# Kitchen Performance Test (KPT) Report

## Haines Solar Cooker Project
## Camps of Iridimi & Touloum (Wadi Fira, Tchad)

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FAIR CLIMATE FUND

ADES ONG Internationale

UNHCR L'Agence des Nations Unies pour les réfugiés

# 1. Introduction

Since 2019, FairClimateFund (FCF) and ADES have been implementing a solar cooker distribution programme in **solar cookers** in the refugee camps of **Iridimi** et de **Touloum**, located in the Wadi Fira region of eastern Chad. These camps have hosted Sudanese refugee populations for over twenty years. Growing pressure on natural resources, particularly on wood energy, is a major challenge. The increasing scarcity of available wood around the camps leads both to higher household expenditures (direct or indirect through collection) and to the progressive degradation of local ecosystems.

In this context, the project aims to **reduce dependence on firewood**, and **improve the living conditions of refugee households** and to **contribute to the environment projection** by introducing a clean cooking technology that is free to use and well-suited to the solar conditions of the region. The Haines Solar Cookers offer a sustainable alternative that reduces fuel expenditure, improves household safety — particularly for women and children exposed to the risks associated with firewood collection — and reduces pressure on wood resources.

The project is also certified under an international carbon standard **(Gold Standard)**), which enables the greenhouse gas emission reductions generated by the adoption of these clean technologies to be valued. The sale of carbon credits helps to finance distribution, training, usage monitoring, and ongoing support for beneficiary households. In a context where the environmental integrity of carbon projects is a central concern at the international level, FairClimateFund pays particular attention to the quality of data collected, the transparency of the project, and the rigorous application of certification methodologies.

To ensure the robustness of the emissions reduction calculations, the chosen methodology calls for the implementation of a **Kitchen Performance Test (KPT)**. This test measures, under real conditions, the firewood consumption of households equipped with solar cookers and compares it with that of households using traditional practices (basic banco stoves or three-stone fires). The KPT is an essential component of the monitoring framework: it provides reliable empirical data, directly integrated into the calculation of avoided emissions and therefore into the generation of carbon credits.

This report describes in detail the implementation of the KPT in the Iridimi and Touloum camps. The tests were conducted between **11th of October 2025** and the **06th of November 2025**, among **102 households** split equally between an intervention group (equipped with a solar cooker) and a baseline group (without a solar cooker). The objective is to precisely evaluate the fuel reduction achieved through the solar cooker, to support the carbon certification process while strengthening the environmental integrity of the project.

*Figure 1 User of the Haines solar cooker (Iridimi)*

## 2. Overview of the KPT

The **Kitchen Performance Test** is a field methodology designed to accurately measure the actual wood consumption of households. The protocol involves **three consecutive days** in each household, during which surveyors measure the quantities of wood consumed, the moisture content of the fuel, the types of meals prepared, and the number of people who consumed the meal.
In addition to the daily measurements, general data on household cooking habits, household size, and firewood sourcing practices were collected. This information makes it possible to interpret the results while accounting for the diversity of culinary practices and social contexts.
The entire test follows the requirements of **KPT Protocol v3.0**[1]. This protocol ensures the reproducibility and statistical validity of the results, as well as their compliance with the Gold Standard methodologies applied in clean cooking projects.

## 3. Training

A **preliminary training session** was held on **10th of October 2025**, with the participation of the carbon consultant from FairClimateFund (Victor Costenoble).

[1] Lien vers le protocole KPT v3.0 : https://cleancooking.org/binary-data/DOCUMENT/file/000/000/83-1.pdf

This training session covered the following:

- Explain the finality of the KPT
- Detail the test procedure
- Presenting the **points of attention** (consistency of weighings, observation bias, consistency of results)
- Training surveyors and households in the use of balances, moister meters, digital data collection tool (KoboCollect)
- Reviewing the survey form and harmonising it considering field practices.

A **pilot phase** was conducted from **11th of October 2025**, including **2×5 households** in Iridimi (5 “project” and 5 “baseline” households). This step made it possible to:

- Identifying field difficulties with the consultant,
- Adjusting certain questions on the form,
- Validating the procedure for the remaining households.

*Figure 2 Verification of data collected in KoboCollect by the FCF consultant*

*Figure 3 Preparation for weighing*

# 4. Survey Implementation

## a) Sampling

Project group households were selected through **random single sampling** from the KoboCollect database of registered beneficiaries. In total, **51 households** were selected. To constitute the baseline group, a **neighbouring household with comparable socio-economic characteristics (household size and housing status)** was identified for each project household, leading to an equivalent sample of **51 baseline households**. A reserve list (buffer) of 50 households was also made available in case households on the priority list were absent or refused to participate.

Tests were conducted simultaneously in both camps, with **52 households in Iridimi** et **50 à Touloum**. The geographic distribution of households is shown on the maps in Figure 5 and Figure 6

| | **Iridimi** | **Touloum** |
|---|---|---|
| Baseline households | 26 | 25 |
| Project households | 26 | 25 |
| **Total** | **52** | **50** |

*Figure 4 Household selection by camp and profile*

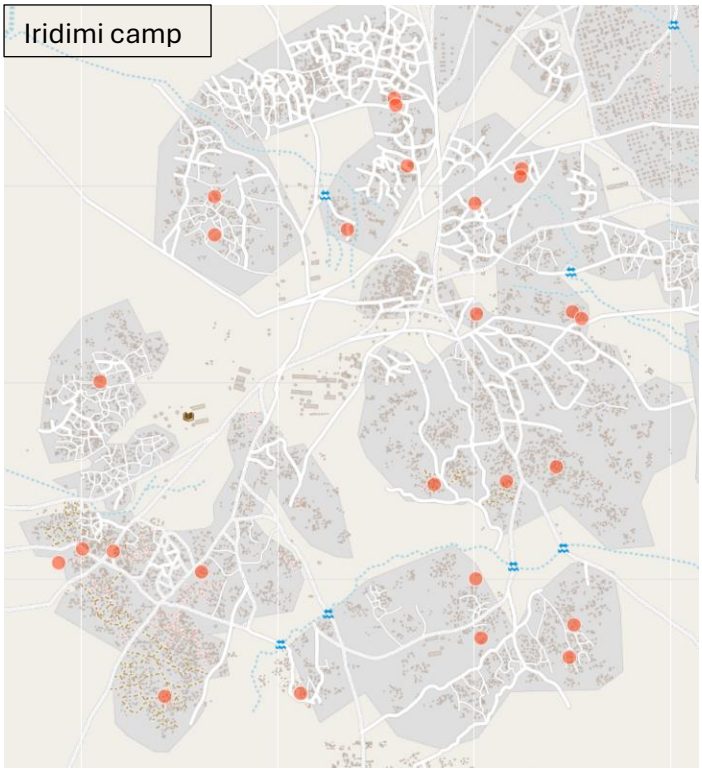


*Figure 5 Distribution of the 26 baseline households (Iridimi)*

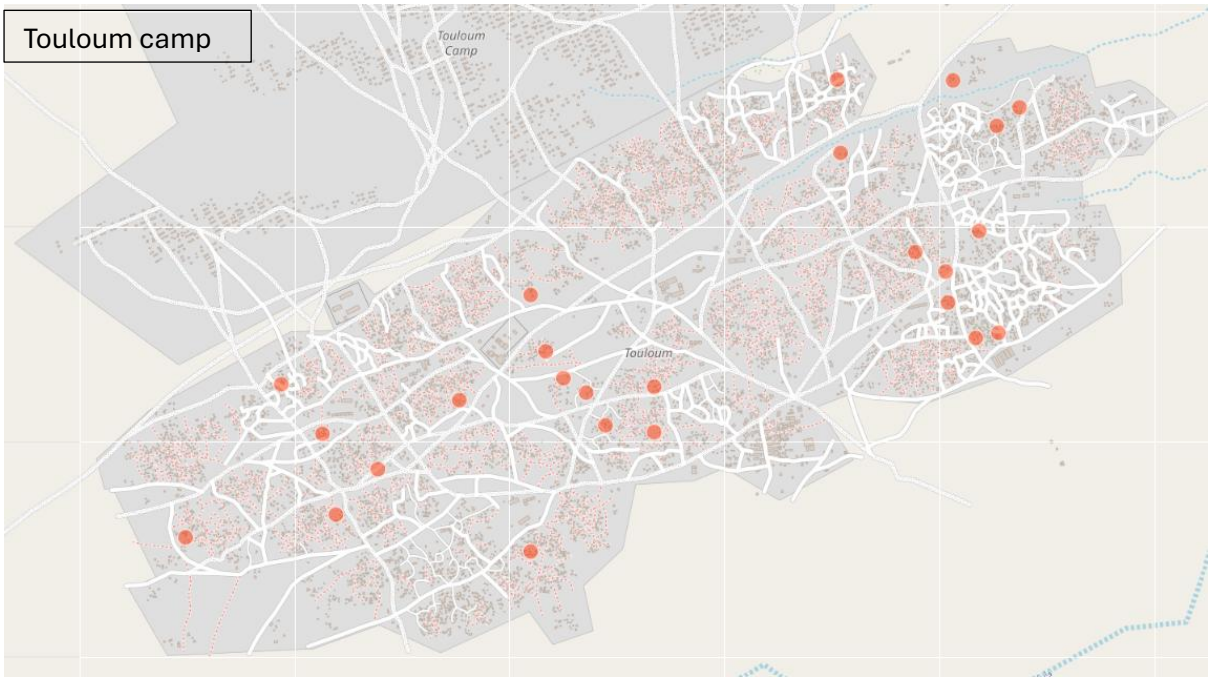


*Figure 6 Distribution of the 25 baseline households (Touloum)*

## b) Fuel Used

The firewood gathered by households for the test had extremely low moisture content: measurements taken with the moisture meter indicated almost systematically a value of **0.0 %**, indicating very dry wood at the surface. This characteristic helped to limit the influence of moisture variations on fuel consumption, thereby strengthening the precision of the results.

On the first day, called Day 0, each household gathers its main pile of wood, which has been pre-weighed by the surveyors. This pile constitutes the fuel reserve for the entire duration of the test, covering the three measurement days (Day 1, Day 2 and Day 3). The surveyors clearly explain to the households that this wood must be used exclusively for meal preparation during the test period.
In cases where the initial reserve proved insufficient for the household's actual cooking needs, an **adjustment mechanism** was provided to avoid interrupting or compromising the test. At the end of each day, immediately after the final weighing of the remaining wood, households were invited to replenish their stock if necessary, using a **reserve pile** also pre-weighed by the surveyor. Any additional wood was strictly controlled, documented, and incorporated into the calculations to faithfully reflect the household's total consumption.

### c) Adult Equivalent

The notion of **Standard Adult Equivalent (SAE)** is used in the Kitchen Performance Test (KPT) to standardise fuel consumption across households of different sizes and compositions. Rather than reporting consumption in terms of the total number of people, the SAE converts each individual into a reference unit based on their average energy needs. The weighting system applied is as follows: **children (0–14 yo) = 0.5**, **adult woman (>14 yo) = 0.8**, **adult man (14–59 yo) = 1.0**, and **old man (>59 yo) = 0.8**. This normalisation consistent with the KPT protocol enables consistent comparison of results across households and provides a more accurate estimate of specific firewood consumption.

### d) Baseline Questionnaire

For baseline group households, a **preliminary questionnaire** was administered before the start of measurements. The purpose of this questionnaire was to document usual cooking practices, the frequency and types of meals prepared, firewood sourcing methods, and household composition. This information makes it possible to contextualise the test results and ensure that households in the control group genuinely reflect traditional practices in place in both camps. Detailed results are provided in the annex. Analysis of the questionnaire highlights several significant trends. The **average household size of beneficiary households** is relatively high in both camps, at **6.65 persons per household in Iridimi** et **7.60 persons in Touloum**. Households report cooking frequently: **traditional stoves are used approximately 20 times per week**, which illustrates intensive fuel use and the need for regular firewood supply.

Results also show a strong dependence on firewood collection: **77% of households in Iridimi** et **84 % à Touloum** collect their fuel directly from the environment around the camp. At the same time, a significant proportion of households also purchase wood to supplement their needs. In Iridimi, **58% of households** buy firewood, spending on average **6,111 FCFA per week**. In Touloum, this proportion rises to **64%**, with an average weekly expenditure of **7,281 FCFA**. Finally, households spend **approximately four hours per day** on meal preparation (lighting the fire, preparation, and monitoring cooking).

# 5. KPT Results

## a) Wood Consumption

Following the pilot phase, the tests were conducted over four consecutive weeks, from Monday to Thursday, strictly adhering to the monitoring schedule for each household and the weighing procedures.
A statistical analysis was then conducted to identify outliers based on the standard threshold of **±1.5 IQR**. The retained data were also subjected to a **90/10 precision and confidence**, in accordance with the methodological requirements of KPT tests, ensuring the reliability and robustness of the final results.

Of the 102 tests conducted, some were invalidated due to data identified as outliers following the outlier analysis. The validated results cover:

- **50 tests baseline**,
- **47 project tests**.

**Table 1** summarises the final results of the 2025 KPT campaign:

| | **Baseline** | **Project** |
|---|---|---|
| No. Tests conducted | 51 | 51 |
| No. Tests validated | 50 | 47 |
| Household size (SAE) | 7.26 | 7.33 |
| Avg. consumption per person per day (kg/day) | 0.73 | 0.36 |
| Avg. consumption per capita per year (kg/year) | 266.5 | 131.4 |
| Avg. consumption per household per year (kg/year) | 1,929 | 964 |
| Precision attained | 8.12% | 9.84% |
| 90/10 assessment satisfied? | YES | YES |

*Table 1 Final results of the 2025 KPT campaign*

Average household size, expressed in Standard Adult Equivalent (SAE), is very similar between the two groups (7.26 in the baseline and 7.33 in the project group), which strengthens the relevance of the statistical comparison.

Average firewood consumption per person per day is:

- **0.73 kg/cap/day** for households using traditional stoves (basic banco or three-stone fire),
- **0.36 kg/cap/day** for households equipped with a Haines solar cooker.

The observed reduction is therefore in the order of **50 %**, corresponding to **nearly one tonne of wood saved per household per year**.

## b) Financial Savings for Households

The financial savings associated with this reduction in consumption were estimated based on the local price of 15 kg bundles of firewood in both camps. On average, households save **67 bundles per year**. Table 2 provides the calculation details.

| Data | Iridimi | Touloum |
|---|---|---|
| Weight of a bundle (KPT) | 15kg | 15kg |
| Price of a bundle (market) | 2,000 FCFA/ 3€ | 3,000 FCFA/ 4.6€ |
| Bundle savings per year | 67 | 67 |
| Savings per year | 133,333 FCFA/ 203€ | 200,000 FCFA/ 300€ |
| Savings per day | 365 FCFA/ 0,56€ | 548 FCFA/ 0,84€ |

*Table 2 Details of savings for households purchasing firewood at the market*

These savings are particularly significant in the socio-economic context of the camps, where the purchase of firewood represents a substantial share of household budgets. The reduction in fuel expenditure directly contributes to improving the economic resilience of refugee families, while reducing pressure on local natural resources.

*Figure 7 Daily weighing of the fuel pile*

# 6. Conclusion

The Kitchen Performance Test (KPT) campaign of October–November 2025 was a resounding success, both operationally and methodologically. The pilot phase, conducted beforehand, made it possible to verify the tools, adjust the questionnaire, and clarify the procedures, which

contributed to the smooth conduct of the test. The ADES team applied the protocol with seriousness and rigour, ensuring the quality of the data collected.

The results show **significant reductions in wood consumption** for households equipped with a Haines Solar Cooker, with a decrease of approximately **50 %** compared with traditional practices. These savings represent nearly one tonne of wood saved per household per year. It is reasonable to estimate that these benefits could be even greater in a scenario where households had access to **multiple solar cookers**, enabling them to cover a wider variety of meals and better adapt their daily organisation.

The KPT results confirm the eligibility of the **suppressed demand** condition applicable under RECH v5.0. The measured baseline consumption of 0.73 kg/capita/day (1,929 kg/HH/year) is significantly below the Minimum Service Level of 3,665 kg/HH/year (0.5 t/capita/year × 7.33 SAE), reflecting the fact that restricted mobility, resource depletion, and limited purchasing power prevent households from meeting their full cooking energy needs. In line with the methodology, the MSL can therefore be applied as the adjusted baseline for emission reduction calculations. These results are **statistically robust**: the 90/10 confidence-precision threshold has been met for both groups, with precisions of 8.12% (baseline) and 9.84% (project)

The operational organisation of the campaign also benefited from rigorous preparation by ADES. The team ensured household identification, visit scheduling, wood distribution, and daily data collection with consistency and reliability. This coordination, both in advance and in the field, made it possible to maintain a smooth test process and guarantee the quality of the information used for the final analysis.

From a carbon certification perspective, the results obtained **confirm the theoretical values** used so far in the project's calculations. They strengthen the credibility and soundness of the avoided emissions estimates, while fitting coherently within the applicable methodology.

Overall, this KPT campaign provides important validation of the real-world performance of solar cookers in the camps and constitutes a robust basis for the continuation of the project and the continuous improvement of its activities.

Finally, beyond the gains in wood consumption, the introduction of solar cookers also contributes to **improving the daily lives of women** in the camps. By reducing the need to collect firewood — a lengthy and sometimes risky activity — solar cookers lighten their workload, strengthen their safety, and provide them with more time for other essential activities.

*Figure 8 Women collecting firewood outside the camp (Iridimi)*

*Report prepared by Victor Costenoble, carbon consultant at FairClimateFund* (costenoble@fairclimatefund.nl)

# A. Annex: Baseline Survey Results

| | | Iridimi | Touloum |
|---|---|---|---|
| B0.1.a. Name of interviewer | Gilhoube Patallet | 16 | 15 |
| | Madjirié Baradine | 0 | 0 |
| | Mountaha Ahmat | 0 | 0 |
| | Zakaria Abdoulaye | 0 | 0 |
| | Halil Ahmat Brahim | 10 | 10 |
| | Other | 0 | 0 |
| | | 26 | 25 |
| B0.4.a. Indicate the camp | Iridimi | 26 | 0 |
| | Touloum | 0 | 25 |
| B0.6. Sex of respondent | Men | 0 | 0 |
| | Woman | 26 | 25 |
| B0.8. Total household size | | 6.65 | 7.60 |
| B0.9 Number of adults in household (individuals aged over 12) | | 3.92 | 3.80 |
| B0.10. Number of children under 12 in household | | 2.73 | 3.80 |
| B0.13.a. Types of cooker used by the household | Three-stone fireplace | 54% | 56% |
| | Banco | 50% | 44% |
| | Save80 | 0% | 0% |
| | Gaz | 27% | 20% |
| | Other | 0% | 0% |
| B0.14. Do you now use one or more solar cookers? | Yes | 0% | 0% |
| | No | 100% | 100% |
| B.0.16. Where do you usually cook? | outside | 0% | 0% |
| | inside the house/kitchen | 92% | 100% |
| | Both | 8% | 0% |
| B.0.17.a. How many times per week (7 days) do you use your cookers during the DRY season? | | 19.65 | 20.16 |
| B.0.17.b. How many times per week (7 days) do you use your cookers during the RAINY season? | | 14.54 | 15.96 |
| B.0.18.a Do you buy or collect the woodfuel ? | Collect | 77% | 84% |
| | Buy | 58% | 64% |

| | | | |
|---|---|---|---|
| B0.18.b. How many hours per week (7 days) do you spend collecting firewood? | | 14.30 | 16.52 |
| B0.18.c. If you buy firewood, how much do you spend per week (7 days) in CFA francs? | | 6,111 | 7,281 |
| B0.19.a. Are you able to buy or collect enough fuel to meet your household's cooking needs? | Yes | 4% | 8% |
| | No | 96% | 92% |
| B0.19.b. If you are unable to buy or collect enough fuel to meet your household's cooking needs, why? | Collecting wood takes too long | 85% | 68% |
| | Can't afford to buy more fuel because it's too expensive | 73% | 64% |
| B0.20. How many hours a day (24h) do you cook? | | 4.08 | 3.88 |