

Deploying modern biomass solutions for clean school cooking in Sub-Saharan Africa



WHO ARE WE?



**SUSTAINABLE
SCHOOL COOKING
PROGRAM**

WHO ARE WE?



Sustainable School Cooking Programme

An initiative of WBA, non-profit organisation promoting the sustainable development of bioenergy globally



Christian Rakos

- Ph.D in technical physics
- In the bioenergy sector since 1997
 - World Bioenergy Association, President
 - European Pellet Council, President
 - Austrian Pellet Industry Association, CEO
 - Austrian Energy Agency



Gilles Gauthier

- Master's degree in Industrial Engineering
- In the bioenergy sector since 2009
 - World Bioenergy Association
 - Hawkins Wright, consultant
 - European Biomass Association/Pellet Council, Director
 - Belgian Biomass Association, CEO
 - Agripellet producer, R&D engineer

COOKING SITUATION IN AFRICA & NEED FOR CLEAN COOKING



**SUSTAINABLE
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COOKING SITUATION IN SUB-SAHARAN AFRICA

Traditional cooking

1 billion people in Sub-Saharan Africa (+/- 80% of households), use rudimentary stoves fuelled by charcoal or firewood.

This causes severe harms:

- **Health** indoor air pollution contributing to 815,000 premature deaths annually in Africa
- **Environmental** harmful emissions (PM, CO) and high GHG
- **Socio-economic** significant time collecting fuel and preparing meals



SCHOOL COOKING SITUATION IN SUBSAHARAN AFRICA



SCHOOL COOKING - A RELEVANT ISSUE



- 1/3 of SSA population goes to school !
- School meals are key for nutrition of kids and their ability to learn
- Largest single user of firewood
- Many other institutional kitchen have the same issue: hospitals, refugee camps, prisons



CLEAN COOKING PLANS IN AFRICA

UN Sustainable Development Goal 7 (SDG 7)

Options for clean cooking (Universal Access to Clean Cooking in Africa, IEA)

- LPG
- Bioethanol
- Natural gas
- Biogas
- Electricity
- Biomass

Opportunities in **households** but also in **institutional cooking** and **process heat**.

The IEA projects that by 2040, over 230 PJ of final energy could come from modern solid bioenergy in Sub-Saharan Africa.



**CLEAN COOKING PROJECTS
USING MODERN BIOMASS**
Project experience



**SUSTAINABLE
SCHOOL COOKING
PROGRAM**

PROJECT EXPERIENCE

1st pilot project: school in Rwanda 2024

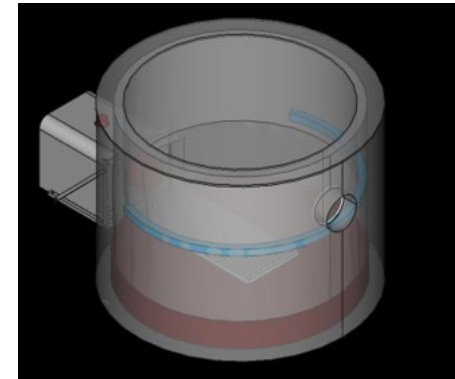
PROJECT OVERVIEW

- School: 1,300 pupils
- Funded by private donor
- Costs +/- 18,000USD
- Partners: WBA & local pellet producer Biomasters
- Retrofit: 2 pellet burners (50 kW) attached to existing firewood cookstoves + cookstove improvement
- Tests:
 - Kitchen Performance Test (firewood and pellets)
 - Efficiency (firewood and pellets)
 - Indoor air pollution (firewood and pellets)

Retrofitted 500l cookstove



Cookstove upgrade



PROJECT EXPERIENCE

1st pilot project: school in Rwanda 2024

PROJECT RESULTS

- Strong improvement of cooking conditions
- Strong reduction of emissions
- Strong improvement of fuel use/efficiency
- Reduction of meal preparation costs



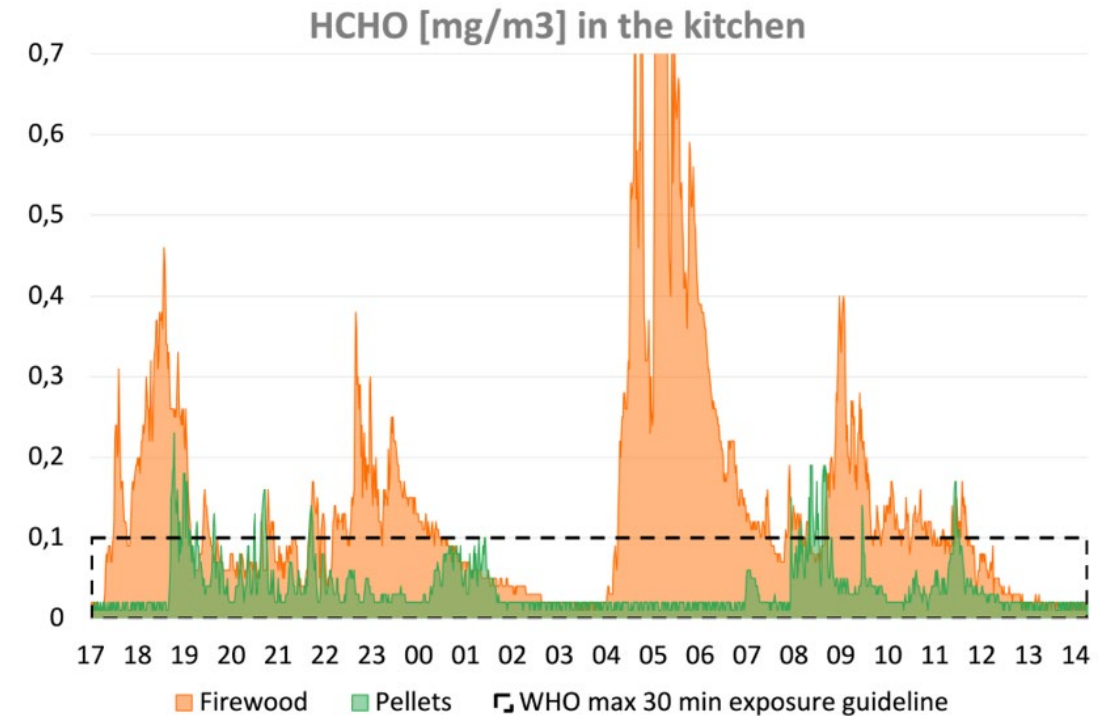
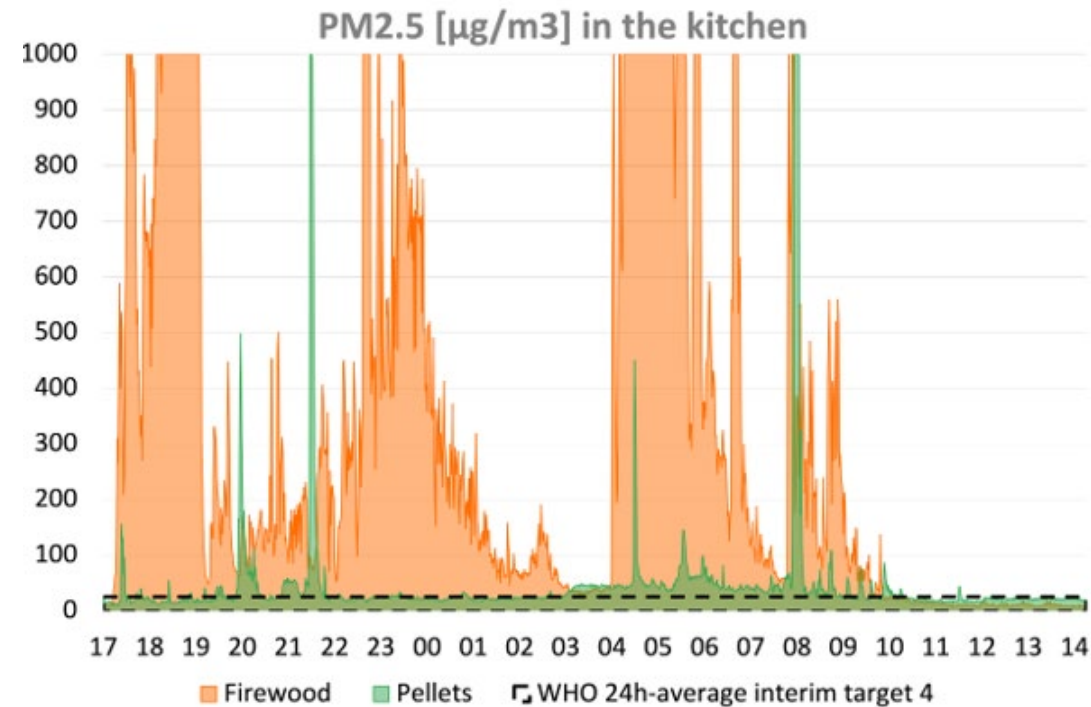
Cooking conditions improvement

- **TIME:** Significant reduction of work to prepare and stoke firewood
- **SMOKE:** Massive reduction of smoke in the kitchen
- **TEMPERATURE:** Significant reduction of ambient temperature in the kitchen
- **COMFORT:** Automatic ignition
- **REGULATION:** Easy and quick regulation of firepower
- **CLEANING:** Significant reduction of work to clean pots – 30 min
- **FOOD WASTAGE:** No burned food

PROJECT EXPERIENCE

1st pilot project: school in Rwanda 2024

Strong reduction in emissions

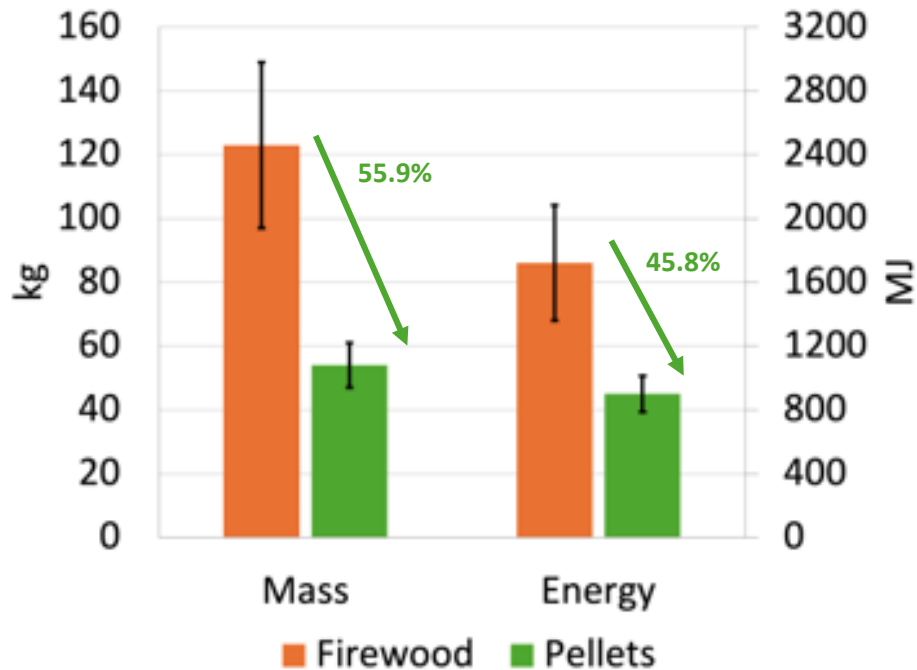


PROJECT EXPERIENCE

1st pilot project: school in Rwanda 2024

Strong reduction in fuel use

Amount of Firewood and Pellets
(- Energy) used by the school per
day



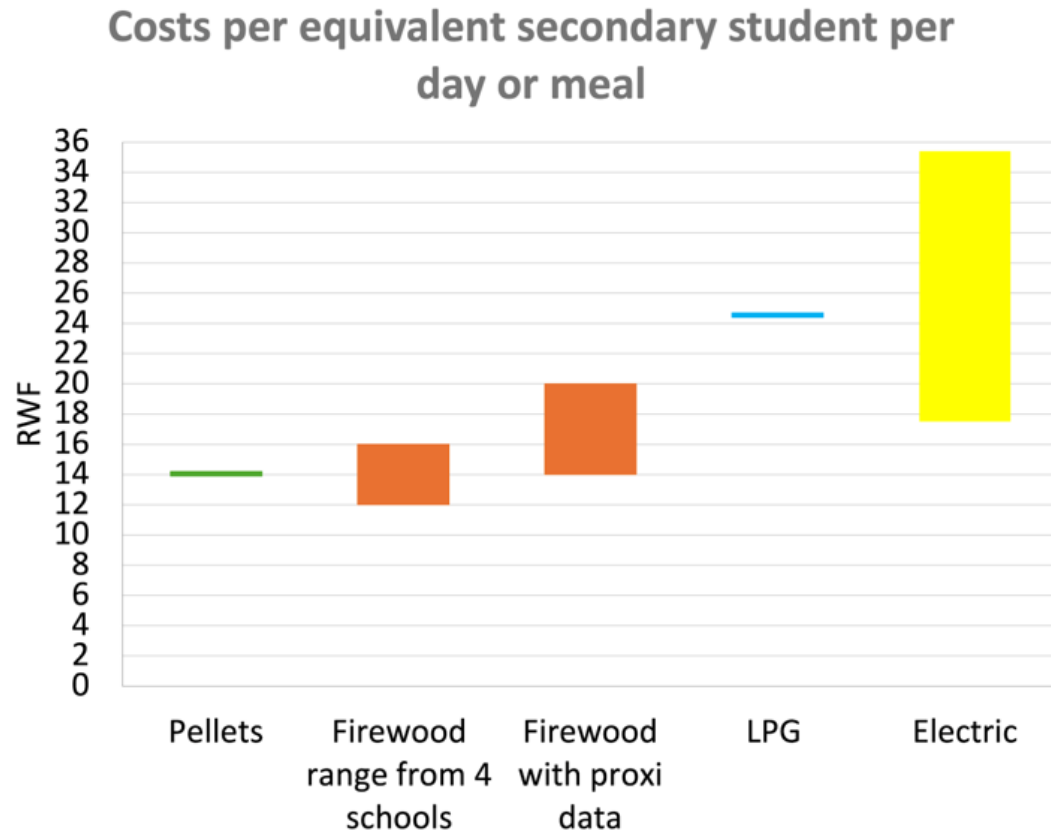
Daily Firewood and Pellets consumption
over two weeks



PROJECT EXPERIENCE

1st pilot project: school in Rwanda 2024

Reduction in energy costs preparation costs



Source: Sustainable School Cooking Program (WBA)

- The calculation only include energy costs and do not include the important labour costs saving that are obtained using pellets.
- The firewood costs are very challenging to calculate since the schools rarely properly monitor their fuel costs.

PROJECT EXPERIENCE

2nd pilot project: 10 schools in Rwanda 2025

Pellet systems (outdoor)



Pellet systems (indoor)



Stove improvement

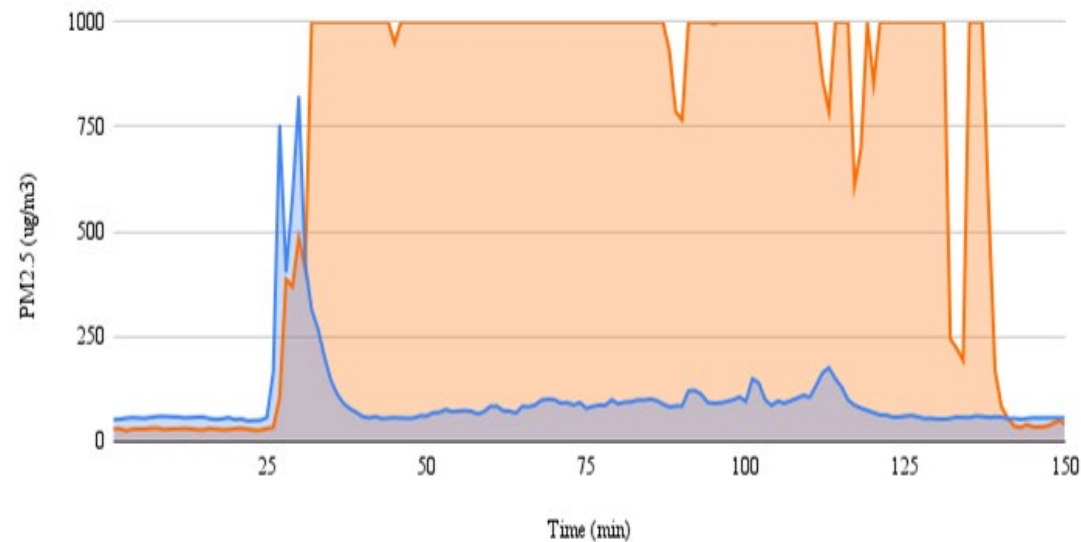


PROJECT EXPERIENCE

2nd pilot project: 10 schools in Rwanda 2025

Strong reduction in emissions

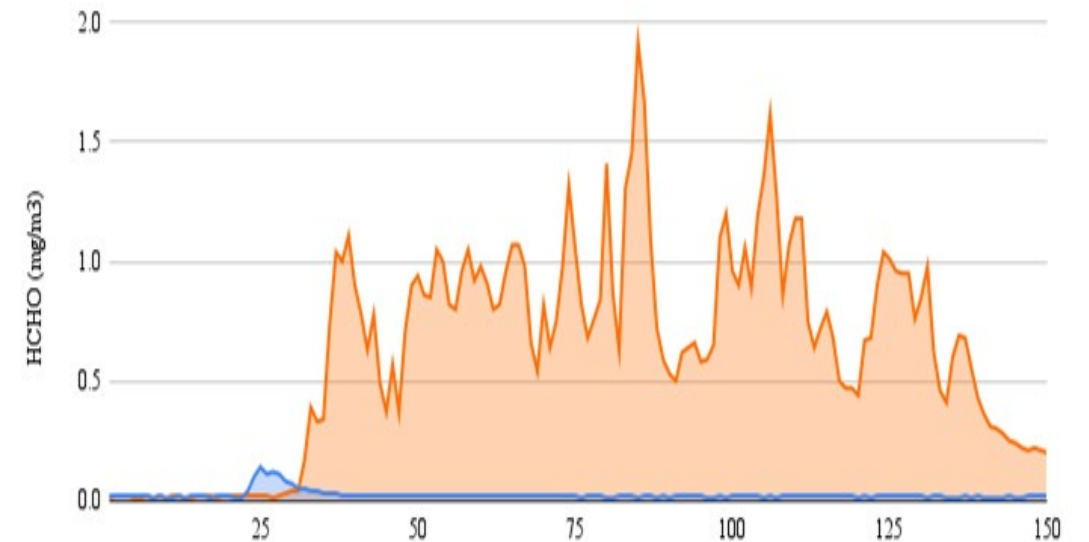
PM emissions in the kitchen



Firewood

Pellets

HCHO emissions in the kitchen

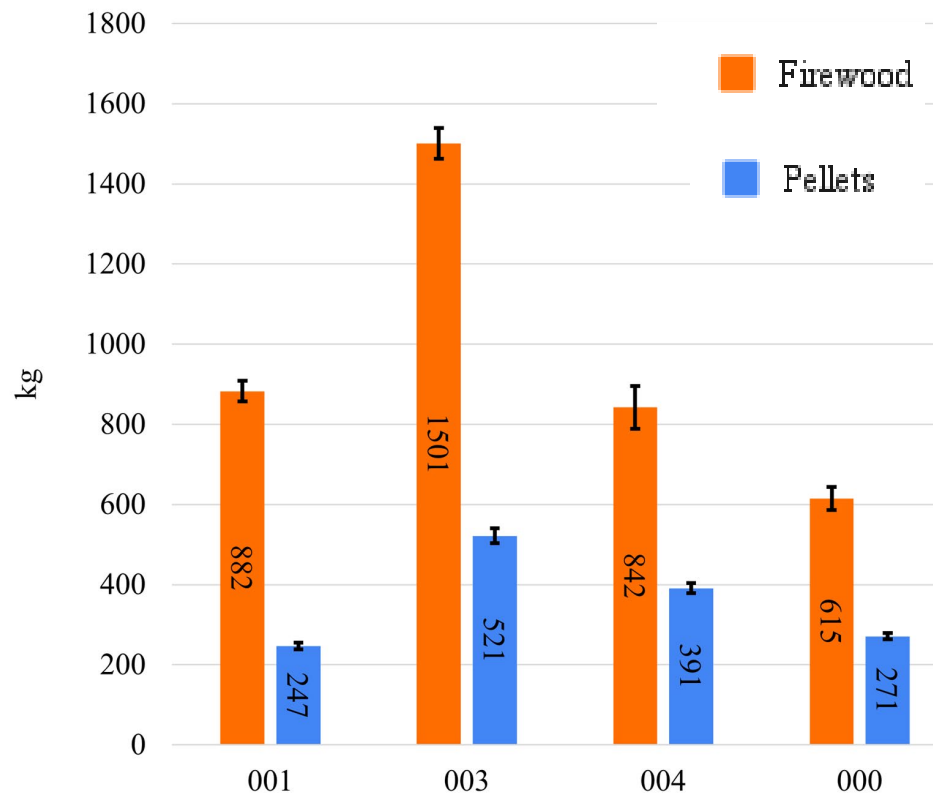


PROJECT EXPERIENCE

2nd pilot project: 10 schools in Rwanda 2025

Strong reduction in fuel use/efficiency

Weekly fuel consumption



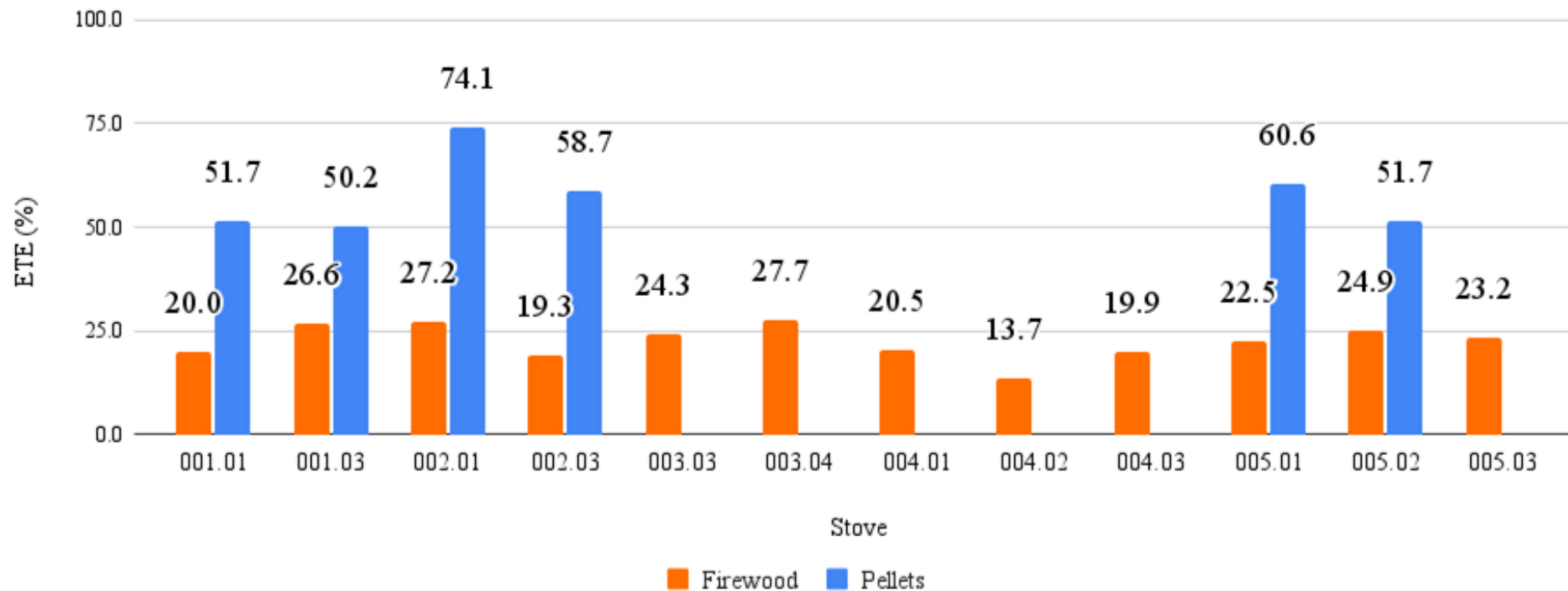
- Average reduction of 61.7% of fuel use (in weight)

PROJECT EXPERIENCE

2nd pilot project: 10 schools in Rwanda 2025

Strong reduction in fuel use/efficiency

Effective thermal efficiency per stove



PROJECT EXPERIENCE

2nd pilot project: problems that have occurred

- Technical issues led to many repair events
- Pellet length has been affecting operation –production adjusted
- A software bug led to many failures of ignition systems
- Improvements of the burners should solve these problems
- Some of the retrofitted stoves are very inadequate
- Retrofits cannot be realised in all kitchen (space requirements!) and cannot be standardized
- Burner costs (depending on purchased number) not including transport, import tariffs etc



PROJECT EXPERIENCE

Next steps in Rwanda

- MOU (250 schools) signed between Biomasters and Ministry of education
- 100 schools to be converted next year if the current pilot proves successful and funding can be secured

WBA CLEAN COOKING

Next projects



**SUSTAINABLE
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PROJECT

New pilot project in Kampala, Uganda

PROJECT OVERVIEW

- School: 600 pupils
- Funded by private donor
- Costs +/- 22.000USD
- Partners: WBA & local consultancy Vestal Energy
- Retrofit: 3 pellet burners attached to existing firewood cookstoves
- Tests:
 - Kitchen Performance Test (firewood and pellets)
 - Efficiency (firewood and pellets)
 - Indoor air pollution (firewood and pellets)



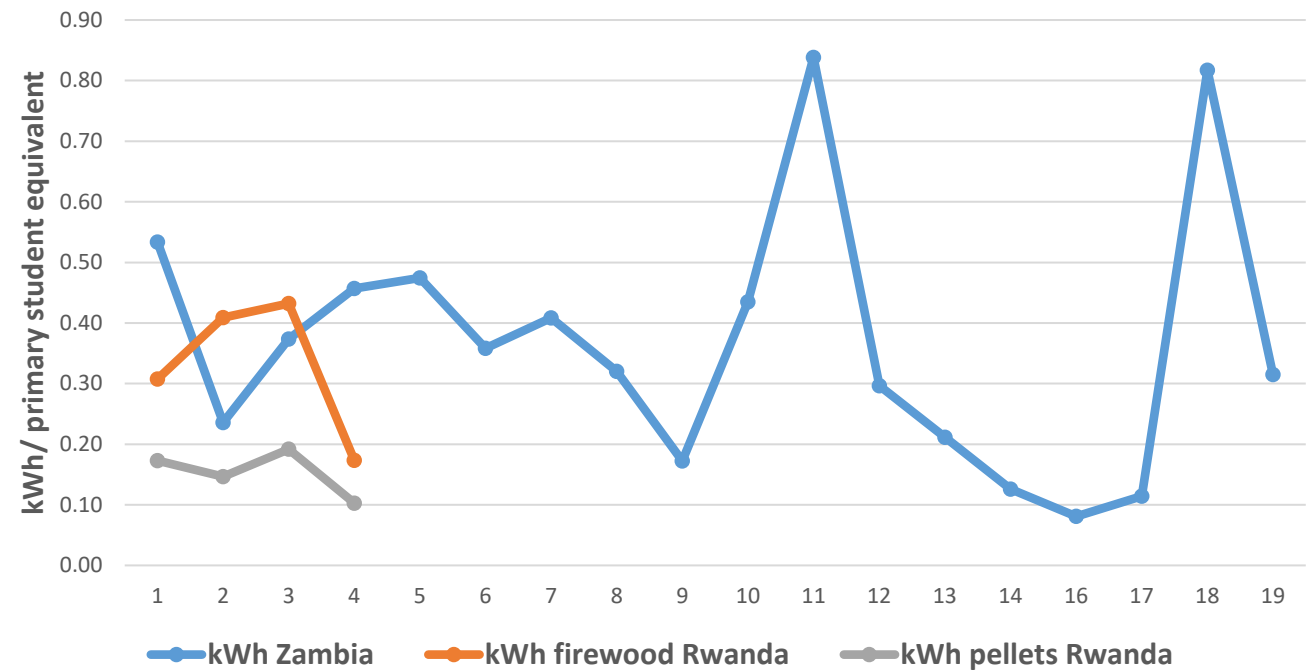
PROJECT

New pilot project in Lusaka, Zambia

- A survey has been conducted on the situation of school cooking covering 20 schools
- Most schools use charcoal and extremely primitive cooking equipment
- 3 schools will be equipped with pellet cookstoves in H1 2026 to measure the improvement



Daily energy demand for cooking per pupil



WBA CLEAN COOKING R&D



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RESEARCH & DEVELOPMENT

Adding wood chips to the portfolio

Why wood chips are interesting?

- 8t of wood needed for 1t of charcoal
- 1,3t of wood needed for 1t of dry chips. 1t of chips can replace 1t of charcoal due to efficient combustion technology
- Transitioning of charcoal production to wood chips production would reduce wood demand by a factor of **6-7** !

RESEARCH & DEVELOPMENT

Adding wood chips to the portfolio

- Chipping of wood, bamboo or invasive bushes is a lot easier to realize and cheaper than pelletization
- Crushed nutshells are another option
- Dedicated burners for chips have been developed in Vietnam for green tea processing
- Adaptation for institutional cooking is under way



RESEARCH & DEVELOPMENT

Adding wood chips to the portfolio

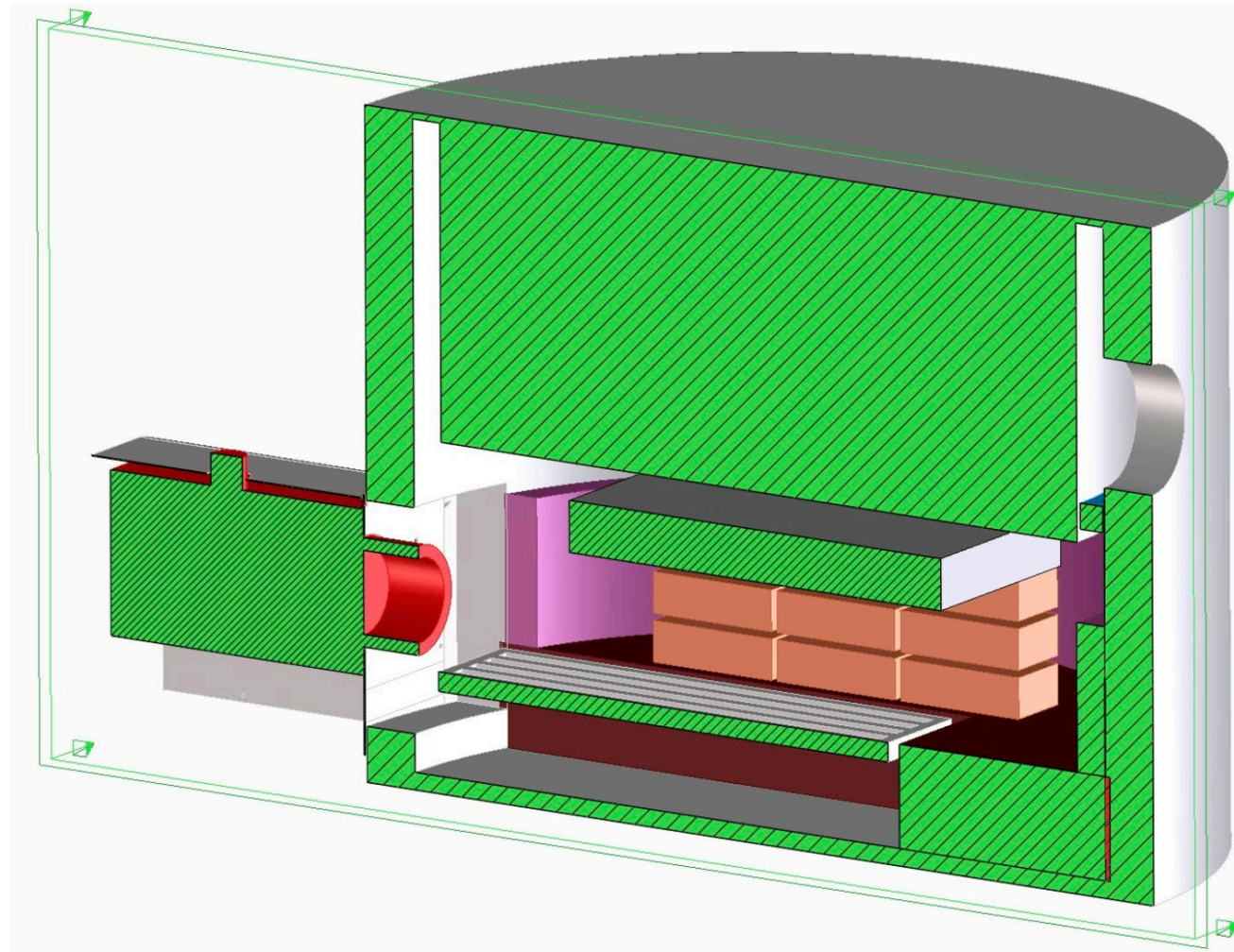
Concept for a chipping operation

- Operation by charcoal producers
- Small shed with PV covered roof, located close to wood resource
- Electric driven robust chipper (20kW)
- Drying of chips by spreading out in the sun
- Packaging and transport similar as charcoal (large bags)
- R&D project for a simple robust technical concept is under way, economic simulations are very promising

RESEARCH & DEVELOPMENT

High efficiency new-built pellet stoves

- Development of a high efficiency dedicated pellet fired cookstove
- Target efficiency is 80%
- Construction has been finalized by technology leading company Ökofen in a pro bono project
- First prototype will be built and tested in Q1 2026



RESEARCH & DEVELOPMENT

Simplified polyfuel burners



OUR OFFERING



**SUSTAINABLE
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OUR OFFERING

- **PERFORMANCE TEST:** comprehensive testing of the performance of cooking stoves (initial set-up)
- **SUPPLY:** supply of state-of-the-art equipment and engineering on fuel production (chips or pellets)
- **PROCUREMENT:** support in fuel procurement (chips or pellets)
- **RETROFITTING:** retrofitting kitchen currently using firewood/charcoal
- **NEW SYSTEMS:** installation of built high-efficient pellet cookstoves for new kitchen
- **STAFF TRAINING:** training of local staff both for the operation and maintenance of biomass systems
- **PERFORMANCE TEST:** comprehensive testing of the performance of cooking stoves (new system)



Thank you for your attention

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An initiative of the World Bioenergy Association