ATBU_EcoFlame: Clean Bio-Coal Energy from Waste with a Smart Stove & Power Generator

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Date obtained:	18th February 2017
Area of doctoral thesis:	Bioenergy Systems (Biofuels)
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EcoFlame: Clean Bio-Coal Energy from Waste with a Smart Stove & Power Generator

Objectives of the Commercialization:

i. **Transform Waste, Preserve Health**: Convert municipal, domestic, non-food, non-feed and agro-wastes into clean energy through thermochemical processes for a healthier environment.

ii. **Clean Heat for Every Home**: Advance solid fuel combustion systems to expand access to safe, efficient cooking and heating solutions in Nigeria.

iii. **Powering Decarbonised Living**: Drive the adoption of fossil-free, durable, and energy-efficient appliances that support Nigeria's renewable and net-zero energy goals.

Area of Focus: Renewable Energy and Sustainability

Expected Benefits of the Product to the Nigerian economy

i. Creates jobs and wealth through waste-to-fuel value chains, boosting local enterprises.

ii. Reduces dependence on imported fossil fuels, conserving foreign exchange and strengthening energy security.

iii. Expands access to affordable, clean, and sustainable energy, especially in rural communities.

iv. Mitigates waste accumulation, deforestation, and emissions, fostering cleaner and greener environments.

v. Improves public health by reducing indoor air pollution and related respiratory diseases.

vi. Promotes innovation, local manufacturing, and research in renewable energy technologies.

vii. Supports Nigeria's transition to a low-carbon economy and advances national and global climate goals.

Innovation Stage

- Customer Readiness Level (CRL): CRL 5 – Established interest for product and relations with target customers
- Technology Readiness Level (TRL): TRL 7 – Technology prototype demonstration in an operational environment.
- Team Readiness Level (TMRL): TMRL 3 – A few of necessary competencies/resources are present. Defined needed competencies/resources (and plan for funding)

- Business Readiness Level (BRL): BRL 5 – Parts of business model tested on market and canvas updated. First version of revenue model incl. pricing hypotheses. Verified competitive position/uniqueness through market feedback.

- Intellectual Property Readiness Level (IPRL): IPRL 7 – All relevant IPR filed (e.g. additional patents). Patent entry into national/regional phase.

- Funding Readiness Level (FRL): FRL 4 – Good pitch and short presentation of the business in place. Plan in place with different funding options over time.

FEASIBILITY STUDY AND BUSINESS STRATEGY REPORT BIO-COAL & ECOFRIENDLY STOVE BUSINESS

1. Executive Summary

This report introduces a patented, eco-friendly self-ignition solid fuel stove and smokeless bio-coal technology to address Nigeria's widespread lack of access to clean cooking fuels. This reworked feasibility and strategy report preserves the original financials (startup capital: ₦37,400,000; Year 1 projected revenue: ₦43,200,000; average stove price: ₦245,000) and deepens the operational, commercial, and investment-readiness narrative.

Key points:

• Startup capital (total first-year budget): ₦37,400,000

• Projected Year 1 revenue: ₦43,200,000

• Average stove sales price: ₦245,000

• Bio-coal price range: ₦65,000 – ₦90,000 per ton

• IRR (as originally estimated): 22–25%

This document provides a structured go-to-market plan, operational roadmap, monitoring framework, detailed budget tables, and prioritized recommendations to accelerate product-market fit and investment readiness.

2. Problem Statement & Rationale

Nigeria faces a critical clean-cooking and energy challenge: over 140 million citizens lack access to modern clean fuels, with large segments of the population dependent on fuelwood and charcoal. These practices drive deforestation, contribute to indoor air pollution and respiratory illness, and create gendered burdens as women and children spend significant time collecting fuel. LPG remains out of reach for many households due to high cost and distribution gaps. Our technology addresses this systemic gap with a locally manufacturable stove and smokeless bio-coal alternative.

3. Business Description

Product suite and technical profile:

• Self-ignition solid fuel stove (patented): designed for reliable ignition, high thermal efficiency, and reduced smoke emissions. Durable materials configured for local manufacturing.

• Smokeless bio-coal: densified biomass briquettes / biochar-like fuel designed for long burn time, low smoke, and competitive pricing relative to charcoal/coal.

Company model and locations:

• Legal structure: Private limited company (positioned to access grants and concessional lending channels).

• Initial operations: Production hubs planned near Bauchi (biomass feedstock access) and Lagos (market & distribution gateway), with phased national roll-out.

4. Market Analysis

4.1 Industry context

The cooking fuel market in Nigeria is large and fragmented. With over 140 million people lacking access to clean fuels, demand for affordable, low-smoke solutions is significant. Key competitors include traditional fuelwood, imported charcoal, and LPG providers.

4.2 Target segments (prioritised)

Priority target segments:

• Urban and peri-urban middle- to low-income households seeking lower-cost cooking alternatives.

• Institutional buyers: schools, small restaurants, hostels, and community kitchens seeking bulk fuel and reliable stoves.

• Retailers and small shops: last-mile distribution partners and resale networks.

• NGOs and government programmes: off-grid and clean-cooking subsidy programmes as strategic partners.

4.3 Value proposition & pricing dynamics

Our proposition is a combined hardware + fuel solution: a durable, efficient stove (avg price ₦245,000) paired with smokeless bio-coal sold competitively at ₦65,000–₦90,000/ton. This pricing targets households that find LPG expensive but want cleaner fuel than fuelwood or traditional charcoal.

4.4 SWOT

Strengths:

• Patent protection and proprietary stove design.

• Local biomass sourcing reduces currency-exposed input costs.

• Dual revenue model (stove sales + recurring fuel sales).

Weaknesses:

• High up-front CAPEX needs: production machinery and initial inventory.

• Consumer price sensitivity—purchase of ₦245k stove may require financing options for broad adoption.

Opportunities:

• Government and donor interest in clean cooking interventions and climate finance.

• Institutional procurement channels and bulk contracts for schools and canteens.

Threats:

• Informal charcoal/wood sellers competing on price and entrenched behaviors.

• Input price volatility (transport, biomass collection) and macroeconomic inflation.

5. Business Strategy & Revenue Model

5.1 Strategic priorities (first 24 months)

1. Pilot & validation: Establish a regional pilot (Bauchi or Lagos) focused on product iteration, user feedback collection, and lab-based emissions testing.

2. Finance-enabled adoption: Launch consumer financing (PAYG or micro-loans) to reduce upfront friction for ₦245,000 stoves.

3. Institutional sales: Secure at least 3 institutional off-take agreements (schools, canteens, hostels) to stabilise volume and cash flow.

4. Retail partnerships: Onboard a network of retailers and aggregators for last-mile distribution.

5. R&D & certification: Complete durability and emissions testing, and pursue certification where relevant.

5.2 Revenue streams and monetisation

• One-time stove sales (Avg price ₦245,000).

• Recurring bio-coal sales (priced ₦65k–₦90k/ton) and subscriptions for steady cashflow.

• Institutional bulk sales and service contracts (maintenance, training).

• After-sales parts & service (replacement components, warranty extensions).

6. Operational Plan & Supply Chain

Production and sourcing

• Raw materials: locally-sourced biomass feedstock for bio-coal; stove components sourced from local metal workshops and suppliers.

• Manufacturing setup: modular production line for stoves and a briquetting/densification line for bio-coal placed in proximity to biomass sources to reduce transport costs.

Quality & compliance

• Implement quality assurance labs for fuel calorific value, moisture content, and smoke/emissions testing.

• Ensure compliance with relevant Nigerian standards and prepare documentation for procurement by public/institutional buyers.

Logistics & distribution

• Hybrid distribution: direct-to-consumer in urban centers, retailer networks in peri-urban areas, and institutional delivery for bulk buyers.

• Inventory policy: rolling buffer stocks with 2–4 weeks of safety stock for critical inputs and finished bio-coal.

Staffing & organization

• Core team: CEO, Technical Lead, Production Manager, Sales & Partnerships Manager, Finance Manager, QA & Compliance Officer.

• Initial staffing plan focuses on production technicians, a small sales team, and one field engineer per hub.

7. Financial Plan (figures retained)

7.1 Summary of core financial figures (retained exactly):

• Total estimated first-year budget (startup): ₦37,400,000

• Projected Year 1 revenue: ₦43,200,000

• Average stove sales price: ₦245,000

• Cost per eco-friendly stove production: ₦120,000 (estimated)

• Cost per ton bio-coal production: ₦70,000 (estimated)

• Monthly operating costs (as stated): ₦3,000,000

• Monthly bio-coal profit (pilot stage): ₦3,600,000

• Year 1 estimated profit: ₦43,200,000

7.2 Detailed Use of Funds (CAPEX & immediate costs):

Item	Amount (₦)
Production equipment and machinery (for stove and bio-coal)	₦15,000,000
Research & Development (patents, prototypes, testing)	₦5,000,000
Facility rental and setup (factory, warehouse) - yearly	₦3,600,000
Initial inventory of raw materials (biomass, stove parts)	₦5,000,000
Office equipment and furniture	₦1,000,000
Legal, licensing, and patent fees	₦1,000,000
Contingency (10% of total budget)	₦3,000,000

7.3 Operating expense assumptions (as provided):

Expense	Monthly (₦) / Yearly, where applicable
Salaries & wages (production, sales, admin)	2,000,000 / month
Utilities (electricity, water, internet)	300,000 / month
Logistics & distribution	500,000 / month
Maintenance & repair	200,000 / month
Marketing & promotion	1,000,000 / year

7.4 Pricing & COGS (as provided):

Item	Value (₦)
Cost per eco-friendly stove production	120,000
Cost per ton of bio-coal production	70,000
Stove retail price range	150,000 - 340,000
Average stove price (used in projections)	245,000
Bio-coal retail price range	65,000 - 90,000 per ton

8. Break-even & Business Viability

The original feasibility suggested a break-even at approximately 3,000 stoves sold per year, with bio-coal contracts stabilizing cash flow. Given the high stove price point (₦245,000), achieving volume relies on financing partnerships, institutional contracts, and strong retailer networks. A structured approach to reach break-even: secure 3–5 institutional buyers in Year 1, and run targeted consumer financing pilots.

9. Implementation Plan & Timeline (12 months)

Phase	Key Activities	Duration (Months)	Deliverables / KPI
Phase 0 – Fundraising & Setup	Finalize financing, sign facility leases, procure equipment, recruit core team	Months 0-2	₦37.4M secured; facility ready; equipment procured
Phase 1 – Pilot Production & Market Validation	Produce a pilot batch of stoves and bio-coal, run household trials, and emissions testing	Months 3-6	200+ household trials; QA & emissions report
Phase 2 – Early Commercialisation	Scale production, onboard retailers, pilot consumer finance schemes	Months 7-9	Retail network onboarded; 500+ stoves sold; first institutional contracts
Phase 3 – Expansion & Institutional Sales	Expand distribution nationally, accelerate institutional off-take, optimize operations	Months 10-12	3 institutional contracts; monthly bio-coal revenue stable

10. Key Performance Indicators (KPIs) & Monitoring

Suggested KPIs (monthly & quarterly tracking):

- Units of stoves sold (monthly)
- Tons of bio-coal sold (monthly)
- Revenue (monthly & YTD)
- Gross margin per stove and per ton of bio-coal

• Customer Acquisition Cost (CAC) and Payback Period

• Institutional contracts signed and retention

• Product returns/failures and warranty claims

• Emissions performance vs baseline (indoor PM2.5 reduction)

11. Risk Analysis (Matrix) & Mitigations

Risk	Likelihood	Impact	Primary Mitigation
Raw material & transport price volatility	High	High	Negotiate fixed-price supplier contracts; localize feedstock sourcing; maintain buffer stock
Low consumer uptake due to the upfront price	Medium	High	Offer PAYG, microfinance partnerships, or rent-to-own schemes
Operational disruptions (power, logistics)	High	Medium	Install generator/solar backup; diversify logistics partners; buffer inventory
Regulatory or certification delays	Medium	Medium	Engage early with regulators; allocate legal/compliance budget; third-party testing
Competition from informal charcoal vendors	High	Medium	Customer education: highlight total cost of ownership & health benefits; subsidized pilots

12. Environmental & Social Impact

NASENI's combined hardware + fuel solution delivers measurable environmental and social outcomes:

• Reduced deforestation pressure through the substitution of fuelwood.

• Indoor air quality improvements and consequent public health benefits.

• Local job creation via production facilities and distribution network; emphasis on women and youth employment.

• Potential to access carbon finance streams pending MRV (measurement, reporting and verification) of avoided emissions.

13. Strategic Recommendations (Prioritised)

High-priority (Immediate - Months 0-3):

1. Lock funding: Finalize the ₦37,400,000 funding package and open a dedicated project account with ring-fenced disbursement tranches tied to milestones.
2. Pilot validation: Run a focused pilot (200+ households) including emissions testing and detailed user feedback to validate product-market fit.
3. Consumer finance partnerships: Approach microfinance providers and fintech PAYG platforms to design a financing product for the ₦245k stove.

Medium-term (Months 4-9):

1. Institutional sales push: Target schools, hospitals and corporate canteens for bulk off-take contracts.
2. Retail & last-mile distribution: build retailer incentives and commission structures for stockists and resellers.
3. Operational efficiency: reduce COGS through supplier consolidation and process improvements (lean manufacturing principles).

Long-term (Months 10-36):

1. Market expansion: replicate production hubs in new regions and create franchise/assembly partnerships.
2. Carbon & ESG: prepare MRV protocols to access carbon finance and explore grant funding for social impact.
3. Product line diversification: smaller/lower-cost stove variants, and larger institutional units.

Appendices

Appendix A — Detailed Budget Summary (as provided)

Capital Expenditure (CAPEX):

• Production equipment and machinery (for stove and bio-coal): ₦15,000,000

• Research & Development (patent, prototypes, testing): ₦5,000,000

• Facility rental and setup (factory, warehouse): ₦3,600,000/year

• Initial inventory raw materials (biomass feedstock, stove parts): ₦5,000,000

• Office equipment and furniture: ₦1,000,000

Operating Expenses (OPEX):

• Salaries and wages (production staff, sales, admin): ₦2,000,000/month

• Utilities (electricity, water, internet): ₦300,000/month

• Marketing and promotion: ₦1,000,000/year

• Logistics and distribution: ₦500,000/month

• Maintenance and repair: ₦200,000/month

Cost of Goods Sold (COGS):

• Cost per eco-friendly stove production: ₦120,000 (estimated)

• Cost per ton bio-coal production: ₦70,000 (estimated)

Revenue Projections:

• Average stove sales price: ₦245,000

• Bio-coal sales profit per ton: ₦180,000/month (pilot stage)

• Monthly bio-coal profit: ₦3,600,000

• Year 1 estimated profit: ₦43,200,000

Miscellaneous:

• Legal, licensing, and patent fees: ₦1,000,000

• Contingency fund (10% of total budget): ₦3,000,000

Total estimated first-year budget: ₦37,400,000 excluding revenue

Prepared by: NASENI Business Planning Team (reworked with consultant recommendations)

Table 1:Income Sheet

INCOME STATEMENT	Year 1	Year 2	Year 3
Sales Revenue	43,200,000	56,160,000	73,008,000
less: Cost of Goods Sold (COGS)	21,600,000	28,080,000	36,504,000
GROSS PROFIT	21,600,000	28,080,000	36,504,000
Gross Margin	50%	50%	50%
less: Sales & Marketing	1,000,000	1,200,000	1,440,000
Wages, Payroll taxes & Benefits	24,000,000	26,400,000	29,040,000
G&A	3,600,000	3,960,000	4,356,000
Utilities	3,600,000	3,960,000	4,356,000
R&D	5,000,000	2,500,000	2,500,000
Professional fees/Licenses	1,000,000	1,000,000	1,000,000
Depreciation	0	0	0
Total Operating Expenses	38,200,000	39,020,000	42,692,000
Net profit before taxes	5,000,000	17,220,000	30,000,000
Operating Margin	11.57%	30.67%	41.09%
Income taxes (30%)	1,500,000	5,166,000	9,000,000
Net Operating income	3,500,000	12,054,000	21,000,000
EBITDA	3,500,000	12,054,000	21,000,000

Table 2: Start-Up Capital (CAPEX)

Item	Amount (₦)
Production equipment & machinery (stove + bio-coal)	15,000,000
Research & Development (patents, prototypes, testing)	5,000,000
Facility rental & setup (yearly)	3,600,000
Initial raw materials (biomass, stove parts)	5,000,000
Office equipment & furniture	1,000,000
Legal, licensing & patent fees	1,000,000
Contingency (10% of total budget)	3,000,000
Total CAPEX	37,400,000

Table 3:Startup Budget

Monthly Costs	No of Months	Monthly Cost (₦)	Total Cost (₦)
Wages/payroll taxes	12	2,000,000	24,000,000
Utilities	12	300,000	3,600,000
Logistics & Distribution	12	500,000	6,000,000
Maintenance & Repair	12	200,000	2,400,000
Marketing & Promotion	12	83,333	999,996
Total OPEX (Year 1)			36,999,996

Table 4: Break Even Points

Metric	Value
Selling price per stove	245,000
Unit cost per stove	120,000
Contribution margin per stove	125,000
Fixed costs/year	37,000,000
Breakeven units/year	296
Breakeven sales (₦)	296 × 245,000 → 72,520,000

Table 5: Assumption

Item	Price
Stove price	₦245,000
Stove unit cost	₦120,000
Bio-coal price	₦65,000–₦90,000/ton (avg ₦77,500)
Bio-coal unit cost	₦70,000/ton
Year 1 stove sales	500 units
Year 1 bio-coal sales	480 tons
Sales growth	30% annually
OPEX growth	10% annually
Tax rate:	30%
Initial CAPEX	₦37,400,000

EcoFlame: Clean Bio-Coal Energy from Waste with a Smart Stove and Power Generator

Dr Isah Yakub Mohammed (PI)

Prof Lawal Garba Abubakar

Prof Mohammed Ahmed Bawa

Prof Yousif Abdalla Abakr

Dr Obichi Obiajunwa

Engr Liman Haliru

Engr Nafisatu Abdulhamid Abubakar

The Problem

140 Million have no access to clean cooking fuels and cooking technology

Cooking gas is expensive

Fuelwood: desertification, emission of CO_2 and eventual global warming

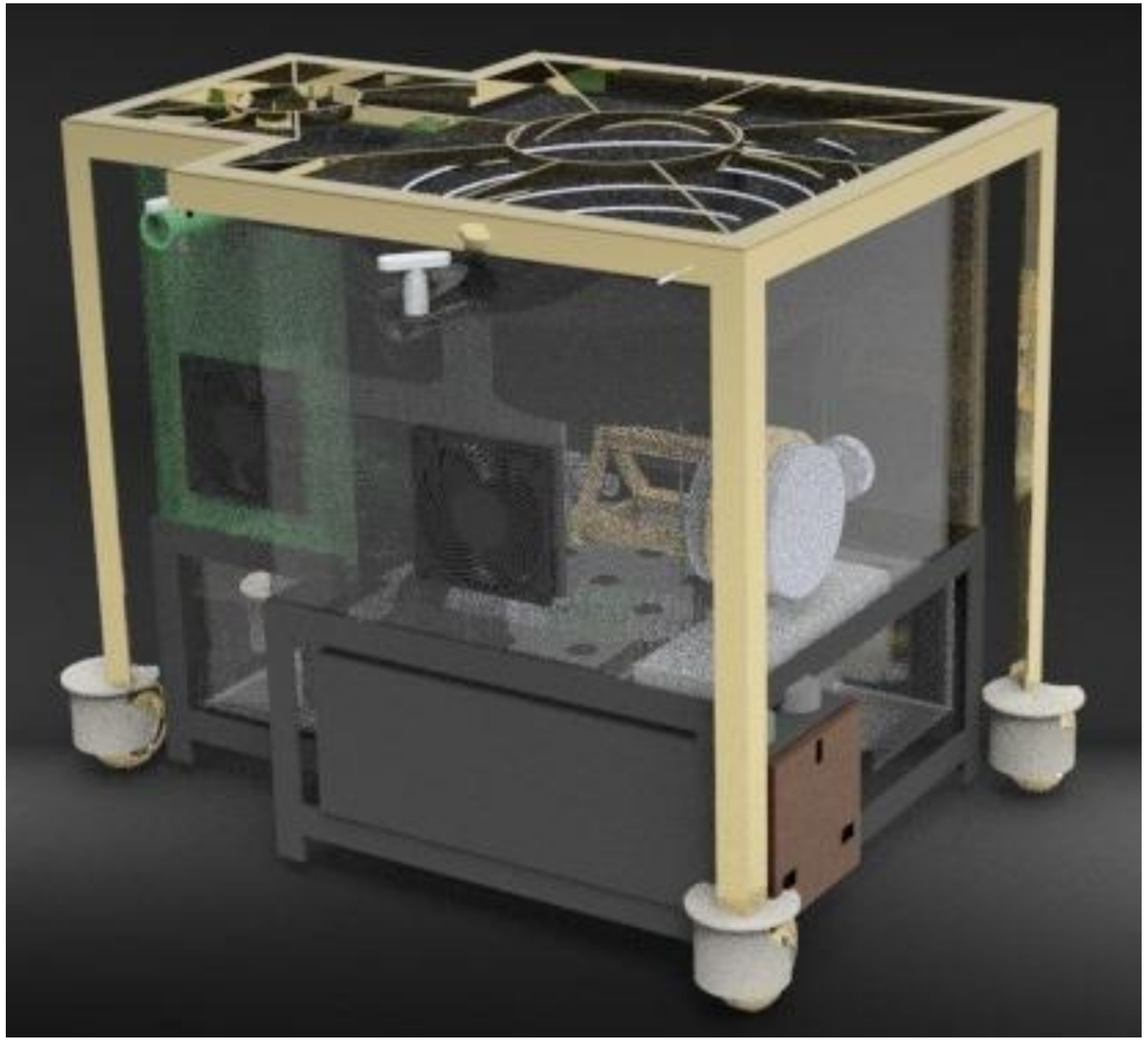
The Solution

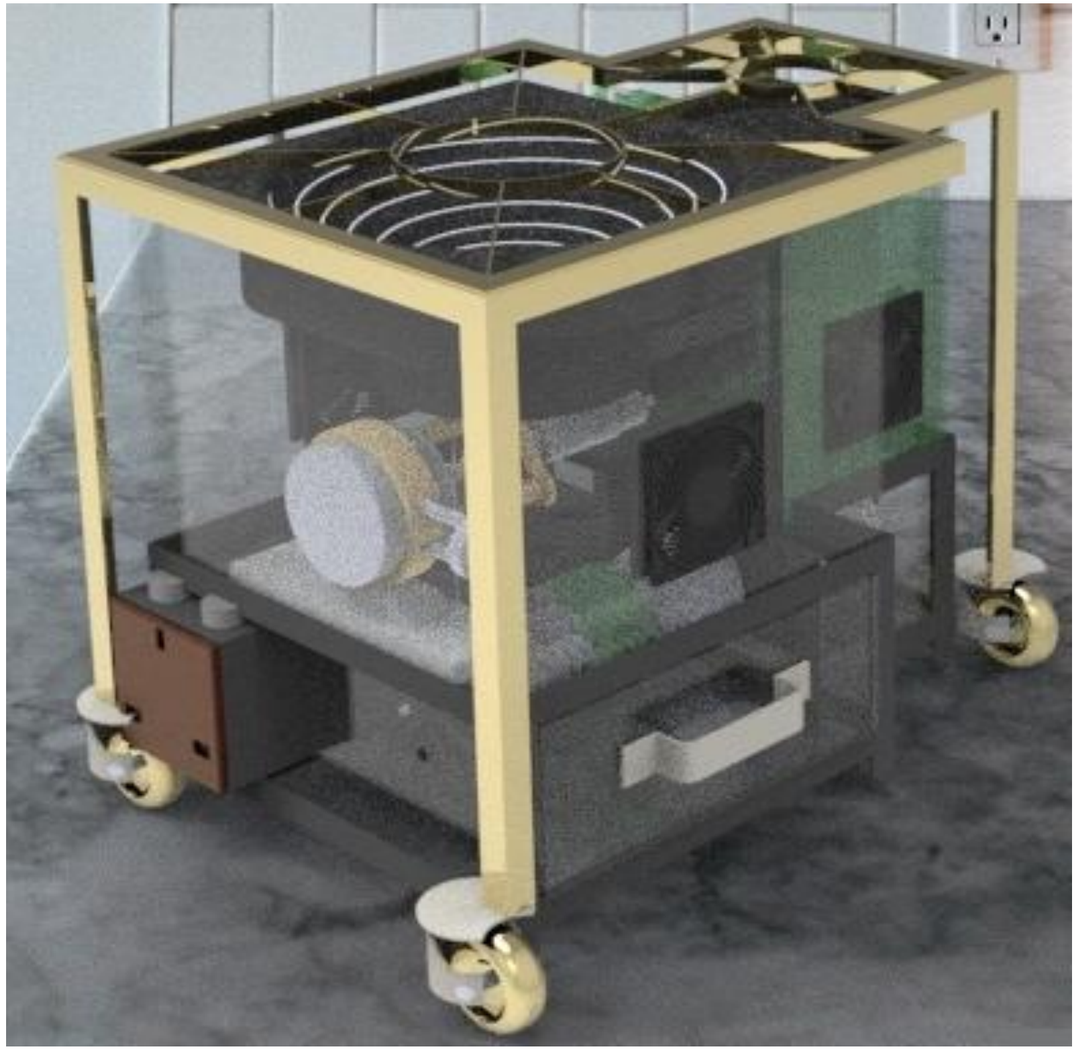
Providing Clean Energy for Cooking and Heating and saving money

Smokeless & Ashless Bio-coal

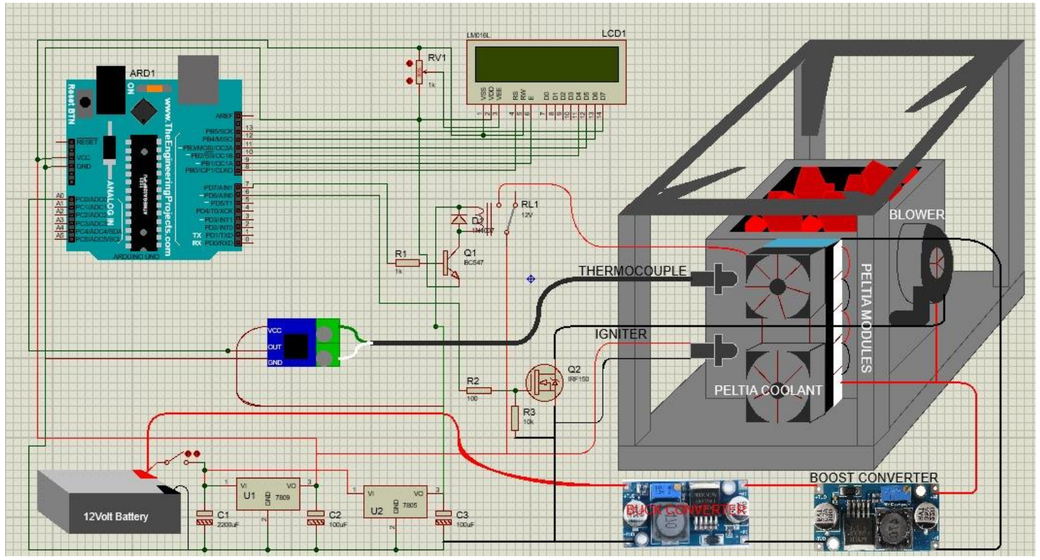
Climate-friendly solid fuel Stove and Electricity generator

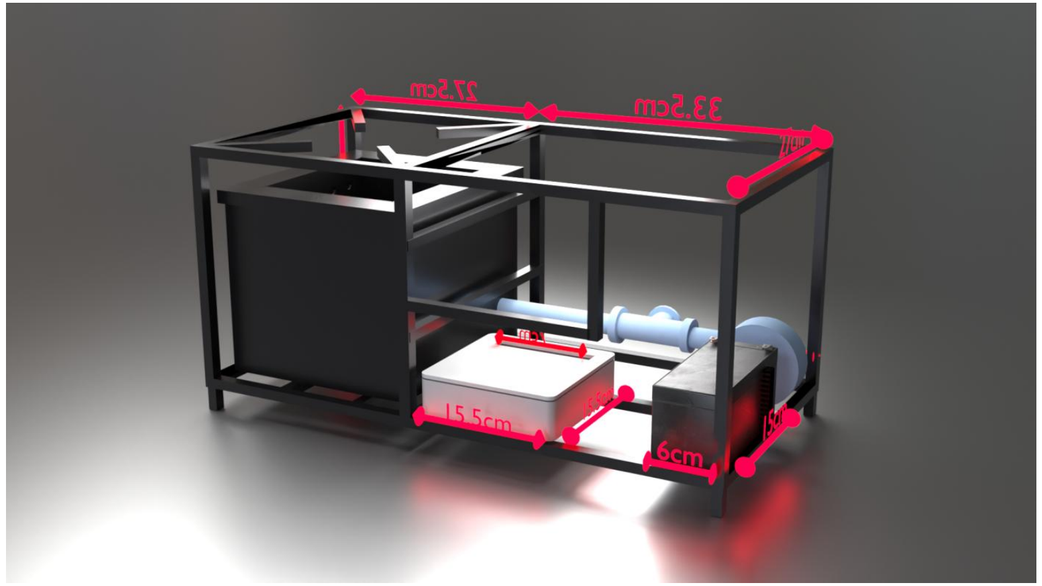
Climate Friendly Stove and Electricity Generator

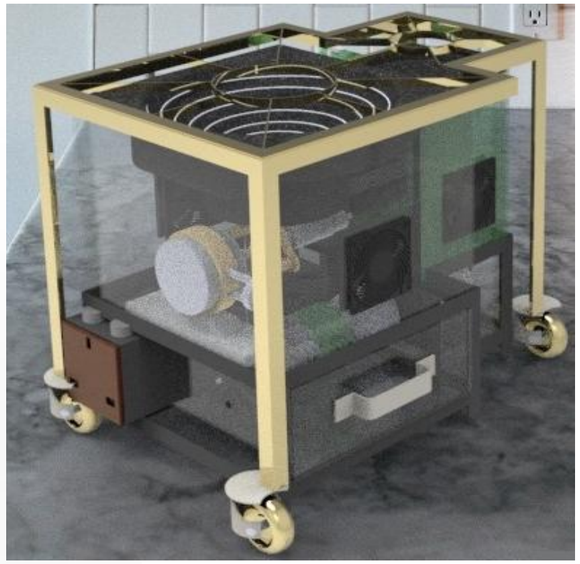




One Technology: Three Sustainable Solutions for African homes







One Technology: Three Sustainable Solutions for African homes

Why This Solution?

Affordable Clean and efficient energy

- Burns longer than regular coal
- 80% More energy
- 20-30% reduced cost

Easy to use

- Does not require manual ignition from external sources
- Flexible Controlled & efficient fuel combustion

Safe and unharmful

- Safe and reliable cooking and heating solutions
- both indoor and outdoor applications
- Generate electricity

The business model

Our offering is a bundle deal plan comprised of 2 elements:

1. The eco friendly stove for ₦150,000-₦340,000 as at February 2024
2. Bio coal subscription plan according to weekly needs

While the cost of our stove is 15-30% higher than the non eco friendly alternative products, our bio coal is cheaper alternative to coal and cooking gas.

Profit per 1 ton of bio coal sales produced daily in pilot stage: ₦180,000

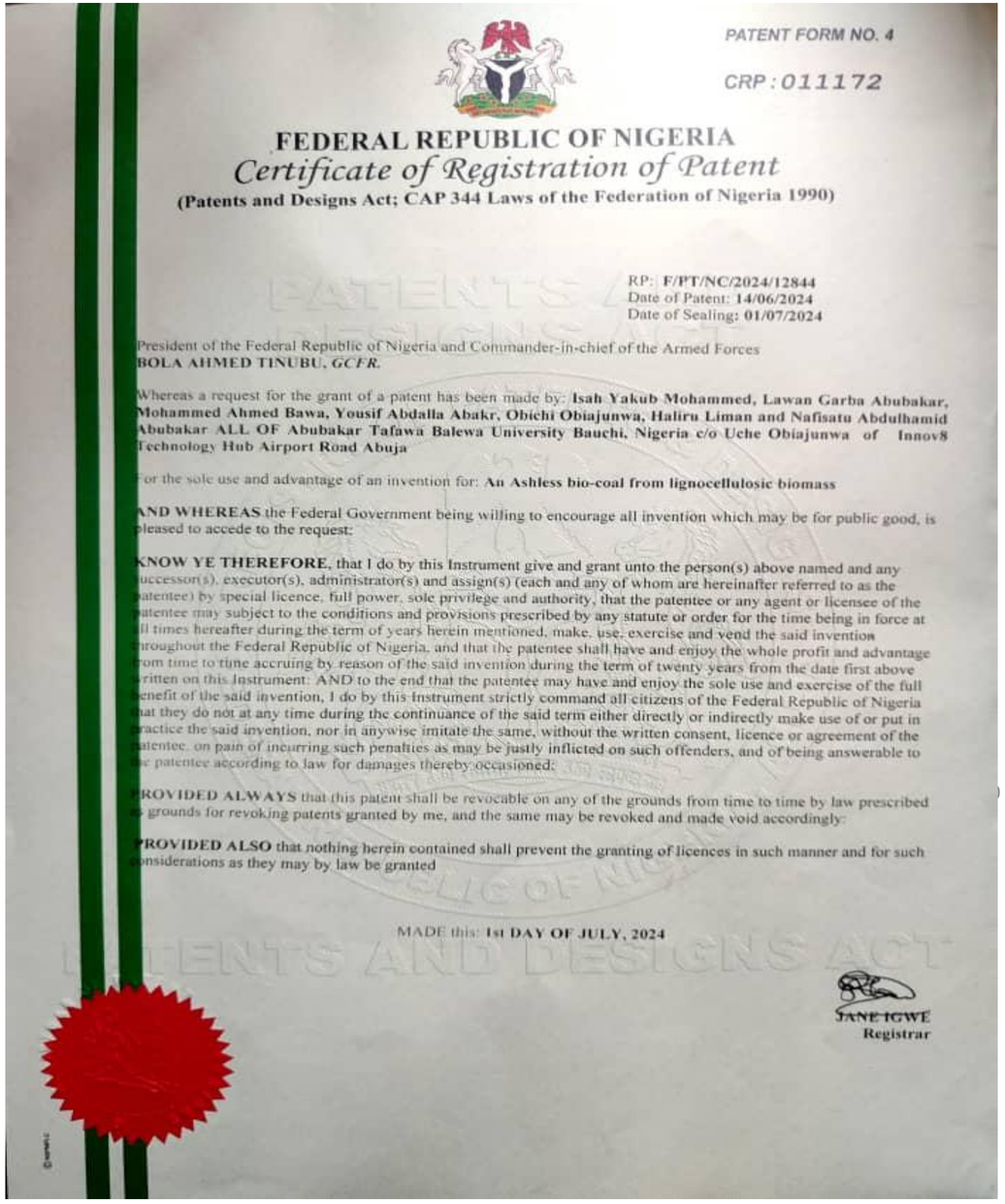
Monthly profit: ₦3,600,000

Year 1 profit: ₦43,200,000

Expected Benefits of the Research Outcome

- Improved Energy Efficiency: Reduced fuel consumption while delivering higher cooking performance compared to charcoal and fossil-based stoves.
- Cost Savings for Users: Affordable, clean alternative that lowers household energy expenses in both rural and urban settings.
- Enhanced Functionality: Combined clean cooking with in-built electricity generation, providing dual benefits for households and small businesses.
- Environmental Sustainability: Reduced deforestation, carbon emissions, and reliance on fossil fuels, supporting climate-friendly energy transitions.
- Versatility and Accessibility: Suitability for both indoor and outdoor use, making it adaptable to diverse lifestyles and communities.

Thank you for listening



PATENT FORM NO. 4

CRP : 011172

FEDERAL REPUBLIC OF NIGERIA

Certificate of Registration of Patent

(Patents and Designs Act; CAP 344 Laws of the Federation of Nigeria 1990)

RP: **F/PT/NC/2024/12844**
Date of Patent: **14/06/2024**
Date of Sealing: **01/07/2024**

President of the Federal Republic of Nigeria and Commander-in-chief of the Armed Forces **BOLA AHMED TINUBU, *GCFR.***

Whereas a request for the grant of a patent has been made by: **Isah Yakub Mohammed, Lawan Garba Abubakar, Mohammed Ahmed Bawa, Yousif Abdalla Abakr, Obichi Obiajunwa, Haliru Liman and Nafisatu Abdulhamid Abubakar ALL OF Abubakar Tafawa Balewa University Bauchi, Nigeria c/o Uche Obiajunwa of Innov8 Technology Hub Airport Road Abuja**

For the sole use and advantage of an invention for: **An Ashless bio-coal from lignocellulosic biomass**

AND WHEREAS the Federal Government being willing to encourage all invention which may be for public good, is pleased to accede to the request:

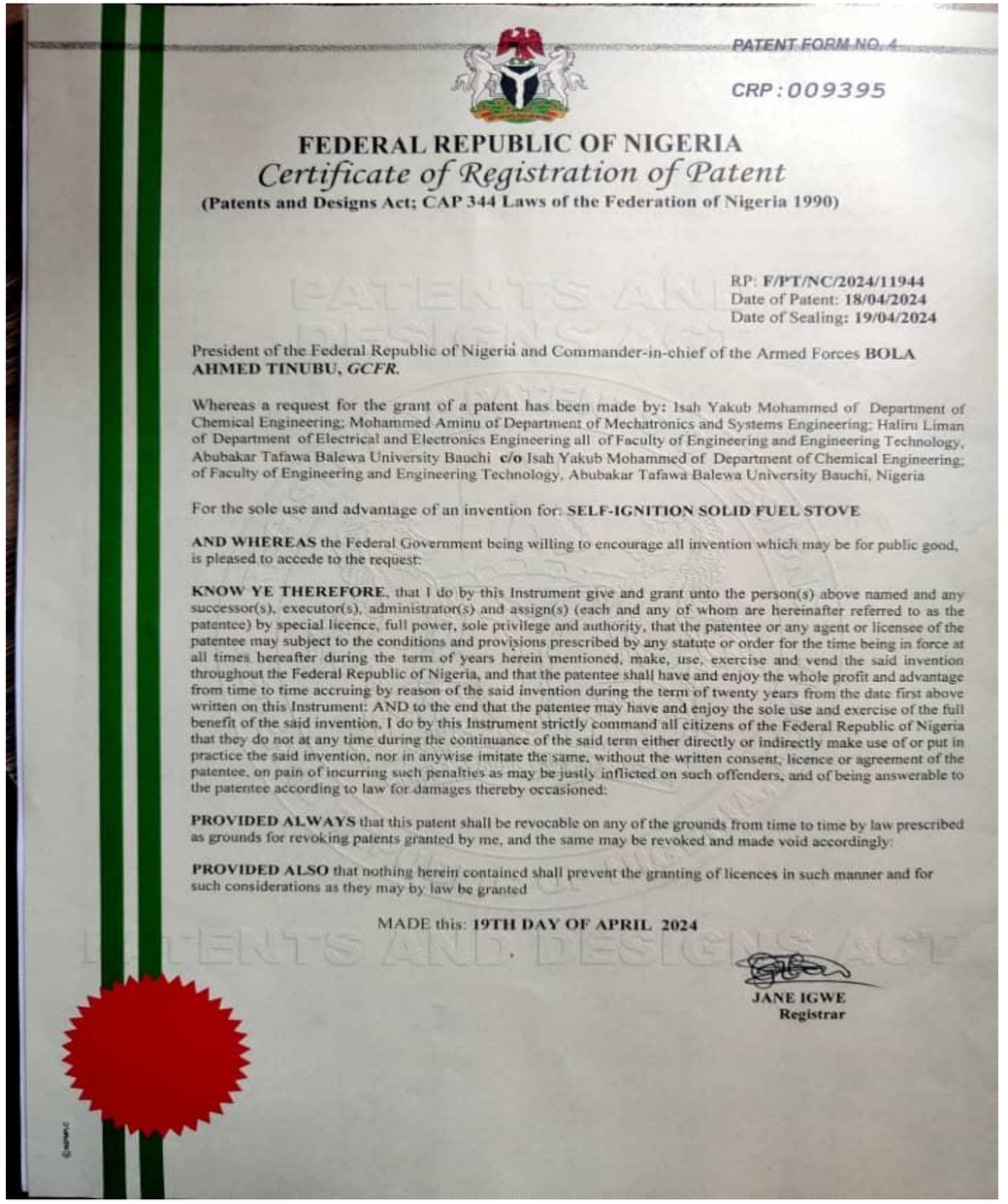
KNOW YE THEREFORE, that I do by this Instrument give and grant unto the person(s) above named and any successor(s), executor(s), administrator(s) and assign(s) (each and any of whom are hereinafter referred to as the patentee) by special licence, full power, sole privilege and authority, that the patentee or any agent or licensee of the patentee may subject to the conditions and provisions prescribed by any statute or order for the time being in force at all times hereafter during the term of years herein mentioned, make, use, exercise and vend the said invention throughout the Federal Republic of Nigeria, and that the patentee shall have and enjoy the whole profit and advantage from time to time accruing by reason of the said invention during the term of twenty years from the date first above written on this Instrument: AND to the end that the patentee may have and enjoy the sole use and exercise of the full benefit of the said invention, I do by this Instrument strictly command all citizens of the Federal Republic of Nigeria that they do not at any time during the continuance of the said term either directly or indirectly make use of or put in practice the said invention, nor in anywise imitate the same, without the written consent, licence or agreement of the patentee, on pain of incurring such penalties as may be justly inflicted on such offenders, and of being answerable to the patentee according to law for damages thereby occasioned:

PROVIDED ALWAYS that this patent shall be revocable on any of the grounds from time to time by law prescribed as grounds for revoking patents granted by me, and the same may be revoked and made void accordingly:

PROVIDED ALSO that nothing herein contained shall prevent the granting of licences in such manner and for such considerations as they may by law be granted

MADE this: **1st DAY OF JULY, 2024**

JANE IGWE
Registrar



PATENT FORM NO. 4

CRP : 009395

FEDERAL REPUBLIC OF NIGERIA

Certificate of Registration of Patent

(Patents and Designs Act; CAP 344 Laws of the Federation of Nigeria 1990)

RP: **F/PT/NC/2024/11944**
Date of Patent: **18/04/2024**
Date of Sealing: **19/04/2024**

President of the Federal Republic of Nigeria and Commander-in-chief of the Armed Forces **BOLA AHMED TINUBU, *GCFR.***

Whereas a request for the grant of a patent has been made by: Isah Yakub Mohammed of Department of Chemical Engineering; Mohammed Aminu of Department of Mechatronics and Systems Engineering; Haliru Liman of Department of Electrical and Electronics Engineering all of Faculty of Engineering and Engineering Technology, Abubakar Tafawa Balewa University Bauchi **c/o** Isah Yakub Mohammed of Department of Chemical Engineering; of Faculty of Engineering and Engineering Technology, Abubakar Tafawa Balewa University Bauchi, Nigeria

For the sole use and advantage of an invention for: **SELF-IGNITION SOLID FUEL STOVE**

AND WHEREAS the Federal Government being willing to encourage all invention which may be for public good, is pleased to accede to the request:

KNOW YE THEREFORE, that I do by this Instrument give and grant unto the person(s) above named and any successor(s), executor(s), administrator(s) and assign(s) (each and any of whom are hereinafter referred to as the patentee) by special licence, full power, sole privilege and authority, that the patentee or any agent or licensee of the patentee may subject to the conditions and provisions prescribed by any statute or order for the time being in force at all times hereafter during the term of years herein mentioned, make, use, exercise and vend the said invention throughout the Federal Republic of Nigeria, and that the patentee shall have and enjoy the whole profit and advantage from time to time accruing by reason of the said invention during the term of twenty years from the date first above written on this Instrument: AND to the end that the patentee may have and enjoy the sole use and exercise of the full benefit of the said invention, I do by this Instrument strictly command all citizens of the Federal Republic of Nigeria that they do not at any time during the continuance of the said term either directly or indirectly make use of or put in practice the said invention, nor in anywise imitate the same, without the written consent, licence or agreement of the patentee, on pain of incurring such penalties as may be justly inflicted on such offenders, and of being answerable to the patentee according to law for damages thereby occasioned:

PROVIDED ALWAYS that this patent shall be revocable on any of the grounds from time to time by law prescribed as grounds for revoking patents granted by me, and the same may be revoked and made void accordingly:

PROVIDED ALSO that nothing herein contained shall prevent the granting of licences in such manner and for such considerations as they may by law be granted

MADE this: **19TH DAY OF APRIL 2024**

JANE IGWE
Registrar