



Climate-smart housing solutions for rural households: Building resilience and practicality

September 2025

Affordable Housing Webinar



• • • FSD Kenya

Financial Sector Deepening Kenya (FSD Kenya) is an independent trust dedicated to the achievement of a financial system that delivers value for a green and inclusive digital economy while improving financial health and capability for women and micro and small enterprises (MSEs).

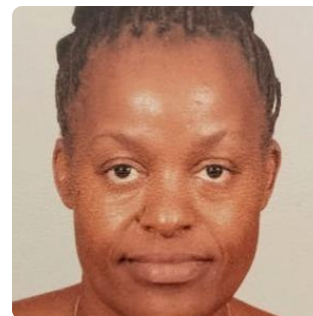
FSD Kenya works closely with the public sector, the financial services industry, and other partners to develop financial solutions that better address the real-world challenges that low-income households, micro and small enterprises, and underserved groups such as women and youth face.



Climate Smart Rural Housing



A value chain approach to stimulating the demand and supply of technical skills and financial product development



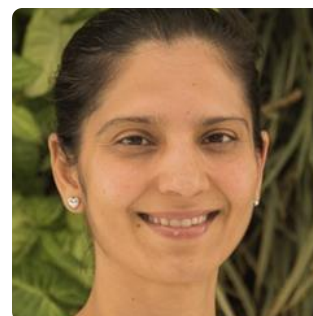
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Table of **Contents**



- 1 KFS Group and FSAs value proposition
- 2 Baseline Survey and demand analysis
- 3 Designing of the intervention
- 4 Implementation and training
- 5 Product development and uptake

KFS- FSA Model

Financial Service Associations (FSA) concept initiated by **K-Rep Development Agency (KDA)** around 1997 with donor support to deliver sustainable financial services to underserved rural communities mostly in arid and semi arid regions.

Target areas characterized by low population density, high incidences of poverty, and poor infrastructure that caused the financial institutions eg microfinance institutions / commercial to exclude them.

FSAs are membership community based financial organisations

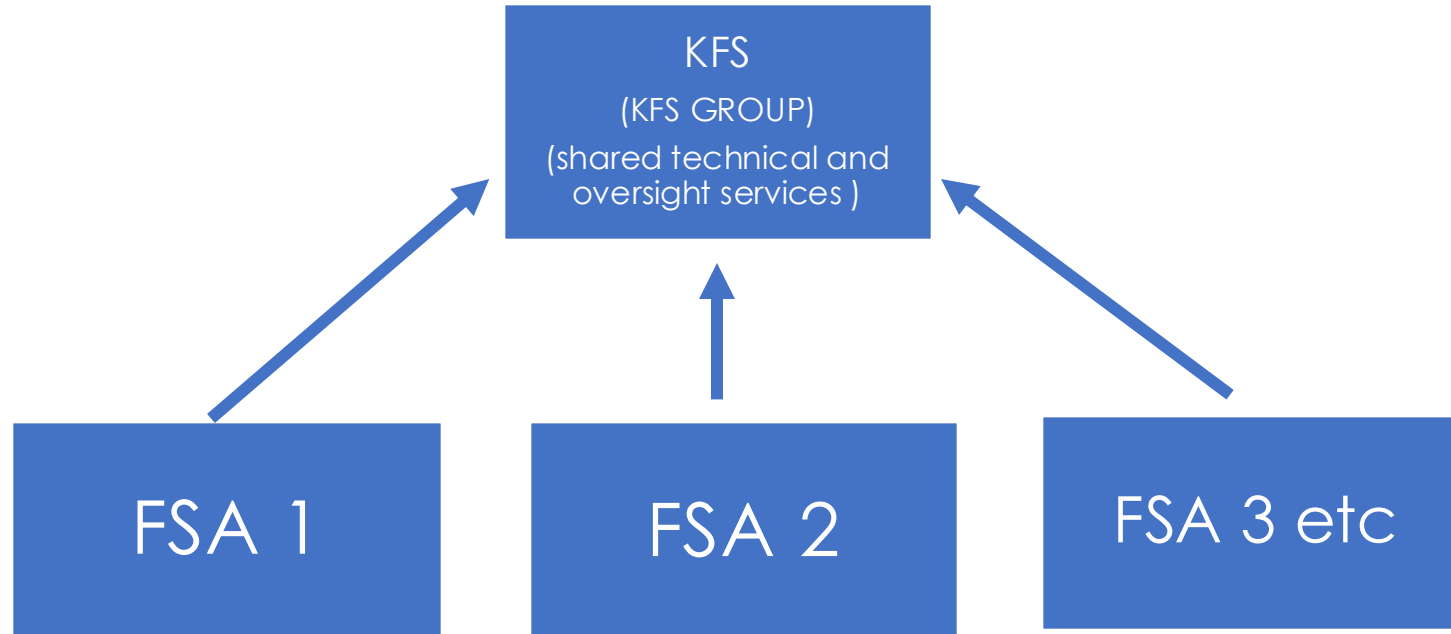
They offer credit, savings and other financial services and proven to be key vehicles for **financial intermediation** and **socio-economic empowerment**

In 2005, KDA established K-Rep Fedha Services Limited (KFS) as a specialist FSA company to provide technical support and oversight to the FSAs, through a shared services arrangement.

KFS Limited was initially established as a company limited by shares but in alignment to its mission and the FSA operations was transitioned to a company limited by guarantee- KFS Group.

In Kenya, other FSAs outside KFS network also exist.

• The KFS FSA ecosystem



Network economies: FSAs designed to cover costs of technical support and oversight in pooled and shared contributions approach pegged to the FSAs actual generated income enhancing **sustainability**

KFS in consultation with the governance committees employs and deploys managers to the FSAs who are charged with the day-to-day FSA operations.

Management capacity is spread across the FSA network, with KFS head office providing technical backstopping. KFS is also involved in outreach, promotion and establishment of additional FSAs.

• • • The KFS FSA ecosystem

Purpose: KFS addresses capacity gaps in small financial intermediaries while retaining member ownership and low-cost operations.

Key Roles of KFS:

- **Operational Management:** KFS deploys **FSA managers** to oversee daily operations and provides technical support from HQ. Most of the other FSA staff are employed locally by the local member selected Governance Committee (GC). Ownership of the FSAs remains with its members
- **Business Development:** Conducts market research, product refinement, branding, and promotion
- **MIS Support:** Supplies infrastructure, software, and centralized tech support to FSAs.
- **Policy & Standardization:** Ensures best practices and uniform service across all FSAs.
- **Capacity Building:** Delivers training for members, Governance Committees, and staff.
- **Financial Oversight:** Manages liquidity, assets, liabilities, and financial reporting.
- **Strategic Planning:** Guides FSAs in business planning; Governance Committee approves final plans.
- **HR Management:** Joint hiring with GC; KFS pays managers, GC pay local staff.
- **Ownership:** FSAs remain member-owned; local GC hire staff and takes charge of governance.
- **Risk Management:** review FSA systems through process mapping, support FSA to comply with Risk management framework and safeguard members funds



FSA growth

Year	2006	2010	2015	2020	June 2025
# FSAs	57	58	40	37	34
# members	71,449	123,815	201,429	332,175	388,900
Ave members	1,253	2,134	5,035	8,978	11,438

- FSAs start with a membership of 400 people, largely women, and then grow organically.
- FSAs are currently present in 8 counties: Kitui, Makueni, Kwale, Kilifi, Bomet, Vihiga, Kakamega, Busia.
- **Growing membership signals strong potential for deeper financial inclusion.**
- In 2000 the average FSA membership was 1,253 while it currently stands at 11,438.

Performance of the 34 FSAs as at June 2025

Indicator	Dec 2024	June 2025
Number of FSAs	34	34
Number of members	375,567	388,900
number of counties	8	8
Member share units (Million KES)	1, 818	1,874
Member deposits (Million KES)	1,005	1,120
Outstanding loans (gross) Million KES	2,418	2,401
Outstanding loans (net) Million KES	2,000	2,000
Surplus for the year (Million KES)	259	131
Retained earnings (Million KES)	1,310	1,400
Total assets (Million KES)	4,400	4,550

FSAs uniqueness

Geographical areas of operation: arid semi-arid communities, limited other FSPs

Mutual membership - pooling meagre resources to enhance livelihoods / socio-economic conditions

Inbuilt mandatory reserves : **50-60% automatically ploughed, balance distributed (FSAs deduct WHT)**

Social mission to assist members in income smoothing, household consumption and risk management

Shared services technical support, oversight and network economies - paid by FSAs

Lending approach - hybrid - Grameen / group lending approach psychological security premised on social and communal bonds

Low loan ticket sizes, slower breakeven in operations, small but stable liabilities build up

With the advent of mobile money and banking, some financial services are now reaching the target population, but FSAs continue to offer broader financial solutions.

While FSAs have some shared features with SACCOs and Chamas, key differences are:

Differences with **SACCOs and FSAs**:

- SACCOs serve diverse communities with diverse abilities, FSAs more focused on rural marginalised communities
- SACCOs often provide avenues for individuals' investment & corporate large scale income generating activities SACCOs often can develop capacity to recruit and compensate professional management and rely less on network economies
- SACCOs can only retain surpluses as reserves on a voluntary basis, whereas FSAs have mandatory reserve requirements
- Unlike SACCOs members shares are not used as collateral for loans

Differences with **Chamas (informal financial groups) and FSAs**:

- FSAs have access to a larger pool of capital
- FSAs charge a much lower rate of interest
- FSAs have longer loan periods
- Savings are safer in FSAs since the default rate in chama savings group is quite high
- Appears FSAs complement membership in informal Chamas, not replaces them.

*Source: [2016 BFA review on FSAs and KFS](#)

• • • FSA loan products (pre housing pilot)

In 2024, FSAs were offering following loan products

- Biashara (business) loans
- Maendeleo (development) loans
- Masomo (school fees) loans
- Emergency loans
- Asset loans: FSAs supports members to purchase goods at fair prices and good quality
- Kilimo (Agriculture) loans
- Savings & money transfers
- Finance management

The tenor of these loans is typically 6-12 months, with a maximum of 36 months, interest rate of 1.5% pm or 18% pa, processing fee of 1% and an insurance fee of 0.06%.

Typical loan size is KShs 14k.



KFS FSD Housing partnership

FSD Kenya supported the sustainability of KFS over many years

KFS and FSD Kenya have partnered to diagnose, co-design and implement a pilot that will support their members to access credit for improved cook stoves, rainwater harvesting, sanitation and housing units.

Process:

- Baseline survey and demand analysis
- Establish feasibility
- Design intervention
- Pilot implementation (Training, Product Development)
- Product uptake and Monitoring

Financial cost

FSD entered into a **KShs 20m** grant agreement with KFS which included:

- KShs 9m to cover training of 1,400 shareholders, create awareness, product design, support uptake, monthly monitoring
- KShs 11m to create a revolving loan fund in each pilot areas
- Loan fund important as tenor for housing stretches to 60 months, whereas most other products between 3months to 36 months (average tenor 18 months)

Separately, FSD entered into contract with building consultant specialist to undertake the training in the two phases:

- KShs 3m Baseline cost
- KShs 7m pilot implementation
- Included all materials, equipment, logistics for training team

During implementation it was found that TA for creating bills of quantities and appropriate sizing was still required as this was difficult for the newly trained artisans. FSD is supporting with 10 days a month (approx. Kshs 70k pm). This will enhance local skills transfer for scalability

Baseline Survey

The Objective of the survey was to understand the housing conditions of FSA members and devise potential housing and related housing loan products that would help the FSAs members improve their current houses or built new improved ones, using locally appropriate, climate resilient, affordable construction technologies.

The study covered all aspects of housing including water, sanitation, cooking stoves and lighting in addition to the housing unit itself.

Baseline conducted in 5 FSAs as below:

Membership Details	Kathonzweni	Kakeani	Malava	Bamba	Matanomanne
Female	6,823	11,200	7,620	6,954	8,000
Male	1,577	2,800	5,044	2,880	3,000
Total	8,400	14,000	12,664	9,834	11,000
Monthly income (Ksh).	9,000/-	9,000/-	20,000/-	9,000/-	2,000/-

Survey findings

From the analysis,

1. The construction technologies in use in all the 5FSAs are **Poles & Mud** and **Burnt Bricks**.
2. These two technologies have an **adverse effect** on the **environment** as both involve cutting of the **scarce trees**.
3. The quality of the **burnt bricks** observed was low quality, with up to **40% lost** during production and low durability requiring plastering to enhance longevity.
4. Water is a limited resource in the very remote areas, with little evidence of **rainwater harvesting**.
5. Sanitation for human waste as expected is **pit latrines**, many in deplorable conditions.
6. For cooking, **firewood and charcoal** are mainly used, further deteriorating the deforestation problem.
7. For lighting, **solar lighting** available through micro-loans from FSAs. There are also solar product suppliers and KPLC (Kenya Power & Lighting Company) has made great inroads interiorly.

Walling Technologies in use in the 5-FSAs Surveyed

No	FSA	Technology	Current Houses	Aspired Houses
1	Kathonzweni & Kakeani FSAs.	 Kiln for burning bricks.	 Burnt Bricks Construction.	 Improved Plastered House.
2	Malava FSA.	 P&M (<i>Poles & mud</i>) technology.	 P&M house improved with local clay plastering.	 P&M house improved with cement/sand plastering.
3	Bamba & Matanomanne.	 Poles structure before infilling with mud.	 P&M house before plastering.	 Improved P&M house with cement/sand plastering.

● ● ● Burnt Bricks typically seen



Houses built using low quality Burnt Bricks in both Kathonzweni & Kakeani were found to be defective, with bricks weathering off, requiring plastering.

40-50% Bricks Lost after Firing



Traditional production of burnt bricks always result with loses of between 40-50% through breakages. This is a huge loss in terms of water, labour and damaged agricultural soil.

• Poles & Mud typically seen



Poles & mud construction was one of most prevalent technologies seen. Key disadvantage is poles begin to rot / be eaten by termites with time.

• Poles & Mud – improved with plastering



Some households had improved the pole and mud with cement or local clay plastering, either to whole building or only the most vulnerable areas to water damage such as the corners and base of the building

- # Poles with stone infill – more permanent



In some cases, the poles are infilled with pebble stones and later plastered, producing a more durable house.

- **Environmental Impact caused by both Poles & Mud and Burnt Bricks construction**



Poles & Mud and Burnt Bricks destroys the environment through the cutting of trees and agricultural soils used for making bricks.

- **Sand Cement Blocks (SCB) seen but few and poor quality**



Few houses with SCB blocks seen – but poor quality as inadequate cement used and curing not done effectively. Here, can see blocks wearing off with time. An unexploited potential.

• Even fewer imported stone structures seen • •



Some people who can afford have been importing machine cut stones, from Thika, doubling the cost of building a house because of transport and cost of stone.

Water & Sanitation

Dams	Piped	Boreholes/Wells	Rainwater harvesting	Pit Latrines	Bath/Shower Rooms
					
In use in 4 <u>FSA</u> s with an exception of <u>Malava FSA</u> .	Featured in a few homes.	Community & privately owned Boreholes featured in <u>Kathonzweni</u> & <u>Kakeani</u> with wells only in <u>Malava</u> .	This featured in only a few homes. Some <u>FSA</u> s has plastic water tanks as one of their loan products.	Most pit latrine have mud floors.	Mostly built with temporally materials.

The main source of water supply in all 5 FSAs were: Earth dams, Wells, Rainwater harvesting and in some exceptional cases piped water. Main means of sanitation was pit latrines.

• • • Cooking Technologies

The 3-traditional stove	Improved firewood stove	Improved charcoal stove
		

Main cooking technologies were the 3-stones using firewood fuel with a few cases of improved energy fuel saving cooking stoves.

Lighting Technologies

Lighting from KPLC.	Solar packages available on higher purchase.	Other solar lighting.
		

There was wide evidence of solar lighting adaptation in many homesteads.

Cost comparison of various Walling Technologies

House Plan & FSA  3-Roomed House, L12M x W4M	Poles & Mud 		Burnt Bricks 		Stabilized Soil Blocks 		Sand/Cement Blocks 		Machine cut stones 		
	FSA	Cost/House	Cost/M ²	Cost/House	Cost/M ²	Cost/House	Cost/M ²	Cost/House	Cost/M ²	Cost/House	Cost/M ²
Kathonzweni & Kakeani		N/A	N/A	685,206/-	14,275/-	653,544/-	13.025/-	625,199/-	13,025/-	704,646/-	14,680/-
Malava		471,770/-	11,570/-	607,365/-	12,653/-	591,624/-	12,325/-	619,299/-	12,902/-	772,929/-	16,102/-
Bamba		512,136/-	11,840/-	N/A	N/A	639,319/-	13,319/-	610969/-	12,728/-	726,597/-	15,137/-
Matanomanne		542,497/-	12,520/-	N/A	N/A	644,220/-	13,421/-	664,470/-	13,843/-	749,385/-	15,616/-

Stabilized Soil Blocks(SSB) & Sand Cement Blocks (SCB) were found to be **cheaper alternatives**, compared even to the widely used Burnt Bricks. Both SSB & SCB have no adverse effect on the environment as soils used are those excavated from the house foundations in case of SSB while sand is in abundance supply in Kitui & Makueni counties.

Conclusion from Baseline Survey

The survey highlighted the needs for:

- Better housing outcomes
- Sustainable solutions that the communities can maintain even after the pilot phase, through sensitization/creation of awareness and training of FSA shareholders, local artisans and FSA staff.
- **Construction of a complete demo house to demonstrate solution.**
- Expanding successes and lessons in the pilot to other areas.

Priority needs and training areas include:

- Introduction of **Stabilized Soil Blocks (SSB)** and **Sand Cement Blocks(SCB)** as future building technologies, incrementally replacing both Poles & Mud and Burnt Bricks – cheaper & better for environment
- Proper and effective **rainwater harvesting.**
- Basic improved **pit latrine** and **bathroom** design.
- Environmentally friendly inbuilt firewood saving or ready-made **cooking stoves.**
- **Training & awareness** creation to members of FSAs.
- **Training** local artisans in production, construction and costing when using SSB or SCB. **Create standardised BQs** and house plans



Design and Implementation of pilot

• Training in production and building with Climate resilient & Environmental Conserving Technologies

Of the 5 FSAs studied in baseline, pilot focused on Kathonzweni and Kakeani due to proximity which enables easier logistics for deeper oversight. Also 90% of the FSAs are in these 2 counties (Makueni and Kitui), so scaling would be easier

Selected local artisans and TVET students were trained in:

1. Production and building with **Stabilized Soil Blocks (SSB)** and Hollow **Sand Cement Blocks (SCB)**.

Both SSB and SCB are similar in cost, but choice introduced based on Household preference and availability of materials

2. Building improved, clean and hygienic **pit latrines** and bathrooms.
3. **Rainwater** harvesting.
4. Building **improved firewood saving cooking** stoves.
5. Encourage continued adaptation of **solar lighting**.

SSB production training



Training in production of SSBs



Production & Curing of SSB on the construction site

Building with SSB training



Training in Building with SSB

SCB production training



These were made on site using a Manual Mold and used to build Pit Latrines

Key Training Points for SSB and SCB

SSB

1. Use block press machine – expensive (approx. KShs 90k) but can purchase at FSA level and artisans rent out
2. Produced on site, using soil excavated from house foundation or pit latrine. Not suitable where high black cotton soil (not encountered in these counties)
3. Soil identification & testing.
4. Production procedures: Correct mixing ratio (1 cement: 14 buckets soil – ratio is dependent on soil conditions), dry mixing first, wet mixing, compressing, lay under shade
5. Curing.
6. Testing the blocks quality.
7. Basic costing of blocks.
8. Estimating # of blocks required
9. Quality control
10. Building with SSB

SCB

1. Use Hand mould – locally available (KShs 15k)
2. Particularly suitable where river sand is widely available, consideration of transportation typically done with ox carts
3. Quality sand selection
4. Production procedure: Correct cement/sand ratio (1 bucket cement : 7 buckets sand) in these areas.
5. Curing & quality control.
6. Testing the blocks quality
7. Basic costing of blocks
8. Estimating # of blocks required
9. Quality control
10. Building with SCB.

Accuracy in measurement for SSB and SCB



Important to use a 10 litre or 20 litre bucket for measurements, rather than wheelbarrow.

If Manual mixing, turn the mixer 3 times while dry, before you add any water. Avoid patches with more cement, and others with no cement.

Ratio of SSB depends on quality of soil, if black cotton not suitable (use shrinkage test)

Ratio of SCB depends on quality of sand, clay must be $<10\%$ (bottle test)

Refer to [blog](#) for step by step illustrated manual

Artisans training



Artisans training





Effective Rainwater Harvesting

Rainwater Harvesting – existing status



Rainwater harvesting was lacking in many homesteads despite having good metal roofs good for rainwater harvesting.

➤ No gutters and tank for rainwater harvesting.

Rainwater harvesting is the most effective way of providing safe water for domestic use.

Poor Rainwater Harvesting Knowledge



Poorly installed gutters and tank resulting in lost rain water harvesting.

Tanks can easily puncture as not placed on base, can even tip over.

All elements of rainwater harvesting

Tank size 	8"x1" Fascia Board 	5M gutters 	Stop end 	Corner gutter 	Outlet 	Down pipe 	3" Elbow 	Gutter bracke 	1" nails x 1Kg
10,000 litres	24 Metres	5	2	4	2	1	2	15	1Kg
5,000 Litres	12 Metres	3	2	2	1	1	2	10	1Kg

Refer to Manual shared via blog

Complete SSB Demo House



SSB house featuring rainwater harvesting

Complete SCB Demo latrine + shower

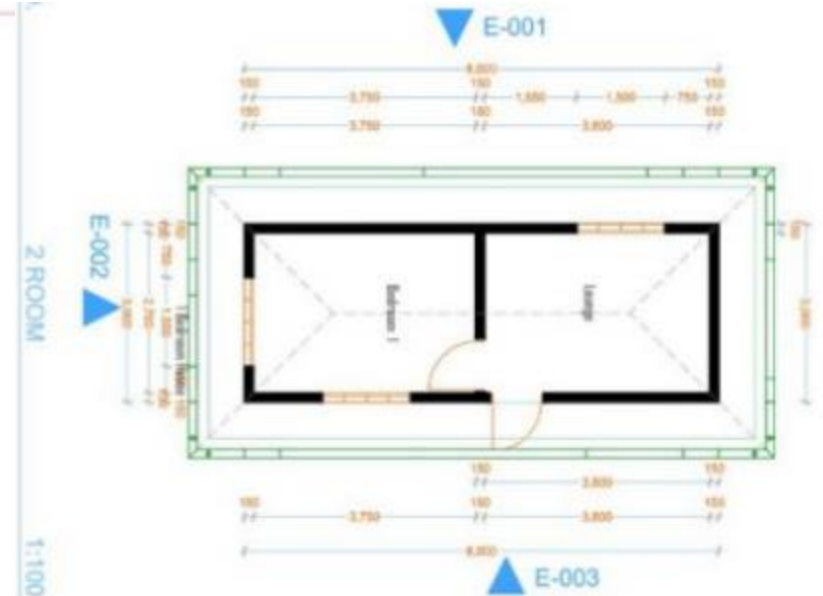
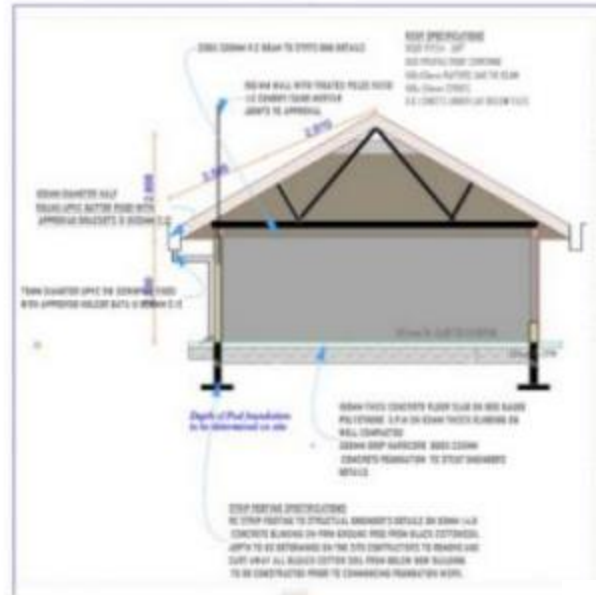
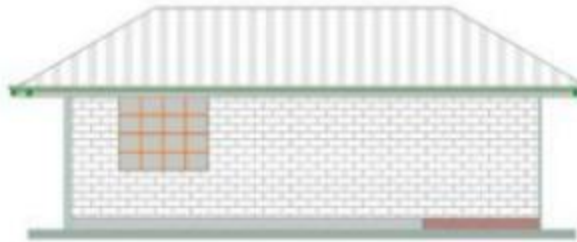


Under construction



Complete

1,2,3 room house plans & BQs developed



No	Item	Unit	Quantity	Rate in Ksh
A	Foundation Strip & Walls			
1	Cement	50Kg Bag	6	
2	Sand	Tons	1.2	
3	Gravel	Tons	1.2	
4	SSB 290mmx140mmx120mm	Nos	420	
B	Floor slab & Perimeter Concrete Edge (50mm)			
1	150mm thick Hardcore	Tons	7	
2	Cement	50Kg Bag	9	
3	Sand	Tons	1.5	
4	Gravel	Tons	3	



Improved Pit Latrines

Pit Latrines



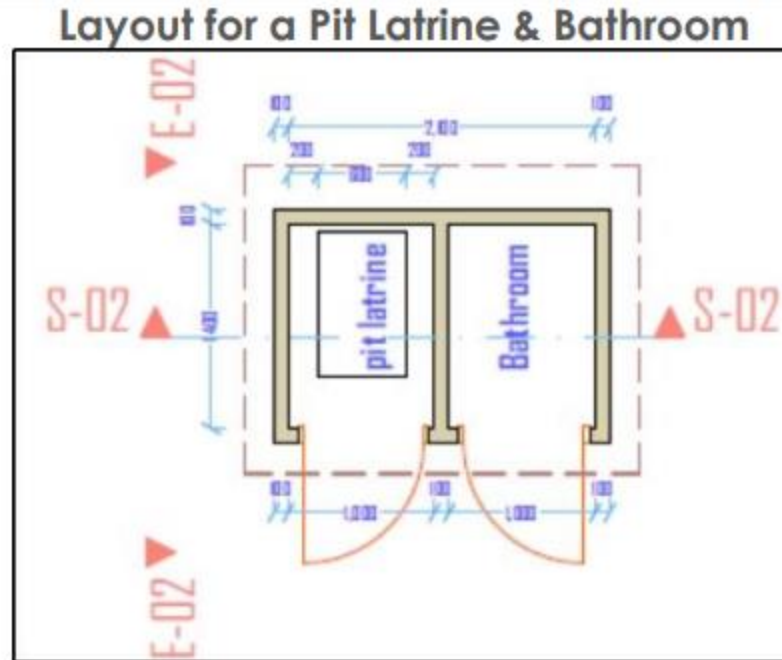
The state of many pit latrines in all 4 FSA's was found to be deplorable, requiring interventions

Pit Latrines



The improvements involved introducing an improved pit latrine slab with a cover, easy to clean and keep away flies

Pit Latrines – plan & BQ developed



Pit latrines and bathrooms can be built adjacent to each other to save on space.



The Pit Latrine super-structure was improved, built with sand/cement blocks and a Bathroom incorporated



Improved Firewood Cooking Saving Stoves

Firewood Cooking Stoves



Main cooking fuel in all FSAs was predominantly firewood and in some cases charcoal, using the 3 stones.

Improved Firewood Cooking Stove.



An improved firewood cooking saving stove was introduced in the pilot project. Stove size determined by size of cooking pots to be used. Families prefer this to standalone energy saving jikos as cook 2 items at once

Published resources

Boresha Boma Blog

<https://www.fsdkenya.org/blogs-publications/boresha-boma-piloting-a-financial-product-for-climate-smart-home-improvements-targeting-rural-communities-in-kenya/>

Provided baseline survey and practical illustrated guide



[Creating climate smart rural affordable housing – baseline survey](#)



[Creating climate smart rural affordable housing – A practical guide for builders and homeowners](#)

Product development

Objective:

Improve living conditions of FSA members by promoting climate resilient solutions

Target market:

Everyone in community: current and new members

Process:

- 1 week product development process on the ground
- Began with reviewing survey outcomes and having ideation conversations between KFS staff, BCE, FSD and FSA members and building material suppliers
- Sieved all information gathered to look for practically applicable ideas
- Developed product concept to allow maximum flexibility to borrowers
- Undertook business analysis to validate costing
- Looked at pricing of product and practicability to the target members
- Tested different names for product to match with the objective and relatable, captures aspiration of the borrowers

Product development

- 4 key components
 - Water harvesting and storage
 - Sanitation
 - Improved cooking
 - Housing – incrementally with the borrower's capacity
- **Interest rate: 1.25% per month flat**
- Loan is capped at 4 times the member share-unit contribution
- Collateral includes Muungano guarantee, mandatory savings and household chattels. Additional collateral is product dependent e.g.
 - Water harvesting: tank and fittings
 - Housing: proof of land ownership varying from letter of allotment, sales agreement, title deeds, endorsed by local chief and endorsed by spouse for married members





Product design: Boresha Boma

Component	Product	Loan size Kshs	Max Term months
Water harvesting and storage	Water tank of 5,000 litres or more, with associated gutters, fittings, placement base	80k-150k	24
Sanitation	Pit latrine and bathroom	60k-100k	24
Improved cooking	Energy saving jikos	5k-10k	6

Product design: Boresha Boma

Component	Product	Loan size Kshs	Max Term months
Housing	Full new house	380k-600k	60
Existing house improvement, incremental new house	Foundation, floor slab, walling, ring beam	150-250k	36
As above	Roofing, ceiling	150k-200k	36
As above	Doors and windows	55k-80k	18
As above	Plastering & painting	20k-40k	12

Product uptake – Oct 2024 to June 2025

Loan Usage	Target loan numbers from Oct 2024 to Dec 2026 (27 months)	Actual loan numbers – Oct 2024 to June 2025 (9 months)	Average loan amount	Male borrowers	Female borrowers
Water Storage solutions	60	79	40,414	12	67
Pit latrine & bathroom with energy saving jiko as one package	60	3	62,800	1	2
Complete house- in progress	10	2	375,000	1	1
Home improvement (lintel, roofing, flooring, doors, windows, plastering)	10	22	76,786	4	18
Energy saving jikos*	30	10	4,610	1	9
Total / Average	170	116	50,573	19	97

All loans currently paying well with 0% default rate, but still early in pilot to establish repayment history.

Water storage loans and home improvement loan numbers exceeded full pilot targets, while full house and pit latrines have slower uptake than expected as less critical to households than other valued needs.

* Understand many households are acquiring energy saving jikos without borrowing (with their own cash at hand)

Takeaways discussion

- **Value chain approach: TA + Finance**
- Housing tenors are longer – therefore, loan fund really helped
- Technical support to **both members and artisans** – and artisans need longer term support
- FSAs core competence is lending, aligned partnerships help to develop new products
- Core banking system allows flexibility to capture different products
- Deep and ongoing monitoring to measure impact
- Scalability – baseline informed pilot, pilot sample representative, ensure solution aligns with a customers problem, then scalability is easier

Built to last

During field work for this trip, Dr Solomon went to see a school building he had built in 1984 with SSB. Imagine his happiness when he saw the building standing strong 40 years later, without much maintenance. This confirms the technology is understood and lasts, but need value chain approach for uptake.

**Close up of wall,
limited maintenance**



**Kitui school building,
built 1984, picture
taken in 2024**



Creating value through **inclusive finance**

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