The Vetiver Latrine

Toilet options currently available in the western Kenya market

Learning Brief 4 of 4 | August 2026

Prepared by Opero Services and Centre for Affordable Water and Sanitation Technology

About this brief

This brief reviews the toilet containment options available to rural households in western Kenya, including their installation and operating costs, suitable settings, and the market conditions facing new sanitation products. It covers the eight counties served by the USAID Western Kenya Sanitation Project: Bungoma, Busia, Homa Bay, Kakamega, Kisii, Kisumu, Migori and Siaya.

The brief was developed through a collaboration between Opero Services and the Centre for Affordable Water and Sanitation Technology (CAWST) as part of the ongoing development of the Vetiver Latrine. The analysis draws on published market assessments and fieldwork conducted under the USAID Western Kenya Sanitation Project. Section 9 provides details of the sources, their geographic coverage, and data collection dates. The brief is an independent publication by Opero Services, drawing on USAID and World Bank Group materials as secondary sources.

This is the fourth in a series of four learning briefs. Brief 1 presents lessons from the pilot and identifies research gaps, Brief 2 examines household toilet preferences, and Brief 3 describes the sanitation market across the eight counties. For further information, contact Edwin at Opero Services, Kisumu, Kenya, at edwin@opero-services.com

1 The rural toilet market

Kenya's sanitation market includes traditional pit latrines, ventilated improved pit latrines, pour-flush toilets, septic tanks and biodigesters. In the eight counties covered by the Western Kenya Sanitation Project, 66 per cent of households use covered pit latrines, while a further 14 per cent use uncovered pits. Overall, pit latrines serve approximately 81 per cent of households, making them the dominant sanitation option in the region (KNBS, 2019; Learning Brief 3, Table 1). In the rural market, most latrines are built to order by informal artisans commonly known as "fundis." Because there is no widely used standard design, the quality, durability, safety and user experience of these toilets vary significantly (WKSP, 2023a)

Standardised sanitation products are manufactured and sold in Kenya, but their distribution and support services are mainly concentrated in Nairobi and other major urban centres (World Bank, 2025). As a result, most rural households still depend on locally constructed toilets. This brief therefore examines not only the sanitation options available nationally but also whether rural households can realistically access and purchase them.

2 Containment options available in the market

Six sanitation containment options are currently used or commercially available in the region, as shown in Figure 1. They differ in how they contain waste, whether they are emptied or abandoned when full, and whether households face a one-time cost or recurring expenses. This last distinction is particularly important

in rural western Kenya, where emptying services are often unavailable. Consequently, when a pit fills, households may have to pay for an entirely new toilet.



Figure 1. Containment options in the western Kenya market: (a) container based sanitation, (b) unlined pit latrine, (c) modular toilet, (d) urine diverting dry toilet, (e) biodigester, (f) plant based toilet. Photographs: Opero Services, Fresh Life and Sistema.bio.

(a) Container based sanitation

Container based toilets collect excreta in sealed, removable containers rather than in pits, septic tanks or sewers. The toilet may separate urine from faeces or collect both together, and it uses little or no water. A service provider exchanges the full container for a clean one and transports the contents for further treatment. The model depends on a functioning collection service and a recurrent service fee rather than a single capital payment (World Bank, 2025). Fresh Life Toilets operates this model in Kenya.

(b) Unlined pit latrine

Unlined pits are the most common form of toilet containment observed in the study area (Opero Services, 2024). Waste is collected in a pit dug directly into the ground without structural lining. Liquids soak into the surrounding soil, while solids remain in the pit and gradually decompose. When the pit becomes full, it may be emptied if accessible, but in most cases it is covered and a new pit is constructed elsewhere on the household's plot.

(c) Modular toilet

Modular toilets are prefabricated in sections, transported and assembled on site over a pit, removable container, septic tank or biodigester. Consistent factory quality and speed of installation are the main advantages, while transport cost and the reach of the supply chain are the main constraints on uptake (World Bank, 2025). Saniwise Technologies in Kisumu now builds its units in concrete and is piloting pay as you go payment, which spreads the capital cost rather than reducing it.

(d) Urine diverting dry toilet

Urine diverting dry toilets are waterless toilets that separate urine from faeces at source. Urine drains from the front of the pedestal into a storage tank or soak pit, and faeces fall through a separate opening into a sealed, ventilated vault or removable container. Urine diverting interfaces are manufactured in Kenya, although recorded national uptake is low (World Bank, 2025).

(e) Biodigester toilet

Wastewater passes from the toilet into an underground airtight tank in which anaerobic bacteria break down organic matter and reduce the volume of solids. Liquid effluent flows to a soak pit or to a further treatment stage, and gas is vented or, in larger installations, captured as biogas. Household scale units are marketed to middle income households and have recorded moderate uptake nationally (World Bank, 2025). FlexiBiogas supplies systems in Kenya.

(f) Plant based toilet

Plant-based toilets use vegetation, treatment media and microorganisms around plant roots to treat toilet wastewater within the household's plot. Solids are retained in a pit, tank or settling chamber, while the liquid flows into a lined treatment bed containing selected plants. The retained solids still require periodic removal and safe management. The Vetiver Latrine is the plant-based system tested during this phase of the project. It is summarised in Section 7 and described in detail in Learning Brief 1.

3 Capital and operating costs

Containment options involve a trade-off between the initial cost of installation and the ongoing costs of use, emptying, maintenance and repair. Table 1 presents reported construction costs for the toilet types most commonly built in Kenya. Costs vary widely within each type, as distance from an urban centre and the customer's ability to pay influence the design, materials and price quoted by a fundi (World Bank, 2025).

Table 1. Reported construction cost of containment facilities in Kenya. Source: World Bank (2025).

Containment type	Median cost	Reported range
Toilet upgrade	KES 20,000	KES 2,000 to 40,000
Uncovered pit latrine	KES 35,000	KES 10,000 to 150,000
Covered pit latrine	KES 50,000	KES 20,000 to 300,000
Ventilated improved pit	KES 100,000	KES 20,000 to 300,000
Septic tank	KES 150,000	KES 70,000 to 600,000
Biodigester or bio septic	KES 150,000	KES 70,000 to 600,000

Household willingness to pay sits below the upper end of that range. Some 54 per cent of rural households regard a toilet costing approximately USD 320 as expensive but manageable, and 27 per cent of those planning construction would invest USD 200 or more (WASHPaLS, 2021). Household expenditure was the only factor found to significantly influence willingness to pay. A market assessment by B&M Consult (2022) estimated that a 1 per cent increase in price could reduce the potential market by approximately 35 per cent. This finding suggests that households are highly sensitive to price and that even a small increase could substantially reduce demand.

Figure 2 compares the containment options based on their initial cost, ongoing operating costs and the value they provide to households. Because the axes do not use numerical scales, the figure shows only the relative position of each option and does not provide exact cost comparisons. It should therefore be interpreted together with the detailed figures in Table 1.

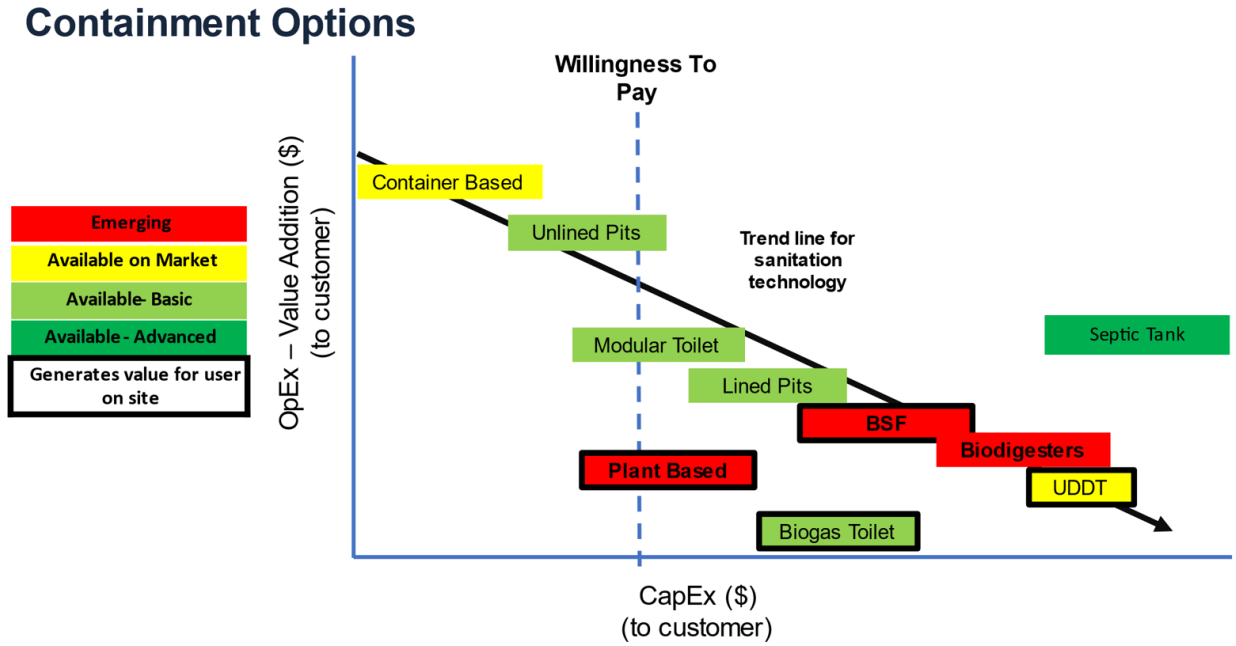


Figure 2. Indicative positioning of containment options by capital cost, operating cost and value to the user. Source: Opero Services, adapted from Western Kenya Sanitation Project material.

4 Suitability by context

Site conditions determine which containment options are suitable before cost is considered. Factors such as soil stability, groundwater depth, flood risk, plot size, water availability and access to emptying services can limit the choices available to a household. Table 2 shows the conditions in which each option is suitable and those in which it should be avoided.

Table 2. Suitability of containment options by household and site context. Compiled by Opero Services from WKSP (2023a), WASHPaLS (2021) and World Bank (2025).

Option	Suitable context
Unlined pit latrine	Rural areas with adequate land, stable soil and a low groundwater table. Unsuitable for flood prone areas, unstable ground and dense settlements because of collapse and groundwater contamination risk.
Lined pit latrine	Suitable for rural and peri-urban areas where pits can be constructed safely and accessed for emptying. Although lining improves structural stability, it does not eliminate contamination risks in areas with high groundwater levels or frequent flooding
Container based	Dense, informal, flood prone and hard to reach settlements where pits and sewers are impractical. Uses little or no water, but depends on reliable collection, transport and treatment.
Modular toilet	Suitable for rural, peri-urban, institutional and emergency settings because it can be installed quickly and relocated when necessary. Its overall suitability depends on the type of containment system installed beneath it.
Urine diverting dry	Suitable for water-scarce and rocky areas, as well as locations with a high water table, because it requires no water or deep pit. However, users must separate urine and faeces correctly, and the collected material must be handled safely.
Biodigester toilet	Suitable for households, schools and institutions with reliable access to water and limited space. It requires proper construction and a safe outlet or treatment route for liquid effluent. Producing a useful amount of biogas also requires a steady supply of organic waste, which most individual households cannot provide.
Plant based toilet	Suitable for rural and peri-urban households with enough space for a planted treatment bed. It uses little water and energy, but its performance depends on proper design, effective drainage, regular plant maintenance and safe management of the treated effluent.

5 Customer and market conditions

Water availability

Most rural households rely on rainwater harvesting as their primary water source, which makes water a limited resource that has to be allocated across cooking, washing, livestock and sanitation (Opero Services, 2024). Any containment that depends on flushing therefore competes with other domestic uses. Options that work with little or no water hold a practical advantage that is independent of price.

Emptying services

Pit emptying services are largely absent in rural areas, because households are widely dispersed, access roads are poor and hauling sludge to a distant treatment facility is costly. Only 10.2 per cent of landlords have ever emptied a latrine or septic tank, and half of those who used a service provider paid less than KES 5,000 (B&M Consult, 2022). When a pit becomes full, households commonly cover it and build another one instead of paying for emptying. As a result, they repeatedly incur the higher cost of constructing a new toilet rather than the lower ongoing cost of maintaining the existing one.

Customer preference

Customers want toilets that are affordable, durable, hygienic and easy to maintain. Control of odour and flies, adequate privacy, low water use and suitability for children, older people and persons with disabilities are raised consistently across the region (Opero Services and Triangle Environmental, 2024). Learning Brief 2 presents these preferences in detail and explains their implications for toilet design.

6 Supply chain and regulatory environment

Sanitation products reach rural customers through a chain of manufacturers, distributors, wholesalers, local retailers and fundis. Retailers rarely promote unfamiliar products or teach customers how to use them, and they stock mainly in response to demand that already exists. Fundis play a central advisory role in the sanitation supply chain. They help households choose a suitable toilet, purchase the required materials and construct the facility. Most fundis build fewer than five latrines a year, each tailored to an individual household's requirements. (WKSP, 2023a).

Sanitation regulations and construction standards exist in Kenya, but enforcement in rural areas remains weak (WKSP, 2023a). Households rely on fundis who use different, non-standardized designs. As a result, toilets vary considerably in quality, durability and accessibility. A further consequence is that much of the existing containment cannot be emptied mechanically, which closes off the upgrade path that a functioning emptying market would otherwise open.

7 Position of the Vetiver Latrine

The Vetiver Latrine is a plant-based sanitation system that offers a potential alternative.It uses a sealed barrel to retain solids while directing the liquid into a lined treatment bed planted with vetiver grass (*Chrysopogon zizanioides*). Vetiver is a non-invasive perennial grass with roots that can grow two to four metres deep and has been used to treat domestic wastewater. Its harvested leaves can also be used as animal feed, thatching material and mulch (Truong, Van and Pinners, 2008). Further information on the design, installation cost and pilot performance is provided in Learning Brief 1.

Set against the conditions in Sections 3 to 6, the Vetiver Latrine directly addresses two key challenges. Its planted treatment bed manages the liquid portion of toilet waste on the household plot, reducing the volume that would otherwise fill a pit. It also uses little water, making it potentially suitable for areas where households mainly rely on harvested rainwater. However, two issues remain unresolved. The planted bed requires space, which may limit its use in densely settled areas, and a practical household-level method for managing the solids. The system therefore reduces but does not eliminate the need for emptying. Learning Brief 1 presents the pilot evidence on these issues, while Learning Brief 3 compares the cost of the substructure with the options presented in Table 1.

8 Implications for innovators

Toilet innovations for rural Kenya must respond to limited household incomes, water scarcity and unreliable emptying services. They should be affordable at the price points outlined in Section 3, use little water, control odour and flies, and remain functional for many years with minimal maintenance. A standardized design should enable local fundis to build them correctly and provide safe access for maintenance and emptying (WKSP, 2023a; Opero Services and Triangle Environmental, 2024).

Adoption depends not only on the product's performance but also how it is supplied, financed and promoted. An innovator entering this market must train local installers, establish distribution channels that reach rural

retailers, offer financing suited to household incomes and clearly explain the benefits of an unfamiliar product. Evidence of environmental safety and regulatory compliance is also necessary to build confidence among households, county governments and other sanitation stakeholders. Learning Briefs 1 to 3 assess how the Vetiver Latrine responds to these requirements.

9 References and evidence base

Kenya National Bureau of Statistics (2019) Kenya Population and Housing Census. Nairobi: KNBS.

Opero Services (2024) The Green Vetiver Latrine Project: Sanitation Needs Assessment and Financial Framework Report, Kisumu and Kisii Counties. Nairobi: Opero Services.

Opero Services and Triangle Environmental (2024) Customer Discovery: Assessment and Design Report. Prepared for the USAID Western Kenya Sanitation Project.

United States Agency for International Development (2021) Sanitation Market Assessment. Research and Learning for Rural Sanitation in Kenya, Part 2. Washington DC: USAID WASHPaLS.

Western Kenya Sanitation Project (2023a) Sanitation Supply Chain Assessment for Eight Counties of Western Kenya. Submitted to RTI International.

B&M Consult Limited (2022) Household Market Sizing and Segmentation Assessment for Sanitation and Hygiene in Western Kenya. Final Draft Report submitted to RTI International, 23 January 2022.

World Bank (2025) Kenya Non Sewered Sanitation Market Sizing and Segmentation: Final Report. Washington DC: World Bank.

Learning Brief 1: The Vetiver Latrine, Pilot Learnings. Opero Services for CAWST.

Learning Brief 2: Household Toilet Preferences. Opero Services for CAWST.

Learning Brief 3: The Sanitation Market in Eight Counties of Western Kenya. Opero Services for CAWST.

Table 3. Sources used in this brief, with coverage, geography and date of collection.

Source	Coverage	Geography	Date
KNBS census	Sanitation facility type by county, full population enumeration	National	2019
WKSP supply chain assessment	57 product sellers, 75 service providers, 24 policy interviews	Eight counties	2023
B&M market sizing	2,328 household interviews, 236 landlord interviews	Eight counties	2023
WASHPaLS market assessment	Household segmentation and willingness to pay	Rural western Kenya	2021
Opero and Triangle discovery	44 household surveys, focus groups with women, men and masons	Kisii, Migori, Busia, Siaya	2024
Opero needs assessment	16 household interviews, 4 schools, micro credit interview	Kisumu, Kisii	2024
World Bank market sizing	Containment costing, products and enterprise characteristics	25 counties	2025