

KENYA SCHOOL BIOGAS PROGRAMME

Clean cooking + local food-waste treatment + fertilizer + community gas revenue

Proposal for the Bank and Government discussion

Using the KB MiraX 200 / 500 / 1000 platform and LushBert robotic O&M

Start with 9 bank-financed demos

KB MiraX BIOGAS SERIES

FOOD WASTE BASED BIOGAS PLANT

CLEAN ENERGY FROM FOOD WASTE. POWERING KITCHENS. PROTECTING EARTH. 



DESIGNED FOR MODERN KITCHENS

Smarter waste management. Stronger bottom line.

The KB MiraX Series converts segregated food waste into clean, usable biogas right at the source — reducing waste disposal costs while generating renewable energy for cooking.



Parameter	Unit	KB MiraX 200	KB MiraX 500	KB MiraX 1000	KB MiraX 2000	KB MiraX 3000	KB MiraX 4000	KB MiraX 6000
Food Waste Input	kg/day	200	500	1,000	2,000	3,000	4,000	6,000
TS Content	%	20	20	20	20	20	20	20
Water Requirement	L/day	67	167	333	667	1000	1333	2000
Slurry Feed @ 15% TS	L/day	267	667	1333	2667	4000	5333	8000
Biogas Production	m ³ /day	16,0	40,0	80,0	160,0	240,0	320,0	480,0
LPG Equivalent	kg/day	7,2	18,0	36,0	72,0	108,0	144,0	216,0
Power Consumption Min / Max	kWh/day	3 - 9	5 - 14	10 - 27	16 - 31	19 - 34	30 - 45	53 - 68
Electrical power production	kWh elec./year	—	—	48k - 57k	96k - 114k	144k - 170k	192k - 227k	288k - 341k
Thermal power production	kWh therm./year	—	—	78k - 81k	157k - 161k	235k - 242k	314k - 323k	470k - 484k
Digester Footprint	m L x W	3 x 2	3 x 2	4 x 2	9 x 2	9 x 3	12 x 3	12 x 3
Total Active Digester Volume	m ³	4	10	20	40	60	80	144

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The government programme already creates the opening

Biogas fits the kitchen-energy and greening logic already established for Kenyan schools.

Publicly reported - not the internal circular

Kenyan media confirmed in June 2026 that the Ministry of Education is directing schools to solar power and cleaner cooking energy, financed through a five-year Bank Financing framework at a reported 9.75% p.a. Kitchen-energy systems are explicitly in scope alongside lighting and electricity.

Reported by:

[The Star \(16 Jun 2026\)](#)

Ministry directs schools to transition to green energy

[Nairobi Wire \(Jun 2026\)](#)

School solarisation programme and Bank Financing for public schools

[Education News Kenya \(Jun 2026\)](#)

Nationwide shift to solar energy in schools under a bank-financed programme

[Ministry of Education Kenya \(official\)](#)

Circulars & Guidelines page (general reference)

National policy problem

Schools remain major consumers of firewood for cooking while Kenya is pursuing tree planting, climate action and cleaner energy.

Kitchen energy is in scope

The programme explicitly covers “kitchen energy systems” in addition to lighting / electricity.

Bank Financing already exists

The programme provides a five-year financing framework; our working interest assumption is 9.75% p.a.

3,213 schools referenced

The programme dashboard is designed to cover 3,213 schools—large enough for a standardized national solution.

Strategic opening: Solar solves electricity. LushBert biogas solves cooking energy + school organic waste.

Sources: independent Kenyan media coverage, June 2026 (see box above). The Ministry's internal implementation circular is confidential and is not reproduced here.



A unique national proposition: one school, four circular-energy functions

The school receives an energy asset; LushBert removes the operating burden.

1. Waste treatment

Kitchen and food waste is digested locally instead of being shipped away for disposal.

2. Clean cooking

Biogas replaces firewood or LPG in school kitchens—reducing purchased fuel.

3. New products

Surplus biogas is sold in reusable 1.5 m³ bags; approved biogas cylinders remain a future option. Solid fertilizer adds a second income stream.

4. Robotic operation

A LushBert-owned humanoid robot supports 24/7 monitoring, routine plant tasks, bag filling and alerts.

Waste in → biogas for school → surplus gas for community → fertilizer → recurring local value

Three existing MiraX sizes fit the demonstration programme

Simple standardization: 200 / 500 / 1,000 kg food-waste input per day.

MiraX 200

Food waste **200 kg/day**

Biogas **16 m³/day**

LPG equivalent **7.2 kg LPG/day**

Digestate/manure **233 L | 10 kg/day**

Working CAPEX **USD 30k installed***

MiraX 500

Food waste **500 kg/day**

Biogas **40 m³/day**

LPG equivalent **18 kg LPG/day**

Digestate/manure **583 L | 25 kg/day**

Working CAPEX **USD 52k installed***

MiraX 1000

Food waste **1,000 kg/day**

Biogas **80 m³/day**

LPG equivalent **36 kg LPG/day**

Digestate/manure **1,165 L | 50 kg/day**

Working CAPEX **USD 72k installed***

**Outputs at full load. 80% of liquid digestate is recirculated; 20% is saleable: 46.6 / 116.6 / 233 L/day. Fermenter warranty: 10 years; expected lifetime: >25 years.*

The school becomes a local circular-energy hub

Plant size follows cooking demand and available kitchen or market waste.



This structure fits the current Bank Financing logic while removing operational hassle from the school.

School

Owens the MiraX plant; supplies the feedstock; uses gas for cooking; receives savings plus 75% of gas and fertilizer sales and 80% of carbon-credit revenue.

Bank

Finances the plant over five years and receives debt service from the project economics.

LushBert

Supplies, installs, commissions, operates and monitors; receives 25% of gas and fertilizer sales revenue, plus 20% of carbon-credit revenue, as management fees.

Robot

Remains LushBert property under O&M; supports 24/7 monitoring, plant tasks, bag filling and alerts.

EPRA

Approval structure for production / packaging / distribution / sale must be formally confirmed before contracting.

Result: The school owns the asset, but never has to become a plant operator nor a gas / fertilizer retailing organisation.

Five economic streams can support repayment and school surplus

The base repayment case uses four operating streams; carbon credits are additional upside.

1

Avoided waste-disposal cost

Kitchen and food waste stays on-site and becomes plant feedstock.

2

Avoided firewood purchase

Biogas replaces purchased firewood in the school kitchen.

3

Fertilizer income

Produced 365 days/year; 75% of sales revenue remains with the school.

4

Surplus-biogas sales

All gas from 135 non-school days is sold in 1.5 m³ bags; 75% goes to the school.

5

Carbon-credit income

80% school / 20% LushBert for aggregation, certification coordination and sales.
Revenue is indicative and depends on approved methodology, verification and market pricing.

Larger models show better results - firewood basis

School view: 230 cooking days, 135 gas-sale days, 365-day fertilizer production. Basis: 100% firewood substitution.

Installed CAPEX	KES 3.88m	KES 6.73m	KES 9.32m
Net annual benefit @ KES 21/kg wood	KES 0.54m	KES 1.43m	KES 3.01m
Simple payback @ KES 21/kg	7.2 yrs	4.7 yrs	3.1 yrs
Firewood price where payback = 5 yrs	KES 34.2/kg	KES 18.9/kg	KES 8.5/kg

How to read these figures

Firewood is valued at KES 21/kg, a documented Kenyan school example (WRI Jamhuri High School). Actual demo-school invoices and measured displacement will override provisional assumptions.

Larger models show better results - LPG basis

School view: 230 cooking days, 135 gas-sale days, 365-day fertilizer production. Basis: 100% LPG substitution at KES 258/kg (working assumption; replace with school fuel invoice).

Metric	MiraX 200	MiraX 500	MiraX 1000
Installed CAPEX	KES 3.88m	KES 6.73m	KES 9.32m
School fuel saving (notional)* <i>230 school days x LPG-equivalent output @ KES 258/kg</i>	KES 0.43m	KES 1.07m	KES 2.14m
Non-school-day gas-sales income <i>135 non-school days, 100% sold @ KES 258/kg, school 75% share</i>	KES 0.19m	KES 0.47m	KES 0.94m
Avoided waste-disposal cost <i>unchanged from the firewood-basis page</i>	KES 0.09m	KES 0.23m	KES 0.45m
Fertilizer income <i>solid + liquid, school 75% share, unchanged</i>	KES 0.05m	KES 0.14m	KES 0.27m
Net annual school benefit <i>sum above, less plant OPEX + robot service</i>	KES 0.62m	KES 1.70m	KES 3.52m
Simple payback @ KES 258/kg LPG	6.3 yrs	4.0 yrs	2.7 yrs
LPG price where payback = 5 yrs	KES 325/kg	KES 199/kg	KES 119/kg

How to read these figures

* School-day value is NOTIONAL ONLY: this gas is consumed on-site by the school and is never sold, so it does not flow into a bank account - it quantifies the value created for the school (avoided LPG purchase) and enters the payback calculation as a cost-avoidance, not as cash. Non-school-day income is real cash: 100% of the gas produced on the 135 non-school days is sold, valued at the same KES 258/kg LPG price for consistency, with 75% reaching the school (usable for loan repayment) and 25% to LushBert. CAPEX, avoided waste-disposal cost, fertilizer income and OPEX are identical to the firewood-basis page; only the fuel-saving assumption changes.

Payback assumptions - transparent, sourced and designed for validation

Published evidence is separated from project working assumptions. Demo-school measurements will replace provisional inputs.

1. Firewood - central economic assumption

- **0.524 kg firewood/student/school day**
Published Kenya secondary-school reference. Demo schools must measure actual firewood use, meals and cooker type.
- **11 kg firewood per kg LPG-equivalent**
Base substitution factor; literature sensitivity range about 6.6-12 kg/kg.
- **Delivered wood price: KES 21/kg**
100% firewood replacement is the target and is credited only when physically achieved.

3. Other savings and revenue assumptions

- **Avoided waste disposal: KES 0 per year**
No waste-disposal cost savings are assumed in the payback calculation.
- **Surplus biogas: 1.5 m3 bag at KES 120**
KES 80/m3 after the agreed price increase. 100% of gas produced on 135 non-school days is assumed sold. School share 75%; LushBert 25%.
- **Fertilizer: solid KES 10.35/kg; liquid KES 2.07/L**
Liquid price is provisional at 20% of solid-fertilizer price. 80% liquid digestate recirculated; 20% treated as saleable. School share 75%.
- **No market-waste gate fee income**
Current model assumes KES 0 gate fee - no disposal-fee revenue upside is included.

RentCo comparison: KES 50/m3 reference; the school model retains KES 80/m3 following the later agreed price increase.

2. School size and technical operation

- **Illustrative school sizes: 500 / 1,000 / 2,000 students**
Working sizing assumptions; actual enrolment must come from NEMIS/KEMIS.
- **230 school cooking days; 365 production days**
Leaves 135 non-school days for surplus gas sales.
- **MiraX output: 16 / 40 / 80 m3 biogas/day**
Full-load operation assumed; actual output must be confirmed by demo measurements.

4. Finance, OPEX and carbon - sensitive items

- **CAPEX: USD 30k / 52k / 72k; FX KES 129.4/USD**
Agreed installed-price assumptions; FX is the presentation working rate.
- **OPEX: USD 500 / 750 / 1,000 per year**
Model-specific agreed OPEX. Robot service: USD 600 / 800 / 1,200 per year.
- **Bank finance: 9.75% p.a., 5 years**
Working financing assumption; must be confirmed by the Bank.
- **Carbon: USD 6.34/credit; 80% school / 20% LushBert**
Indicative only; not yet validated for larger models.

WHY NINE DEMOS: replace assumptions with measured Kenyan operating data

Measure enrolment, meals, firewood tonnes + KES/kg, stove type, waste, gas yield, firewood displaced, gas/fertilizer sales, robot uptime and carbon eligibility.

Sources: (1) Kenya secondary-school firewood study: onlinelibrary.wiley.com/doi/10.1155/2018/3196567

(2) UNFCCC cooking-device efficiency tool: cdm.unfccc.int/Reference/catalogue/document?doc_id=000004709

(3) FAO comparative wood/LPG cooking evidence: fao.org/4/r6560E/r6560e03.htm

(4) Clean Cooking Alliance Kenya institutional references: cleancooking.org/news/kenya-makes-the-business-case-for-institutional-clean-cooking/ and momentum-grows-for-clean-cooking-in-kenyas-institutions/

(5) WRI Jamhuri High School: wri.org/insights/cleaner-burning-fuels-kenyan-schools-feed-students-and-protect-forests (6) NEMIS: nemis.education.go.ke

(7) Carbon benchmark: Ecosystem Marketplace 2025 State of the Voluntary Carbon Market. Carbon methodology eligibility must be formally assessed before crediting.

FUEL MIX AND PAYBACK

The 100% firewood case is the conservative baseline

100% firewood

Current model assumption and bottom-line payback case. Firewood can be renewable only when sustainably sourced; it remains a purchased external fuel.

Mixed firewood + LPG

Replacing the LPG share normally raises direct fuel savings. Payback should be stronger than the all-firewood baseline.

100% LPG

The strongest payback case. LPG is purchased fossil fuel and non-renewable; its replacement can create the highest direct fuel-cost saving.

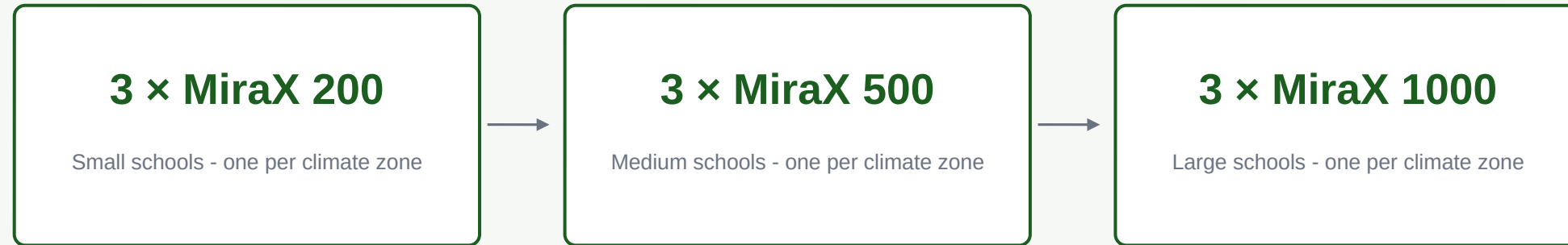
Biogas delivers more than cooking-fuel replacement

Firewood and LPG both rely on externally purchased fuel. LPG does not solve the continuous organic-waste problem, and neither alternative creates biogas-model income from surplus gas, fertilizer or possible carbon credits. Local waste becomes local energy - improving school energy independence.

Government selection of the 9 demos should intentionally cover all three fuel situations to validate the full payback range.

Nine financed demonstration plants

Nine installations - one of each model in cold, moderate and hot climate zones - create evidence for the Bank and Government.



Select with Government / Bank

Use enrolment data. Select sites across cold, moderate and hot zones; collect essential baselines only: fuel, waste, meals, disposal cost and cooking demand.

Bank finances all nine

The demonstration should test the same financing logic intended for later rollout, not grant-funded “special cases”.

Measure real economics

Verify waste diverted, gas produced, fuel displaced, fertilizer, public-gas sales, robot uptime and debt-service coverage.

After the nine demos: replace assumptions with verified Kenyan operating data.

The humanoid robot is the scaling mechanism

The robot platform exists; school-site tasks still require project-specific training and validation.

Robot responsibilities

- 24/7 plant status monitoring
- Defined operating tasks and inspections
- Bag filling for surplus gas
- Gas and fertilizer sales transactions / records
- Automatic alerts to human operators
- Central LushBert reporting and service

Recurring LushBert service model

Robot remains LushBert property
Plant OPEX (200/500/1000): USD 500/750/1,000 per year
Robot application: USD 600/800/1,200 per year
25% gas + fertilizer sales revenue
15% carbon-credit management fee

Why the Bank / Government should care

- Standardized operation across many schools
- Continuous performance visibility
- Less dependence on local specialist operators

From nine demonstrations to a repeatable national framework

The goal is not 3,213 bespoke engineering projects—it is three standard products inside one operating system.



National model = standardized plant + standardized robot/O&M + standardized Bank Financing + standardized EPRA compliance + centralized digital sales platform

What we propose the Bank and Government do next

A controlled step that can create the evidence for national scale.

- 1 Confirm interest** Agree in principle to evaluate biogas as the clean-cooking + organic-waste module of the programme.
- 2 Nominate nine schools** 3 schools per MiraX size across cold, moderate and hot climate zones, using government enrolment data.
- 3 Structure Bank Financing** Finance the nine demonstration plants using the same five-year logic intended for later rollout.
- 4 Clarify EPRA pathway** Confirm who holds production / packaging / distribution / sale approvals and how LushBert can operate across multiple sites.
- 5 Launch measurable demos** Install, commission and begin robotic operation, digital sales and KPI reporting from Day 1.

Core proposition: Give us nine schools across three climate zones. We will verify technical performance, economics, robotic operation and repeatability - then scale.



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