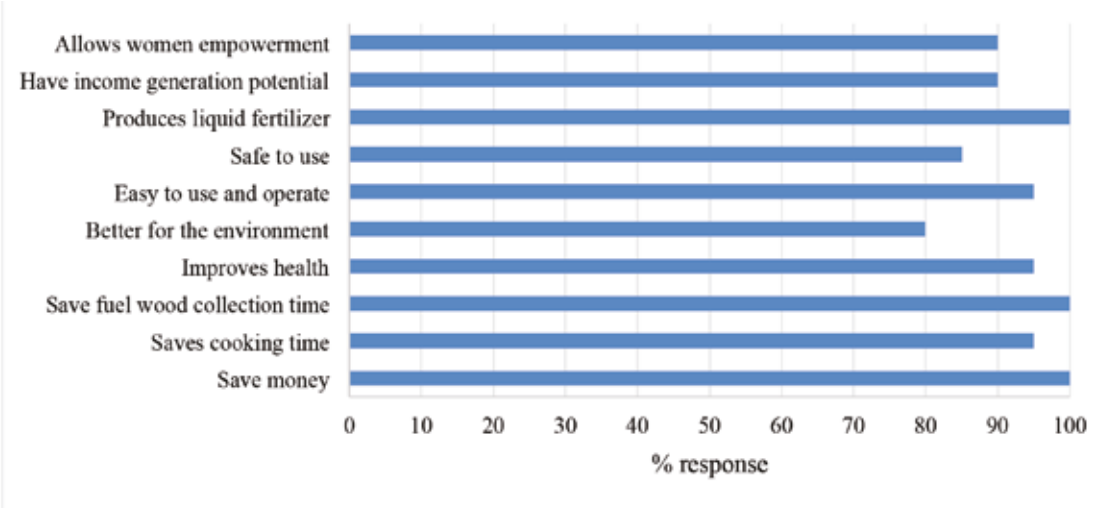

Fig.2 Benefits of use of biogas digester and stove.

RECOMMENDATIONS

Based on the findings, the following recommendations are made:

1. Policymakers should prioritize the implementation of clean cooking technologies in rural communities, such as Kavewa Island, to increase access to clean and affordable energy. There is a need for immediate and effective steps not only on Kavewa Island but also other rural communities in Fiji to transition away from the unsustainable nature of firewood as a cooking energy source.

2. The promotion of the use of biogas digesters as one of the viable solutions for providing clean cooking access in rural communities can help the Fijian Government meet several policy objectives by reducing the negative impacts of traditional cooking methods on health and the environment and improving the economic and socio-cultural well-being of rural communities.

3. Women and children should take a central role in ensuring access to cooking energy since they possess a profound understanding of the family's cooking energy requirements, despite the traditional role of males as the heads of households. Leadership in clean cooking energy should prioritize the inclusion of women and children in energy policy discussions, particularly at micro (family) level.

4. Economic constraints, cultural factors, and the lack of alternative energy sources are drivers for the reliance on firewood for cooking energy in rural communities. Policymakers should make clean cooking technologies competitively attractive by enabling the reliance thereon, providing economic incentives, and raising awareness of the negative impacts of traditional cooking methods and of possible income generation activities.

5. The Fijian government should fund future research that focuses on the long-term sustainability of clean cooking technologies in rural communities. The government of the day needs to establish proper monitoring and evaluation mechanisms to assess the effectiveness of biogas digesters and other clean cooking technologies in reducing greenhouse gas emissions and improving the health, economic, and socio-cultural well-being of rural communities.

6. The Fijian government/policymakers should facilitate/fund more training activities for the users to understand how and why certain steps are done in biogas production. Training should also include building entrepreneurial capacity of women in addition to skill development in income-generating activities.

7. Fijian government/policymakers should raise awareness programmes regarding the strict adherence to the user manual to keep the digester safe and to avoid the biogas digester system being damaged by cyclones, sharp objects, or flying debris. It is recommended that the system is enclosed in a cage-like structure that allows sufficient ventilation and adequate sunlight.

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