Standardized Crediting Framework Madagascar:   
Methodology for renewable ethanol cookstoves in Madagascar

1. Methodology title, version and date

|  |  |
| --- | --- |
| Methodology title | Renewable ethanol cookstoves in Madagascar |
| Version | 1.0 |
| Date | 27/03/2025 |

1. Definitions

For this methodology, the following definitions apply:

**Batch:** The population of devices of the same type registered during a certain period in the activity database in a certain calendar year.

**Date of registration:** The date of registration of a household in the activity database depends on the implementation mechanism used by the activity as follows. The activity devices will be considered operational in each household from the date of registration.

**Direct sale of mobile devices to customers:** The date of registration shall be the first day following the date of sale.

**Indirect sale (sale through intermediaries) of mobile devices to customers:** Where activity participants can provide verifiable evidence of the exact date of sale to end users from intermediaries, registration shall be the first day following this sale. Where such evidence is unavailable, thedate of registration shall be 120 days from the date of sale to the first intermediary.

**Biomass:** Non-fossilized and biodegradable organic material originating from plants, animals and micro-organisms including: (a) Biomass residue; (b) The non-fossilized and biodegradable organic fractions of industrial and municipal wastes; (c) The gases and liquids recovered from the decomposition of non-fossilized and biodegradable organic material.[[1]](#footnote-2)

**Crediting period**: As per the Program Standard, “for Ci-Dev portfolio activities that began before 2021, the end of the first crediting period should be the same as their current CDM crediting period (i.e. this will vary according to the CDM CPA from 2023 to 2026). Subsequent five-year crediting periods, when approved by the GB, should align with the schedule for reviewing NDC commitments under the Paris Agreement. The GB will agree on a process for renewing crediting periods, including the impact on baseline and activity emissions calculation parameters.”

1. Eligibility criteria

Activities applying this methodology must demonstrate compliance with the following eligibility criteria:

|  |  |
| --- | --- |
| Technology | The activity applies to bio-ethanol stoves which displace the use of non-renewable biomass. The stoves may be portable, in-situ or multi-pot stoves. |
| Target group | Rural and/or urban households using fuelwood and/or charcoal to meet their domestic cooking needs in the baseline scenario. |
| Technical standards | The production of bio-ethanol sourced from biomass residues and/or a dedicated plantation of the activity, shall meet the following conditions:[[2]](#footnote-3)   1. For activities that use biomass residues, prior to the implementation of the activity, the biomass residues have not been collected and used but been left for decay and would, in the absence of the activity, continue to be left for decay; and 2. For activities that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the activity does not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process; and 3. The biomass used by the activity facility is not stored for more than one year; and 4. In the case biomass from dedicated plantations are used, the applicability conditions of TOOL16 “Activity and leakage emissions from biomass” are satisfied.   Activity participants shall demonstrate that the bioethanol cookstoves are designed, constructed and operated in line with safety requirements. Demonstrated compliance with IWA 11:2012 or ISO 19867-1:2018 (safety tier 3 or higher) is considered sufficient evidence to comply safety requirements. Any cookstove listed in the Clean Cooking Alliance’s online catalogue with a safety rating of 3 or higher is considered to comply with the safety requirements mentioned above. [[3]](#footnote-4) |
| Double counting | The activity may not generate any carbon credits under any other compliance or voluntary carbon market standard for the same period for which they request issuance of SCF ERs. |

1. Additionality

Activities which meet the eligibility criteria listed above shall be considered additional on the basis that they are small scale off-grid energy projects located within a least developed country.

1. Emission sources and gases

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Source** | **GHG** | **Included?** | **Justification** |
| **Baseline**  **e** | Emissions from combusting non-renewable woody biomass | CO2 | Yes | Main emission source. |
| CH4 | Yes | Relevant emission source |
| N2O | Yes | Relevant emission source |
| **Activity** | Emissions from combusting renewable fuel | CO2 | No | No net CO2 emission from renewable fuel. |
| CH4 | No | Excluded for simplification. |
| N2O | No | Excluded for simplification. |
| **Leakage** | Diversion of biomass residues from other applications | CO2 | Yes | Potentially relevant source of leakage |
| CH4 | Yes | Excluded for simplification. |
| N2O | Yes | Excluded for simplification. |
| Transportation of biomass residues outside the activity boundary | CO2 | Yes | Potentially relevant source of leakage |
| CH4 | Yes | Potentially relevant source of leakage |
| N2O | Yes | Potentially relevant source of leakage |
| Processing of biomass residues outside the activity boundary | CO2 | Yes | Potentially relevant source of leakage |
| CH4 | Yes | Potentially relevant source of leakage |
| N2O | Yes | Potentially relevant source of leakage |

1. Emission reductions

Emission reductions are to be estimated based on the equation below.

*Equation 1*

Where:

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  | = | Emission reductions in year *y* (tCO2e) |
|  | = | Baseline emissions in year *y* (tCO2e) |
|  | = | Activity emissions in year *y* (tCO2e) |
|  | = | Leakage emissions in year *y* (tCO2e) |

1. Baseline emissions

The following equation is applied to calculate baseline emissions:

*=* *Equation 2*

Where:

|  |  |  |
| --- | --- | --- |
| *j* | = | Index for batch number of activity devices |
| *f* | = | Index for baseline fuel type, wood or charcoal. |
|  | = | Share of households using fuel f (firewood or charcoal) in the baseline scenario (percentage). A default value of 30% shall be applied for charcoal, and a default value of 70% shall be applied for firewood.[[4]](#footnote-5) |
|  | = | Quantity of woody biomass that is substituted or displaced in year y for batch j (tonnes) for baseline fuel type f. |
| 0.95 | = | Default factor to account for leakage due to use/diversion of non-renewable woody biomass saved under the activity by non-activity households year y. |
|  | = | Adjustment to account for any continued use of pre-activity devices for batch j (percentage). |
|  | = | Fraction of woody biomass used in the absence of the activity that can be established as non-renewable biomass (fraction or %). |
|  | = | Net calorific value of the non-renewable woody biomass that is substituted (TJ/tonne) for baseline fuel type f. Default value for firewood: 0.0156TJ/T. For charcoal: 0.029TJ/T.[[5]](#footnote-6) |
|  | = | CO2 Emission factor of the fuel that is substituted or reduced for baseline fuel type f. Use IPCC default value of 112 t CO2/TJ as emission factor for woody biomass. Use IPCC default value of 165 t CO2/TJ as emission factor for charcoal. |
|  | = | Non-CO2 emission factor of baseline fuel type f. Use IPCC default value of 9.46 t CO2e/TJ for wood. Use default IPCC value of 44.3 t CO2/TJ as emission factor for charcoal. |

**7.1. Determining *By* from the implementation of renewable fuel cookstoves:**

**Option 1: Based on number of households served and average consumption before and after activity implementation**

*By* is calculated as the product of the number of households using cookstoves distributed under the activity multiplied by the estimate of average annual consumption of woody biomass per household that is displaced by the activity:

*Equation 3*

Where:

|  |  |  |  |
| --- | --- | --- | --- |
|  | = | Cumulative number of activity devices of batch j registered under the activity (number) | |
|  | = | Share of activity devices of batch j operating during year y (percentage) |
|  | = | Average annual consumption of woody biomass **per household** before the start of the activity or at the renewal of each crediting period, whichever is later (tonnes/household/year) | |
|  | = | Share of households using fuel f (firewood or charcoal) in the baseline scenario (percentage). A default value of 30% shall be applied for charcoal, and a default value of 70% shall be applied for firewood. | |

**Option 2: Based on thermal energy efficiency of cookstoves.**

Calculated from thermal energy generated in the activity as:

*Equation 4*

Where:

|  |  |  |
| --- | --- | --- |
| *f* | = | Fuel used in the baseline scenario (firewood or charcoal). |
|  | = | Thermal energy generated by the new renewable energy technology in year y (TJ). |
|  | = | Net calorific value of the non-renewable woody biomass that is substituted (TJ/tonne). |
|  | = | Efficiency of pre-activity devices (percentage). |
|  | = | Share of households using fuel f (firewood or charcoal) in the baseline scenario (percentage). A default value of 30% shall be applied for charcoal, and a default value of 70% shall be applied for firewood. |

shall be determined as follows:

*Equation 5*

Where:

|  |  |  |  |
| --- | --- | --- | --- |
|  | = | Net Calorific Value of ethanol (TJ/m3). | |
|  | = | Average daily ethanol usage by activity participating households of batch j in year y (litres). | |
|  | = | Cumulative number of activity devices of batch j registered under the activity (number) | |
|  | = | Share of ethanol cookstoves of batch j operating in year y (percentage). |
|  | = | Average thermal efficiency of ethanol stove used by the activity participating household (percentage). | |

* 1. **Regardless of the option chosen for calculating** *By*, **the following conditions apply:**

The **lifespan of each type of activity device** shall be documented based on the manufacturer’s specification. If the lifespan of devices is less than the crediting period, it shall be demonstrated that the devices shall be replaced after the lifespan has ended. If it cannot be demonstrated that the activity devices are replaced with new devices, no emission reductions can be claimed beyond the lifespan of the activity devices. The purchase/receipt of new activity devices by households under the activity for which original stoves have exceeded their operational lifespan will be tracked in the monitoring database. This is considered to be the only suitable demonstration of the replacement of devices.

Leakage emissions related to the non-renewable woody biomass saved by the project activity shall be accounted for by multiplying *By* by a net to gross adjustment factor of 0.95. This is based on the standard default value to account for this source of leakage under the CDM and is already included in Equation 2.

1. Activity emissions

For activities implementing ethanol stoves, activity emissions can be considered 0.

1. Leakage emissions

The following three sources of leakage shall be calculated and included:

*Equation 6*

Where

|  |  |  |
| --- | --- | --- |
|  | = | Leakage due to diversion of biomass residues from other applications in year y. |
|  | = | Leakage due to the transportation of biomass residues outside of the activity boundary in year y. |
|  | = | Leakage due to processing of biomass residues outside the activity boundary in year *y.* |

9.1. Leakage due to diversion of biomass residues from other applications

As the biomass residues used in the activity can be used for energy or non-energy applications, leakage due to the diversion of biomass away from other uses must be accounted for. Where precise alternative uses of the biomass residue used to make ethanol (e.g., molasses) outside the activity may be impossible to determine, conversion to ethanol and ultimate substitution for gasoline in vehicles may be assumed. On this basis, a default value of 0.00050317 tCO2e/L of ethanol used in the activity may be applied.

Therefore, leakage due to diversion of biomass residues from other application shall be calculated as follows:

*Equation 7*

Where

|  |  |  |
| --- | --- | --- |
|  | = | Leakage emissions due to the diversion of biomass residues from other applications in year *y* (t CO2e) |
|  | = | Average daily ethanol usage by activity participating households of batch j in year y (litres). |
|  | = | Cumulative number of activity devices of batch j registered under the activity (number) |
|  | = | Share of ethanol cookstoves of batch j operating in year y (percentage). |
|  | = | Avoided CO2 emission factor per litre of ethanol burned in place of gasoline as vehicle fuel (0.00050317 tCO2e/L) |

9.2. Leakage due to the transportation of biomass residues outside the activity boundary

Activity participants will apply a conservative default emission factor to estimate activity or leakage emissions from transportation of activity fuels outside of the activity boundary.

*Equation 8*

Where

|  |  |  |  |
| --- | --- | --- | --- |
|  | = | Leakage due to the transportation of biomass residues outside of the activity boundary in year y. | |
|  | = | Average daily ethanol usage in litres by activity participating households of batch j in year y. | |
|  | = | Cumulative number of activity devices of batch j registered under the activity (number) | |
|  | = | Share of ethanol cookstoves of batch j operating in year y (percentage). |
|  | = | Default emission factor for the transport of ethanol (tCO2e/liter) | |

An emission factor of 0.0003 tCO2e/liter of ethanol shall be used when imported ethanol is used by activity devices, and a value of 0.0002 tCO2e/liter shall be used in case the activity devices use ethanol produced in Madagascar.

9.3. Leakage due to processing of biomass residues outside the activity boundary in year y

Emissions resulting from processing of biomass and biomass residues are determined as based on the equations below:

Equation 9

Where

|  |  |  |  |
| --- | --- | --- | --- |
|  | = | Leakage due to processing of biomass residues outside the activity boundary in year *y.* | |
|  | = | Average daily ethanol usage by activity participating households of batch j in year y (litres). | |
|  | = | Cumulative number of activity devices of batch j registered under the activity (number) | |
|  | = | Share of ethanol cookstoves of batch j operating in year y (percentage). |
|  | = | Emission factor of production of ethanol (. | |

Activity participants may apply a conservative default emission factor 0.00247 tCO2e/litre of ethanol to estimate activity or leakage emissions from the production of ethanol fuels. Alternatively, proponents may calculate emissions for monitored ethanol sources used under the activity, including robust estimations of direct and indirect emissions resulting from cultivation and processing based on verifiable sources.

1. Data and parameters not monitored

| **Parameter** | **Description** | **Value** | **Units** |
| --- | --- | --- | --- |
| **For all options** | | | |
|  | Default value for fraction of non-renewable biomass.  If the activity proponent wishes to substitute the default value in favour of one calculated directly, see parameter fNRB in section 11.1 Monitored Parameters. | 30[[6]](#footnote-7) | % |
|  | Net calorific value of non-renewable woody biomass that is substituted | For firewood: 0.0156  For charcoal:  0.029 [[7]](#footnote-8) | TJ/tonne |
|  | CO2 Emission factor for firewood or charcoal | Firewood: 112  Charcoal: 165[[8]](#footnote-9) | t CO2/TJ |
|  | Non-CO2 Emission factor for firewood or charcoal | Firewood: 9.46  Charcoal 44.3[[9]](#footnote-10) | t CO2/TJ |
|  | Thermal efficiency of ethanol stove used by households.  Project proponents must submit testing results performed in laboratories that follow the method ISO 19867-1. These may be obtained from stove manufacturers. | - | % |
| **For option 1** | | | |
|  | Average annual consumption of woody biomass per household before the start of the activity | Firewood: 3.865  Charcoal: 1.1264[[10]](#footnote-11) | Tonnes/household/year |
| **For option 2** | | | |
|  | Efficiency of pre-activity device (three-stone fire) | A default value of 15% can be used for traditional 3-stone fireplaces or any other conventional fireplace without combustion enhanced by ventilation management.  A default value of 25% can be used for all other fireplaces.  [[11]](#footnote-12) | % |
|  | Net calorific value of ethanol | 0.0213 [[12]](#footnote-13) | TJ/m3 |
| **For leakage emissions** | | | |
|  | Avoided CO2 emission factor per litre of ethanol burned in place of gasoline as vehicle fuel | 0.00050317 [[13]](#footnote-14) | tCO2e/L |
|  | Emission factor of transportation of ethanol | Imported ethanol: 0.0003;  Ethanol produced in Madagascar: 0.0002.[[14]](#footnote-15) | tCO2e/L |
|  | Emission factor of production of ethanol | 0.00247[[15]](#footnote-16) | tCO2e/L |

1. Monitoring requirements

In order to be able to track and trace the cookstoves implemented, the following information must be collected in a centralized, transparent database:

* Cookstove owner name and personal identification number
* Cookstove owner phone number
* Cookstove owner address [[16]](#footnote-17)
* Unique serial number allocated to the cookstove or the identification number of the household. [[17]](#footnote-18)
* Date of registration of the cookstove
* Primary fuel used before receiving an improved cookstove (i.e., firewood or charcoal). [[18]](#footnote-19)
* Type of activity device (if more than one type is installed)
  1. Monitored parameters

| **Parameter** | **Unit** | **Description** | **Monitoring approach** | **Monitoring frequency** |
| --- | --- | --- | --- | --- |
| **All options** | | | | |
|  | Number of households | Cumulative number of activity devices of batch j registered under the activity (number) | **Source of data:** Continuously recorded in the activity database, with verifiable documentary evidence to support numbers reported. | Continuously |
| Date of registration | Date | Date of registration of each stove in the activity database | **Source of data:** Recorded in the activity database, with verifiable documentary evidence to support numbers reported. The date of registration shall be two weeks from the date of sale of the stove.[[19]](#footnote-20) | Continuously |
|  | % | Share of households using fuel f (firewood or charcoal) in the baseline scenario (percentage) | **Source of data:** Recorded in the activity database. The activity participant shall ask the end user the fuel used in the baseline scenario at the time of sale and register this information in the activity database. | Continuously |
|  | Percentage | Share of households with a activity cookstove of batch j operating in year y (percentage) | **Source of data:** Based on a representative sample with the following size:   * Annual monitoring: A minimum of 48 households shall be monitored to ensure 90/10 confidence/precision levels. [[20]](#footnote-21)   Separate samples shall be taken for each batch. | Annual |
|  | % | Adjustment to account for any continued use of pre-activity devices of batch *j* operating during year *y* | **Source of data:** Representative sample survey.    **Sample size:** Minimum sample size of 48 for activity devices of batch *j* (year of registration). [[21]](#footnote-22)    **Measurement procedures:** The parameter is based on the number of meals per week cooked in the pre-activity device as determined by the sample survey. The value of the parameter shall be set as follows:     * 100% if the pre-activity deviceis not used**,** * 66% if onemeal per day (7 per week) is cooked in the pre-activity device. * 33% if two meals per day (14 per week) are cooked in the pre-activity device. * 0% if the pre-activity device is used alongside the activity stove | Annual |
|  | % | Fraction of non-renewable biomass. | **Source of data:** Peer-reviewed reports.  **Measurement methods and procedures:** Activity proponents may calculate fNRB directly using CDM Tool 30 approach. If CDM tool 30 is used, calculations and valid peer-reviewed data sources must be included in validation documents, and an uncertainty discount of 26% applied (For example, if fNRB calculated based on TOOL30 is 0.60, the fNRB applied to emission reduction calculations is 0.60 × (1 − 0.26) = 0.44.  If the activity proponent wishes to substitute the default value in favour of one calculated directly, see parameter fNRB in section 11.1 Monitored Parameters. | Annual |
| **Option 2** | | | | |
|  | Litres | Average daily ethanol usage in litres by activity participating households of batch j in year y | **Source of data:** Monitoring of random sample of activity participating households. A minimum of 40 households shall be monitored to ensure 90/10 confidence/precision levels. [[22]](#footnote-23)  **Measurement methods and procedures:** The usage of denatured alcohol will be physically recorded in a representative number of households over a period of 7 days. This will be used to calculate the average daily denatured alcohol consumption per household that use ethanol stoves.  **QA/QC procedures:** The ethanol consumption will be based on pure ethanol. This means that the monitored volume of fuel used has to be adjusted for its purity (%). For example, if a household uses 5 litres of denatured alcohol with 90% purity, then the calculation will be 5 \* 90% = 4.5 liter of denatured alcohol with 100% purity.  The purity of the denatured alcohol will be measured and registered by the representative sample of at least 44 households monitored. The purity of the ethanol is determined by a “Hydrometer” also referred to as a “Alco meter”. This device measures the purity or strength of the fuel. This is measured based on the density of the fuel, based on the knowledge that the density of ethanol is lower than the density of water, which is the main non-ethanol component in the fuel.  Alternatively, activity participants may apply a default value of 90%, which is the minimum requirement by law in Madagascar. | Annual |

1. Version history

|  |  |  |
| --- | --- | --- |
| Version | Date | Contents revised |
| 0.1 | 03/07/2023 | All (first version) |
| 1.0 | 27/02/2025 | - Additionality  - Sampling approach  - Baseline fuel calculations  - Emission factors  - fNRB |

1. [↑](#footnote-ref-2)
2. Activities registered under the CDM using previous versions of the methodology AMS-I.E., that did not include these eligibility criteria can transition to the SCF using the same eligibility criteria in the methodology with which they were originally registered under the CDM. New activities seeking registration under the SCF (i.e., that were not previously registered under the CDM or other standards, or whose crediting period under other standards have ended) shall comply with the eligibility criteria of this methodology. [↑](#footnote-ref-3)
3. CCA Cookstove Catalogue is available here: http://catalog.cleancookstoves.org/ [↑](#footnote-ref-4)
4. Values sourced from the Enquête Démographique et de Santé (EDSMD-V). 2021. Institut National de la Statistique (INSTAT). Antananarivo, Madagascar. Available at: https://dhsprogram.com/pubs/pdf/FR376/FR376.pdf [↑](#footnote-ref-5)
5. IPCC default for firewood. 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy. Available [here](https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html) [↑](#footnote-ref-6)
6. CDM Tool 33 default value. [↑](#footnote-ref-7)
7. IPCC default for firewood. 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy. Available [here](https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html) [↑](#footnote-ref-8)
8. IPCC default for firewood / charcoal. 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Tables 1.4 and 2.2. Available [here](https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html) [↑](#footnote-ref-9)
9. IPCC default for firewood / charcoal. 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Tables 1.4 and 2.2. Available [here](https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html) [↑](#footnote-ref-10)
10. Dasgupta, S.; Martin, P.; Samad, H. A. (2015). Lessons From Rural Madagascar on Improving Air Quality in the Kitchen. States average wood consumption among wood burning households as 75.8kg per week. That gives an equivalent 3.865 tonnes per year. This equates to 0.93847 Tonnes/person/year (with 4.2 persons per household). The same paper cites charcoal consumption among charcoal use households as 21.7kg per week. This equates to 1.1264 tonnes per year. [↑](#footnote-ref-11)
11. Values based on the CDM Tool 33 system as used by the AMS-I.E. v.13 methodology. Alternatively, the parameter can be established based on a representative sample survey of pre-project devices and set ex ante (i.e., it is not necessary to determine the baseline efficiency for each household when including it in the project activity database). The survey should be conducted in the relevant geographical area, in accordance with the “Sampling and Survey Standard for CDM Project Activities and Programs of Activities”. The representative sample survey may ask whether the pre-project device is a traditional three-stone stove or another conventional device without improved combustion air supply or flue ventilation.. [↑](#footnote-ref-12)
12. Net calorific value of ethanol is 27.0 TJ/Gg according to 2006 IPCC Guidelines for National Greenhouse Gas inventories. Volume 2 – Energy, Chapter 1 – Introduction, Table 1.2 “Default Net Calorific Values (NCVs)”. Density of ethanol is 0.789 g/cm3. NCV for ethanol is hence calculated as (27.0 \* 0.789 / 1000) = 0.0213 TJ/m3 [↑](#footnote-ref-13)
13. “By comparing total GHG emissions from 1000 L bioethanol to gasoline, the net-avoided GHG emissions came out at 503.17 kg CO2 eq.” [0.00050317 tCO2e/L]. (Farahani, S. S., & Asoodar, M. A. (2017). Life cycle environmental impacts of bioethanol production from sugarcane molasses in Iran. *Environmental Science and Pollution Research*, *24*(28), 22547-22556.) [↑](#footnote-ref-14)
14. Emission factor based on combined emissions of sea and land transit from assumed production site Eswatini to Madagascar, 500km road transport, 2,250km sea transport generating 0.000142 tCO2e/L and 0.000036 tCO2e/L emissions respectively. Road transport emission factor taken from CDM Tool12 light vehicle transport emission factor 245gCO2e/tonne-km (245 x 0.783 x 500 x 2 / 1000000000 = 0.000191 tCO2e/L). (TOOL12 – Methodological tool Project and leakage emissions from transportation of freight Version 01.1.0. Available here: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf>) Transport emissions from sea transport for imported ethanol are taken as 0.0000158 tCO2e/L. (CO2emissiefactoren (2023) *List of Emissions Factors*. Available here: https://www.co2emissiefactoren.nl/lijst-emissiefactoren/) [↑](#footnote-ref-15)
15. Emission factor is based on the assessment of emissions from ethanol production in Malawi of Dunkelberg, Finkbeiner, and Hirschl (2014). This study gives total emissions as 116gCO2e per MJ of ethanol. (Assuming ethanol has an energy density of 0.0213 TJ/M3 this equates to 0.0024708tCO2e/L. Madagascar imports the majority of its denatured ethanol from Eswatini and South Africa. Domestic production is currently low with few large scale operations present. Sugarcane cultivation and ethanol production in Malawi takes place under roughly similar conditions and similar emissions reducing regulations as in Eswatini, South Africa and Madagascar. In the absence of detailed lifecycle emissions assessments for ethanol produced in these later countries, Malawi provides the closest approximation. (Dunkelberg, Elisa; Finkbeiner,; Hirschl, Bernd (2014). *Sugarcaneethanoproduction in Malawi: Measures to optimize the carbon footprint and to avoid indirect emissions. Biomass and Bioenergy, 71(), 37–45.*doi:10.1016/j.biombioe.2013.10.006), World Bank (2011) *Ethanol as a Household Fuel in Madagascar,* Available here: https://documents1.worldbank.org/curated/en/564801468055752320/pdf/699820v10ESW0P0ry0Report0Eng0220911.pdf [↑](#footnote-ref-16)
16. If the cookstove owner does not have an address, the activity proponent shall register the Municipality where the cookstove owner resides. [↑](#footnote-ref-17)
17. For households that have more than one stove, credits can only be claimed for one stove. [↑](#footnote-ref-18)
18. Activity proponents may use the following default values for the primary fuel used before receiving an improved cookstove:

    Charcoal: 30%

    Firewood: 70%

    Values sourced from the Enquête Démographique et de Santé (EDSMD-V). 2021. Institut National de la Statistique (INSTAT). Antananarivo, Madagascar. Available at: https://dhsprogram.com/pubs/pdf/FR376/FR376.pdf [↑](#footnote-ref-19)
19. Separate batch sampling is required for devices registered in different calendar years. [↑](#footnote-ref-20)
20. The minimum sample size (target) for this parameter is 48 households. Activity Participant shall add +10% (i.e., 5 households) to the survey campaign to ensure this minimum sample size is reached [↑](#footnote-ref-21)
21. The minimum sample size (target) for this parameter is 48 households. Activity Participant shall add +10% (i.e., 5 households) to the survey campaign to ensure this minimum sample size is reached [↑](#footnote-ref-22)
22. The minimum sample size (target) for this parameter is 40 households. Activity Participant shall add +10% (i.e., 4 households) to the survey campaign to ensure this minimum sample size is reached [↑](#footnote-ref-23)