

Image source: EnDev website, link

EnDev DSS Performance Study

Malawi country report

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Netherlands Enterprise Agency

endev

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Abbreviations

ATP	Ability to Pay
CBV	Community-Based Validation
CRM	Customer Relationship Management
CUMO	CUMO Microfinance Limited
DSS	Demand-Side Subsidies
EnDev	Energising Development
ESMAP	Energy Sector Management Assistance Program
EUR	Euro
GDPR	General Data Protection Regulation
GPS	Global Positioning System
ICS	Improved Cookstoves
ID	Identification
IVA	Independent Verification Agents
LNOB	Leave No One Behind
LQ1 / LQ2	Learning Question 1 / Learning Question 2
MEAP	Malawi Energy Access Project
MSR	Malawi Social Registry
MWK	Malawian Kwacha
NCSC	National Cookstove Steering Committee
NGOs	Non-Governmental Organizations
SHS	Off-Grid Solar
PAYGo	Pay-As-You-Go financing
QR	Quick Response
RBF	Results-Based Financing
RVO	Netherlands Enterprise Agency
SCTP	Social Cash Transfer Programme
SHA	Self Help Africa
SHS	Solar Home System(s)
SMS	Short Message Service
SPGs	Stove Production Groups
SPP	Social Protection Program
TA	Traditional Authority
UBR	Unified Beneficiary Registry
VDCs	Village Development Committees

1. Executive summary

Background

Energy access in Malawi remains constrained by affordability, particularly for low-income rural households. Only 11% of households are connected to the national grid, while around 15% rely on off-grid solutions, primarily solar.[1] Despite growing market availability, an estimated 80% of off-grid households cannot afford entry-level commercial solar products.

The clean cooking sector faces a more structural challenge. Nearly 90% of households rely on traditional biomass, with widespread reliance on freely collected firewood reducing willingness to pay for improved cookstoves (ICS), even where products are available.[2]

In this context, the EnDev Demand-Side Subsidy (DSS) pilot aimed to improve access by reducing upfront costs for solar home systems (SHS) and improved cookstoves (ICS).

Programme design

The DSS pilot was implemented through private sector companies under a results-based financing (RBF) model, with subsidies applied at the point of sale and reimbursed after verification. Key design features included:

Design	Key elements
Targeting	Households were selected using the Malawi Social Registry (MSR), focusing on households classified as **poorer and poorest, alongside the Social Cash Transfer Programme (SCTP) recipients** • Eligibility is confirmed by agents at the point of sale using a digital **Kobo ToolboX app** to register National IDs and prevent double-dipping • The geographic focus of the DSS pilot targeted the districts of **Balaka, Dedza, Salima, Nkhata Bay, Dowa, Mzimba, and Kasungu**
Subsidy level	Subsidies were applied as **upfront price reductions, covering a significant share of product costs** • For SHS, households classified as poorer in MSR received a **subsidy covering 73% of the market price and 88% for the poorest** • For ICS, the subsidy initially covered 85% of the cost, and later adjusted to cover **92% for poorer,** increasing the distribution subsidy • For the SCTP and the poorest households, the subsidy initially covered 89% of the cost, and was **adjusted to cover 94%**
Delivery model	Participating companies **sold products directly to households in targeted areas**, often utilizing mobile sales agents and local community representatives • To ensure high-quality service and sustainability, these **suppliers were selected through a due diligence process** and were contractually required to provide credible warranties as well as ongoing after-sales maintenance and support to the beneficiaries
Financing	• Financing for cookstoves operated on a **one-time, upfront cash payment basis**

[1] *National Energy Compact for Malawi, Link*
[2] *Malawi CCDR Clean Cooking Sector Background Note, Link*

	• For solar products, many **paid through PAYGo models**, with repayment periods ranging from 3 to 24 months and low initial down payments equal to their estimated monthly ability to pay, as well as **some through upfront cash payments**
Verification	Companies registered sales data through Kobo, which was then checked against **submitted claims and verified by an Independent Verification Agent (IVA)** before subsidy payments were disbursed after 30 days • The IVA verified these claims using a statistical sampling approach, conducting **70% of the checks through phone interviews and 30% through in-person field visits,** to confirm the products were successfully installed and functioning before the fund manager (CUMO) transferred the funds to the suppliers

Objectives

This study evaluates how the DSS performed in practice in Malawi, focusing on:

- How effectively subsidies reached low-income households
- How programme design affected market functioning and sustainability

These questions align with EnDev's broader objective of improving the efficiency of public funding and minimizing market distortion in energy access programmes.

Methodology

The study combines quantitative and qualitative data to assess programme performance. Key inputs include:

- A household survey of 510 beneficiaries (257 SHS, 253 ICS) across seven Traditional Authorities (local administrative areas)[1]
- Key informant interviews with participating companies, government stakeholders, and programme implementers
- Focus group discussions with beneficiary and non-beneficiary households
- Review of programme monitoring data, including sales, subsidy disbursement, and verification records

Data was collected by the IVA through a mix of in-person (90%) and phone-based (10%) interviews using digital data collection tools.

Key findings

1. Subsidies improved affordability and uptake, but reduced incentives for after-sales service

The DSS was effective in addressing upfront affordability barriers. Survey results show that 90% of respondents found the final price affordable (ICS: 93%, SHS: 88%). PAYGo financing further reduced entry barriers, contributing to very low default rates (1–4%), suggesting that most households were able to manage repayments once initial costs were reduced. However, the same design reduced the residual transaction value for companies. In some cases, participating solar companies (n=2) observed that sales agents had limited financial incentive to undertake costly maintenance or collection trips into remote areas, as the residual balances on subsidised PAYGo systems fell as low as EUR 5–10. For companies operating in remote areas, this limited the financial incentive to conduct follow-up visits or maintenance, given high transport costs.

Implication: The current subsidy structure successfully drives uptake but creates a trade-off between affordability and the sustainability of service delivery, particularly in last-mile areas.

[1] *Traditional Authority is a customary leadership area headed by a chief or equivalent traditional leader*

2. Registry-based targeting limited leakage but did not fully capture dynamic household conditions

Targeting through the MSR provided a structured mechanism for directing the subsidy toward low-income households and appears to have limited leakage into higher-income groups. 95% of beneficiaries reported they would still require a subsidy for future energy purchases, suggesting that the buyers reached during the pilot were drawn from households without the means to participate at commercial prices. At the same time, companies and field stakeholders observed that because the MSR is not fully up to date in some districts, those who were observed to be genuinely poor on the ground were often not found in the registry at the time of mobilization. While not universal, these instances contributed to localised confusion around eligibility and, in some cases, to perceptions of unfairness within communities.

Implication: The MSR is an effective targeting tool, but its limited frequency of updates creates inclusion and exclusion risks that need to be managed at the implementation level.

3. Verification systems strengthen accountability while highlighting the importance of timely disbursements of funds to participating companies

The independent verification approach, complemented by customer eligibility checks through Kobo-based eligibility tool, ensured strong data integrity and accountability, with limited evidence of subsidy misuse. However, in instances where verification-to-payment cycles were extended, participating suppliers, particularly smaller firms, experienced temporary liquidity pressures that affected their ability to restock and sustain sales momentum.

Implication: While RBF systems effectively safeguard public resources, careful attention to process efficiency, particularly in minimizing payment delays to participating companies, is important to mitigate liquidity pressures and support sustained market participation.

4. Subsidies stimulated demand, but supply constraints limited access, especially in clean cooking

The DSS increased demand for both solar and clean cooking products. In the solar sector, companies were generally able to respond to increased demand, supported by more established supply chains. In contrast, the clean cooking sector faced significant constraints. These included limited production capacity among Stove Production Groups (SPGs), high transport costs, and seasonal disruptions (e.g., reduced production during the rainy season).

Implication: Demand-side subsidies alone are insufficient in sectors where supply chains are underdeveloped, limiting the ability of the programme to translate demand into sustained access.

Recommendations

Based on these findings, four priorities emerge for future DSS design in Malawi:

1. Align subsidy frameworks to measure long-term service delivery alongside initial uptake levels

While subsidies successfully drive initial adoption, programs must look beyond upfront sales. Success metrics should expand to evaluate long-term operational sustainability, tracking critical indicators like system uptime, service quality, maintenance compliance, and ongoing user satisfaction. To protect supplier margins without undermining consumer affordability, systems must incorporate distinct supply-side operational top-ups rather than altering consumer-facing discounts

2. Strengthen targeting by complementing registry data with practical implementation adjustments

Continue using the MSR as the primary targeting tool but introduce mechanisms to address gaps in registry accuracy (e.g., clearer communication of eligibility, local validation where appropriate).

3. Complement demand-side subsidies with targeted support to strengthen supply chains

In the clean cooking sector, subsidies should be paired with support to improve production capacity, logistics, and coordination with SPGs to ensure that increased demand can be met.

4. Streamline verification and payment processes to shorten disbursement timelines

Enhancing efficiency of verification workflows, alongside more streamlined payment processes, can help ensure timely fund flows to participating companies. This is particularly important for maintaining adequate working capital and supporting continuous sales.

Conclusion

The Malawi DSS pilot demonstrates that demand-side subsidies can effectively reduce affordability barriers and expand access to modern energy among low-income households. However, the results also highlight that subsidy design alone does not determine programme success.

In practice, programme performance was shaped by a set of design trade-offs between affordability and after-sales sustainability, between targeting accuracy and operational flexibility, and between strong verification controls and timely company payments. In addition, in sectors such as clean cooking, supply-side constraints limited the ability of subsidies to translate demand into sustained access.

Scaling this approach would benefit from a more integrated approach that combines demand-side support with improvements in targeting systems, verification processes, and supply chain capacity particularly for ICS products.

2. Country context and relevance for DSS

Malawi has made gradual progress in expanding access to modern energy over the past decade, supported by policy reforms, donor-funded programmes, and increasing private sector participation in off-grid markets. However, overall access remains low, with access disparities pronounced between urban and rural areas, where most households remain underserved.

Off-grid solar has emerged as a key pathway for expanding electricity access, particularly in rural and hard-to-reach areas where grid extension is not economically viable. The market has seen increasing participation from private sector companies, supported by enabling environment reforms and programmes. However, while supply has improved, future growth is dependent on reaching lower-income populations, where affordability constraints are more binding.

Access to clean cooking remains even more limited, with the majority of households relying on traditional biomass fuels. Despite growing policy attention, the transition to modern cooking solutions has been slow, with affordability, accessibility, and behavioural factors constraining uptake. Structurally, limited commercial incentives, high technology acquisition costs, and the availability of free or low-cost traditional fuels continue to constrain market development. As a result, adoption remains concentrated among households already purchasing fuel, with more remote and lower-income populations largely excluded.

These dynamics reflect a broader shift in Malawi's energy access challenge from availability to affordability and inclusion. In response, Malawi has implemented a range of programmes aimed at improving access, including supply-side interventions and early applications of demand-side support. Initiatives such as the Ngwee Ngwee Ngwee Fund under the Malawi Electricity Access Project (MEAP) have supported off-grid market development, while the EnDev DSS pilot introduces more targeted approaches to addressing affordability constraints among the poorest households.

Demand-side subsidies play an important role within this evolving landscape. By reducing the price paid by end users, DSS extends access to populations that are not currently served by commercial markets. However, their effectiveness depends on careful design, in relation to targeting, subsidy levels, and delivery mechanisms, to balance inclusion objectives with market sustainability.

The EnDev programme provides an opportunity to test these approaches in practice. By focusing on households classified as poorer and poorest, EnDev Malawi DSS pilot offers insights into how targeted subsidies can support access in highly constrained contexts, and how design choices influence both programme outcomes and broader market dynamics.

This report provides a detailed assessment of the DSS pilot performance in Malawi as part of the broader EnDev performance study. It focuses on the practical challenges of reaching low-income and rural populations, as well as the implications of subsidy design for effectiveness, efficiency, and market development.

3. Research objectives and methodology

3.1. Study objectives and learning focus

The analysis is structured around two core learning questions:

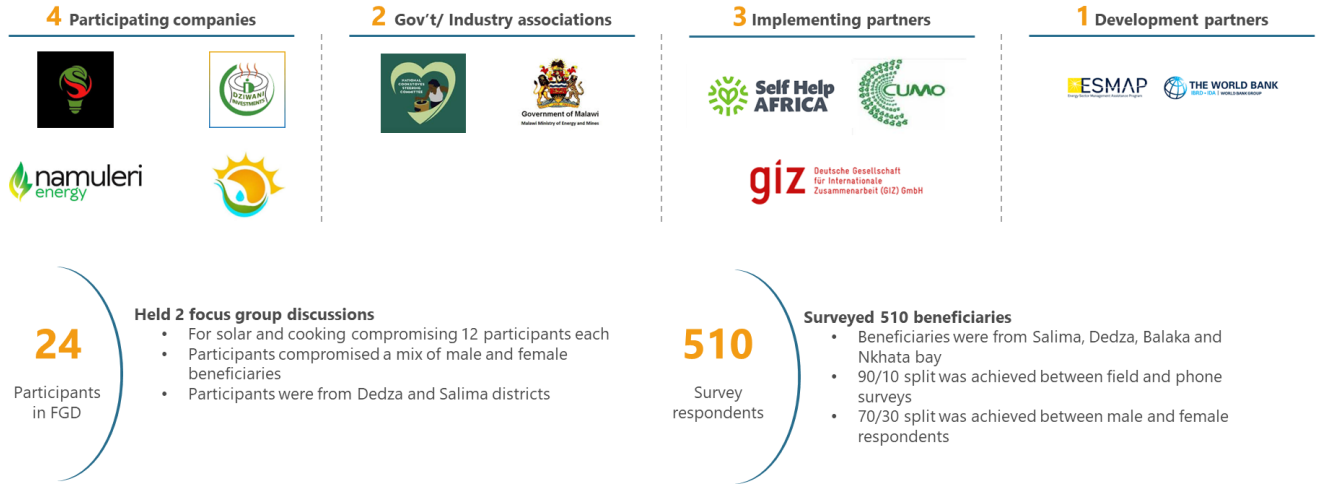
1. How can scarce public funding be used most efficiently to reach low-income and marginalised groups?
2. How can DSS be designed to minimise market and price distortion?

To address the learning questions, the study assessed how DSS RBF in Malawi performed in reaching low-income and marginalised groups and how key design choices influenced programme outcomes.

3.2. Research methodology

This study used a mixed-methods evaluation matrix to align research questions with the World Bank End-User Subsidy Toolkit for Energy Access elements.[1] This ensured that data analysis focused precisely on how design choices influenced pilot performance and market interactions. The evaluation matrix was populated through the integration of **pilot data analysis, key informant interviews, focus group discussions, and field surveys.**

Figure 1: *Snapshot of stakeholder engagement*



4. Pilot context and operational overview

The DSS RBF pilot is a targeted, market-based financial support initiative to test innovative subsidy models that bridge the affordability gap for clean energy technologies, specifically off-grid solar products and locally produced improved cookstoves. By using an RBF mechanism, the programme channels funds through participating suppliers to directly lower the purchase price of these products for end-users. The Malawi pilot focuses on reaching the most vulnerable demographics, households classified as poorer and poorest in the Malawi Social Registry (MSR), formerly known as the Unified Beneficiary Registry (UBR), as well as Social Cash Transfer Programme (SCTP) recipients, ensuring that those who are entirely excluded from commercial markets can still access reliable energy and cooking solutions. To navigate the complexities of nascent, hard-to-reach markets, the pilot strategically adapted its core design elements during implementation.

4.1. Targeting

Initial design

The targeting mechanism utilized demographic and geographic parameters anchored to the MSR, focusing on the most vulnerable households within the designated pilot areas, including Balaka, Dedza, Salima, and Nkhata Bay. For off-grid solar products, eligibility specifically required that recipient households lacked any prior

[1] *End-User Subsidy Toolkit for Energy Access, Link*

electricity access, including central grid connections, mini-grids, or standalone solar home systems. The pilot set quantitative benchmarks to drive rapid market penetration, formally expecting participating suppliers to achieve a minimum monthly sales threshold of 50 units. The incentive budget was strategically allocated, with 85% to SHS and 15% to ICS, while capping any single supplier's share at 30% of the incentive budget per technology to prevent market monopolies.

Implementation reality and drivers of change

Eligibility was expanded to include SCTP recipients because relying solely on the MSR inadvertently excluded highly vulnerable individuals missing national ID data. Simultaneously, geographic targeting was broadened to include three additional districts, including Dowa, Mzimba, and Kasungu, driven by a budget surplus from currency devaluation, strategically shifting focus to districts with more recent MRS survey data. Operationally, the 50-unit monthly sales targets were relaxed to target absolute non-performance instead, as companies frequently struggled to meet targets in nascent rural markets, necessitating a more flexible approach to maintain supply chain momentum. This evolution highlights the need for future targeting approaches to combine structured eligibility criteria with the flexibility required to identify and reach underserved populations.

4.2. Subsidy level

Initial design

The subsidy structure was designed to bridge specific affordability gaps, using fixed subsidies calibrated to the monthly Ability to Pay (ATP). For SHS, initial subsidies covered 73% and 88% of the average market price for targeted households, respectively. For ICS, the design layered a base subsidy with a fixed supply-side support of EUR 1.68 to cover remote logistical costs, including transport, procurement, and agent mark-ups, which standard retail prices exclude. This combination allowed for affordable doorstep delivery, resulting in total subsidy levels of 85% for poorer households and 89% for the poorest and SCTP beneficiaries.

Implementation reality and drivers of change

To account for inflation and rising product costs from suppliers, the programme adjusted its pricing framework for solar home systems in October 2025 by increasing the maximum allowable subsidy cap price from MWK 237,227 to MWK 351,904. Under this mechanism, any portion of a market price set above the cap would not receive the subsidy, though in practice, participating companies maintained their pricing within or very close to this established limit.

Additionally, feedback from ICS participating companies revealed that the logistical challenges of reaching remote areas exceeded original estimates. To address these rising expenses, the distribution cost subsidy for cookstoves increased by 48% in October 2025, raising it from EUR 1.68 to EUR 2.49 following engagements with suppliers regarding vehicle hire and fuel costs. Furthermore, in response to the fuel price increases announced in 2026, the distribution allocation was adjusted by an additional EUR 1.71. These cumulative adjustments were absorbed by the programme to fully insulate cookstove end-users from market volatility; consequently, total subsidy levels reached 92.3% for poorer and 94.4% for the poorest. This ensured that customer contributions remained fixed at their original levels (EUR 0.40 and EUR 0.29, respectively) despite the escalating costs of last-mile delivery.

4.3. Delivery

Initial design

The project used an RBF mechanism, delivered through a dual fund management partnership of Self Help Africa (SHA) and CUMO Microfinance Limited. Under this approach, the subsidy funds were channelled to participating suppliers only after products were sold and sales independently verified. Sales agents used the Kobo Toolbox at the point of sale, which initially required them to navigate two separate digital forms to verify customer eligibility and validate each transaction. This process was strictly enforced to maintain data integrity, though it introduced additional operational demands during high-volume sales windows in the field. Demand generation heavily relied on traditional face-to-face community engagement through local leaders, alongside mass outreach initiatives like physical roadshows and phone-based SMS campaigns.

Implementation reality and drivers of change

The digital workflow was streamlined into a single point of entry to reduce the administrative bottlenecks for suppliers during high-volume field sales. To ease delivery bottlenecks for cookstove companies, the fund manager offered to cover upfront transportation costs and deduct these expenses from later reimbursement claims, though no ICS suppliers chose to use this arrangement.

On the marketing front, communication channels for the pilot were adjusted through structured strategy updates and stakeholder feedback, shifting resources away from expensive or low-yield methods toward more consistent and cost-effective mass media. Early in the project, awareness was primarily driven by face-to-face community engagement. To increase customer reach and stimulate product uptake, the project implemented mass outreach initiatives like roadshows and phone-based SMS campaigns. However, roadshows were discontinued shortly after their launch because they had a minimal impact on the intended target audience, along with SMS campaigns that had high service costs. After assessing these channels, the project learned that radio programs were the most cost-effective and impactful way to engage the public. Market campaigns provided a foundational layer intended to unify and complement more localized marketing efforts. This multi-channel approach ensured that while on-the-ground strategies addressed specific community needs, the campaigns provided consistent, wide-scale outreach across the targeted districts to reinforce the program's visibility.

4.4. Verification

Initial design

a) Customer eligibility checks

At the point of sale, sales agents checked customers against predefined criteria to confirm their eligibility for subsidized products. This check was conducted using a dedicated Eligibility Tool administered via the Kobo Collect application on Android devices. To verify eligibility and establish a baseline registry, agents were required to capture photographic evidence of the installation or customer, record the geographic (GPS) coordinates of the household, and verify that no duplicate clean energy products were already in use at that location.

b) Independent verification of sales

Once baseline registries were submitted by participating companies, claims were forwarded to an IVA. The IVA verified product sales using a statistically determined sample drawn from each claim, with 70% of the sample verified via phone calls and 30% through physical field visits.

To streamline fund administration and ensure operational efficiency, the program's Operations Manual (OM) established tiered claim thresholds that companies had to meet before submitting a reimbursement claim. Participating companies were required to accumulate a minimum of 100 SHS or 500 ICS units for their initial claim, with the threshold increasing to 250 SHS or 1,000 ICS units for all subsequent submissions.

Implementation reality and drivers of change

a) Adjustments to eligibility data collection

During implementation, the requirement for sales agents to collect photographic and GPS evidence at the customer's home was made optional for ICS sales. This adjustment was introduced to ease the heavy administrative and digital burden on last-mile sales agents operating in complex rural settings, many of whom struggled with low digital literacy and poor local connectivity.

b) Adaptations to sales verification approach

In September 2025, the program temporarily shifted to a 100% phone-only verification approach, pausing all physical field visits. This shift was a critical risk-mitigation measure driven by acute staff safety concerns. Localized misconceptions had dangerously linked the use of digital data collection tools and national ID registrations to pre-voting activities for upcoming national elections, making a pause in field deployment necessary to protect field personnel and avoid community pushback.

4.5. Exit Strategy

Initial design

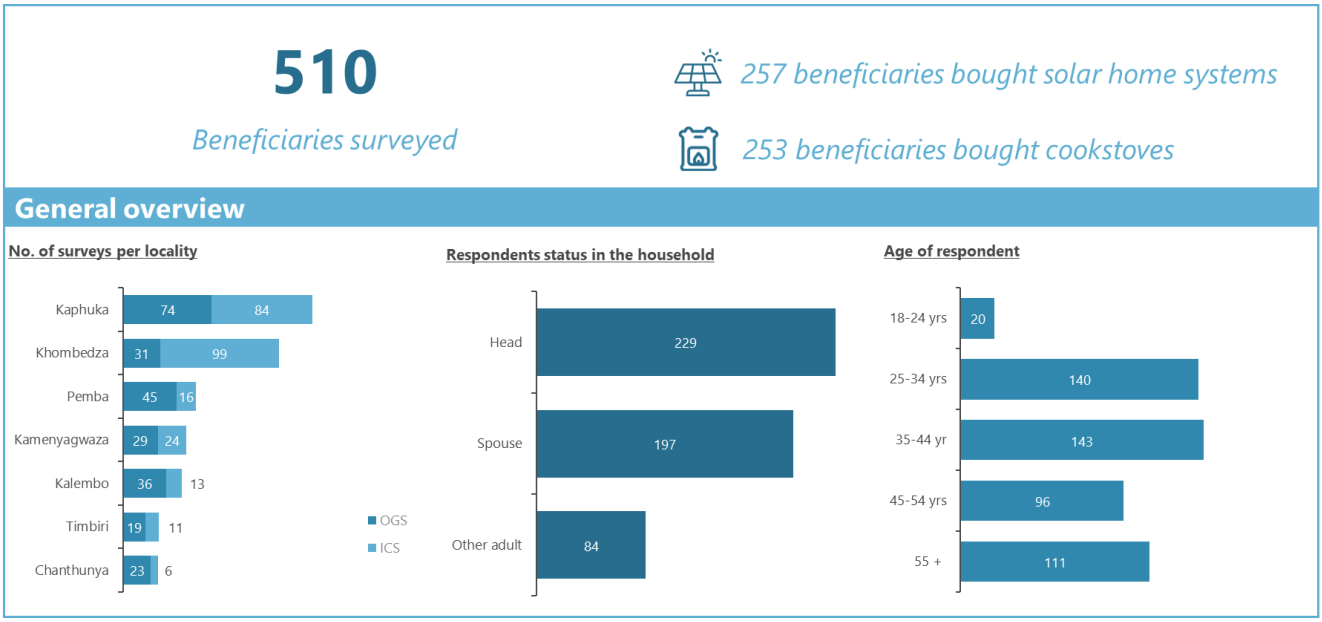
The pilot was designed with the expectation of a direct operational handover, whereby the Government of Malawi would adopt and scale the exact targeting and subsidy model by integrating it directly into World Bank funding frameworks, specifically the Ngwee Ngwee Ngwee Fund.

Implementation reality and drivers of change

The exit strategy pivoted away from seeking a direct continuation of the pilot's operational design toward institutional integration, as players would not yet adopt the highly specific, targeted model as in the pilot. Therefore, a handover became less critical as both solar and clean cooking suppliers utilized the DSS to establish permanent commercial niches and organically expand their reach to unsubsidized customers. The early survival of these last-mile supply networks provides an initial indication of market resilience. This shifts the exit focus toward transferring programmatic knowledge, targeting tools, and operational lessons to shape future public sector designs.

5. Findings

***Figure 2**: Snapshot of household and respondent profile*



5.1. Targeting effectiveness and efficiency

Results: The subsidy reached the intended ultra-poor beneficiaries with high precision, proving that the targeting mechanism identified households that were previously excluded from the commercial market

Solar home systems

The DSS used the MSR registry to direct solar subsidies toward the lowest-income segments of the target districts, and uptake patterns indicate that this filter functioned as designed. Solar sales were concentrated within households classified as poorer and poorest in the registry, and the 12-month PAYGo term emerged as the primary option taken up by 60% of customers. This suggests that the targeting logic, combined with the financing structure, successfully reached the segments the programme was designed to target and prevented leakage into higher-income households able to purchase at commercial prices.

Survey findings further suggest that solar beneficiaries reflect a population structurally dependent on supported pricing. 88% of solar beneficiaries reported the final price was affordable, and the share indicating they would still require a subsidy to make their next energy purchase remained near-universal across the sample, with 51% solar buyers accounting for those responses. Combined with high retention (97%) and near-daily use of the product (99% for solar specifically), these findings suggest that solar households relied on the subsidy to access the product.

At the same time, the registry-based targeting approach introduced inclusion gaps that became visible at the community level. Because registry data is updated in a staggered manner, the data did not always fully align with the current needs observed on the ground. These gaps occasionally made it difficult for field agents to manage community expectations and programme rules.

Overall, the findings suggest that solar targeting effectively reached the intended low-income population within the registry's coverage but remained constrained by the nature of the underlying data. Where the registry was current, the filter performed accurately; where it was not recently updated, eligibility decisions did not always match observable household circumstances on the ground.

Clean cooking

Clean cooking targeting also relied on the MSR targeting approach, and survey findings suggest that the affordability profile of cooking beneficiaries was broadly similar to that of solar buyers. 93% of clean cooking beneficiaries reported the final price as affordable, and clean cooking buyers accounted for 41% ICS beneficiaries who indicated they would still require a subsidy for future energy purchases. These figures suggest that the filter directed cookstove subsidies toward households with limited capacity to participate in the cooking market at full commercial prices.

However, registry gaps appeared to create more visible community friction within clean cooking than within solar, particularly where stockouts compounded inclusion concerns. FGDs in Dedza reported that 13% of eligible households (40 of 300) within those specific groups were able to benefit, primarily due to persistent stockouts. Survey findings showed that 31% of beneficiaries (157 of 510) had heard complaints from others about the programme; 71% of those complaints related to unmet demand and exclusion, 17% to confusion about selection criteria, and 9% to logistical bottlenecks such as stockouts or unfulfilled transactions. This suggests that targeting friction in clean cooking was reinforced by supply-side limitations; when supply could not match demand, eligibility decisions became more visible and contested.

Overall, the findings suggest that the targeting framework worked consistently across both technologies in directing subsidies to low-income households. However, clean cooking targeting appeared to experience greater implementation challenges. This was driven less by the targeting tool itself than by the interaction between registry gaps, persistent stockouts, and concentrated demand within communities.

5.2. Subsidy level determination and impact

Results: Subsidies are a primary driver of market demand, enabling ultra-poor households to access products otherwise beyond their reach

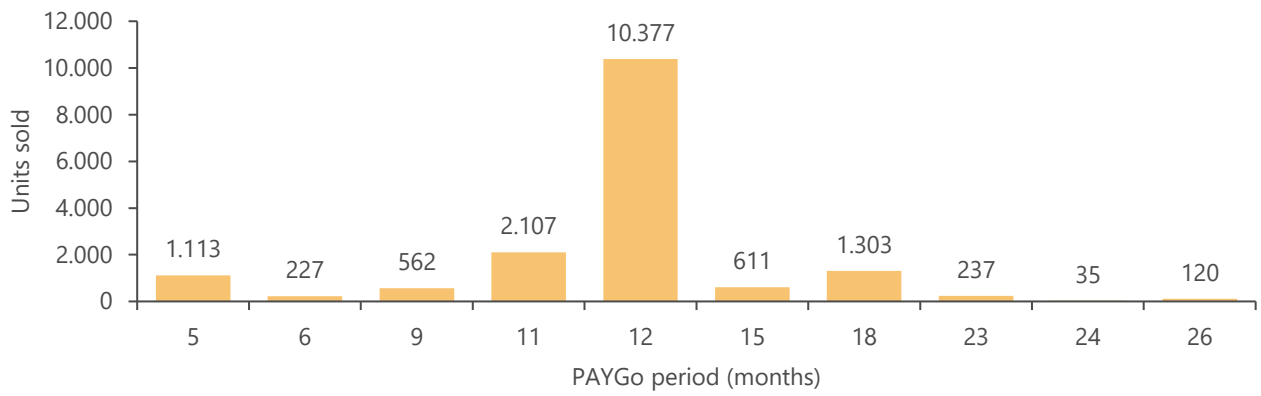
Solar home systems

The combination of the DSS subsidy and PAYGo financing converted the upfront cost of solar systems into manageable instalment payments aligned with existing household energy budgets. Repayment terms ranged from 5 to 26 months, but the 12-month term emerged as the standard, accounting for 60% of all solar sales. FGD participants reported being able to substitute existing energy spending for solar instalments, and default rates reported by participating companies remained between 1% and 4%. This suggests that instalment levels stayed within the threshold households were already accustomed to spending on energy, which is the practical mechanism through which the financing structure preserved affordability without producing repayment stress.

Figure 3: *PAYGo payment for solar technologies from September 2024 to August 2025*[1]

[1] Malawi Anonymized Data

PAYGo payment for solar from September 2024 to August 2025, *units*



The same financing structure that improved affordability also reduced the residual balance available to fund after-sales service. With residual balances on subsidised PAYGo systems falling between EUR 5.12 and EUR 10.25, some participating companies (n=2) observed that sales agents had limited financial incentive to undertake costly maintenance or collection trips into remote areas. While higher pricing would improve servicing margins, pilot data indicate that it would also exclude the targeted populations. This points to a structural trade-off that the subsidy depth enabled access for ultra-poor households but reduced the commercial margin available to sustain post-sale service in those same locations.

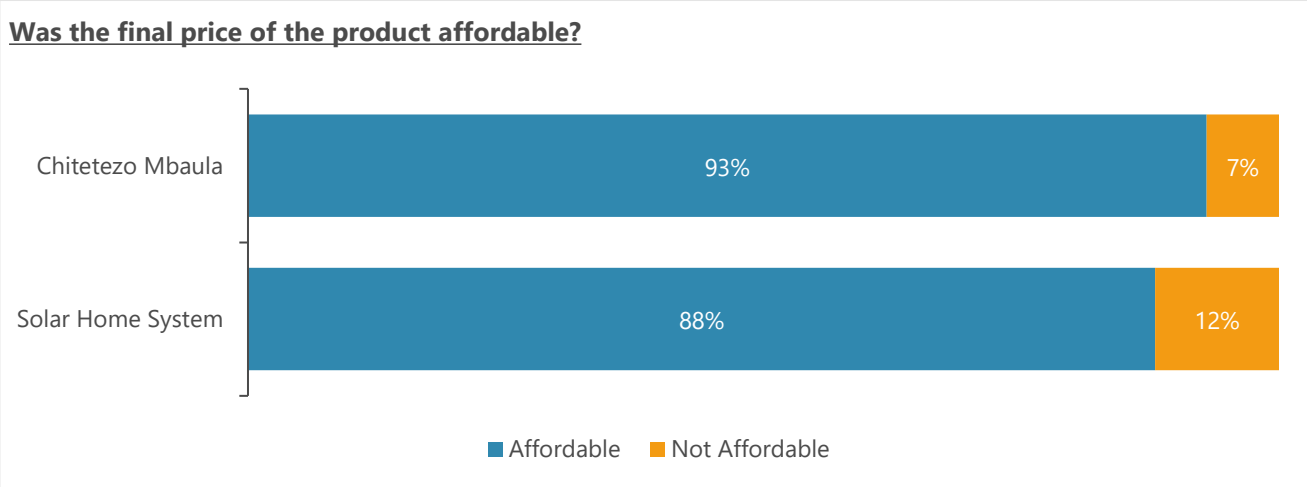
The pilot also showed that the subsidy delivered measurable gender inclusion within solar uptake, though with a residual affordability gap among female-headed households. The pilot also showed that the subsidy delivered measurable gender inclusion within solar uptake, leveraging existing safety nets by integrating Social Protection Program (SPP). Overall, SCTP beneficiaries accounted for 23% of solar technology buyers. Women accounted for 62% of overall solar buyers in the sales data, indicating that they were positioned as primary purchasers rather than secondary household participants. This was even more pronounced within social safety nets, where female buyers constituted 66% of the solar SPG buyers. However, female-headed households (28% of the sample) reported affordability of 79% compared with 92% among male-headed households, with the gap concentrated specifically in solar. This suggests that while the subsidy and SPG linkages reached vulnerable women effectively as buyers, the residual affordability strain remained concentrated among the subset of women who carry the primary economic burden of the household.

Overall, the findings suggest that the solar subsidy and PAYGo design successfully bridged the upfront cost barrier for low-income households and produced strong repayment performance, while also creating a sustainability trade-off where residual balances became too low to support the cost of maintaining service in remote areas.

Clean cooking

The clean cooking subsidy was set to enable household-level affordability, and survey data indicate that this objective was met within the constrained markets the programme served. 93% of clean cooking beneficiaries reported the final price as affordable, slightly above solar, and 86% of all beneficiaries reported the product as cheaper than similar items available on the market. This suggests that the subsidy level was correctly calibrated relative to the willingness and ability of beneficiaries to pay.

Figure 4: *Beneficiary views on affordability per technology*



During implementation, the programme increased the cookstove distribution subsidy by 150%, from EUR 1.68 to EUR 4.20, in response to rising inflation and fuel price volatility. This adjustment effectively absorbed the additional cost of operating in difficult-to-reach markets and prevented price increases from being passed on to end-users. With the subsidy no longer the binding variable, the persistent underperformance of cookstove distribution suggests that the residual constraint was structural rather than financial. Even when companies were fully insulated from cost shocks, the lack of physical distribution infrastructure continued to constrain delivery.

The programme demonstrated strong gender inclusion across clean cooking customers. Overall, SCTP beneficiaries accounted for 29% of cookstove buyers. Sales data show that women accounted for 68% of clean cooking buyers, indicating that they were positioned as the primary purchasers. This was further reinforced within social safety nets, where female buyers constituted 70% of the clean cooking SPG buyers. This suggests that the DSS and SPG linkages reached vulnerable women effectively as buyers and users.

Overall, the findings suggest that the clean cooking subsidy successfully bridged the affordability gap for low-income households, but that a financial subsidy alone could not compensate for the structural delivery constraints of the clean cooking sector. This is the central operational distinction between the two technologies, solar performance scaled with subsidy depth, while clean cooking performance plateaued once supply-side limitations became binding.

5.3. Delivery and communication effectiveness

Results: The private sector demonstrated willingness and ability to expand into remote, underserved districts, proving that the RBF model can de-risk the last mile for companies; however, logistical and delivery bottlenecks restricted the scalability

Solar home systems

Solar delivery relied on commission-based company agents compensated per installation, followed by community structures (VDCs and local chiefs) that helped generate initial awareness. Across the sample, 40% of beneficiaries identified company agents as their main awareness channel, followed by local leaders, community meetings, and friends or relatives. This pattern reflects the operational logic of solar delivery, where

installation and customer onboarding require direct contact, and agents are well placed to handle that interaction at the point of sale.

Figure 5: *Solar beneficiary awareness and product discovery*



While 93% of beneficiaries reported being briefed by company agents, the temporary nature of the discount appears to have travelled less consistently through this channel across SHS and ICS. 48% of those briefed by agents (n=226) did not know the discount was temporary, compared with 26% of those briefed by local leaders (n=8), although the small leader subgroup limits how firmly this comparison can be drawn. The evidence indicates that this specific message did not land as reliably through agent briefings, suggesting that future programmes may benefit from reinforcing temporary-pricing communication through additional channels alongside the agent.

Figure 6: *Communication and messaging on programme rules and payments*[1]



A notable commercial spillover also emerged from the localised agent presence within solar markets. Distributors reported that the physical demonstration of products convinced ineligible households to purchase solar systems at full cash prices. This suggests that the agent network performed two functions in parallel: delivering the subsidy to eligible households and seeding broader commercial demand among non-eligible households who had not previously been reached by these companies.

Overall, the findings suggest that solar delivery worked well in converting eligible households into buyers and even generating commercial spillover, but that programme-level messaging, particularly around the temporary nature of the discount, did not travel reliably through the agent channel.

Clean cooking

Clean cooking awareness relied on a more balanced mix of company agents and local leaders compared with solar. This reflects the structure of the cooking market, where products are typically delivered through smaller producer groups and where community legitimacy plays a larger role in adoption. Pre-purchase awareness of the product reached 63% of the sample overall, while awareness of the subsidy specifically reached 54%, suggesting that the product was visible before the subsidy mechanism became understood.

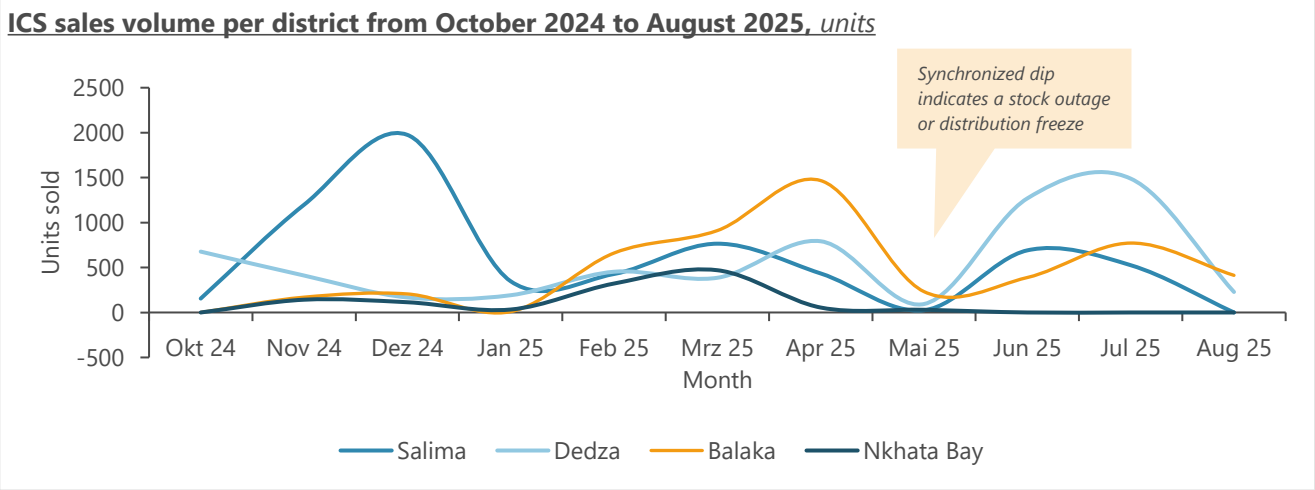
[1] ** Not clearly explained represents 0.2% (1) of total responses (510). ** Other represents 0.2% (1) of total responses (510)*

Figure 7: *Clean cooking beneficiary awareness and product discovery* [1]



However, the binding constraint within clean cooking delivery was not communication but inventory. Persistent stockouts, particularly during the rainy season, when clay-based cookstove production becomes difficult, meant that demand frequently outpaced available supply. Of beneficiaries who reported hearing complaints about the programme, 71% pointed to unmet demand and 9% to logistical bottlenecks such as stockouts and unfulfilled deliveries. This suggests that the same seasonal weather pattern that increases household demand for cooking solutions also disrupts the production cycle of clay-based stoves, creating a structural mismatch between the timing of demand and the timing of supply.

Figure 8: *Clean cooking sales from October 2024 to August 2025*[2]



Regional production imbalances compounded seasonal constraints. Districts without locally established stove producer groups (SPGs) were dependent on inbound supply, which reintroduced transport costs that the distribution subsidy could not fully neutralize. However, even where local groups existed, they frequently lacked the capacity to meet supplier volume targets, and seasonal rains halted clay production across all regions. Furthermore, broader market dynamics suppressed expected sales, whereas the low profit margins of clay stoves made the program less competitive for larger, established distributors. Consequently, companies struggled to generate sales momentum while competing against a deep-seated NGO handout culture and the widespread availability of free gathered firewood in rural settings.

Overall, the findings suggest that clean cooking delivery faced a seasonal production bottleneck rooted in the physical realities of clay-based stove manufacturing that solar did not face.

[1] * Other represents the selection of IVA
[2] Malawi Anonymized Data

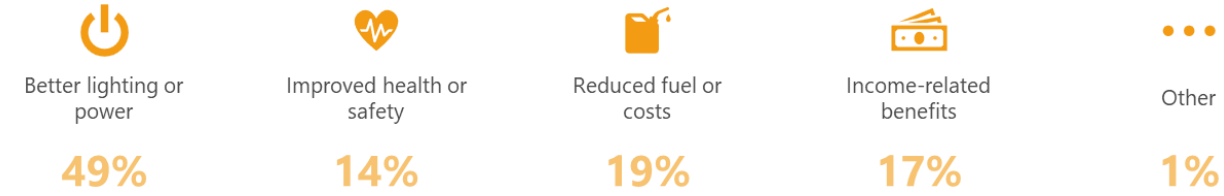
5.4. Subsidy valuation and behavioural impacts

Results: Strong demand and high uptake for energy products were met with supply-side bottlenecks and product-market misalignments that dictated the outcomes

Solar home systems

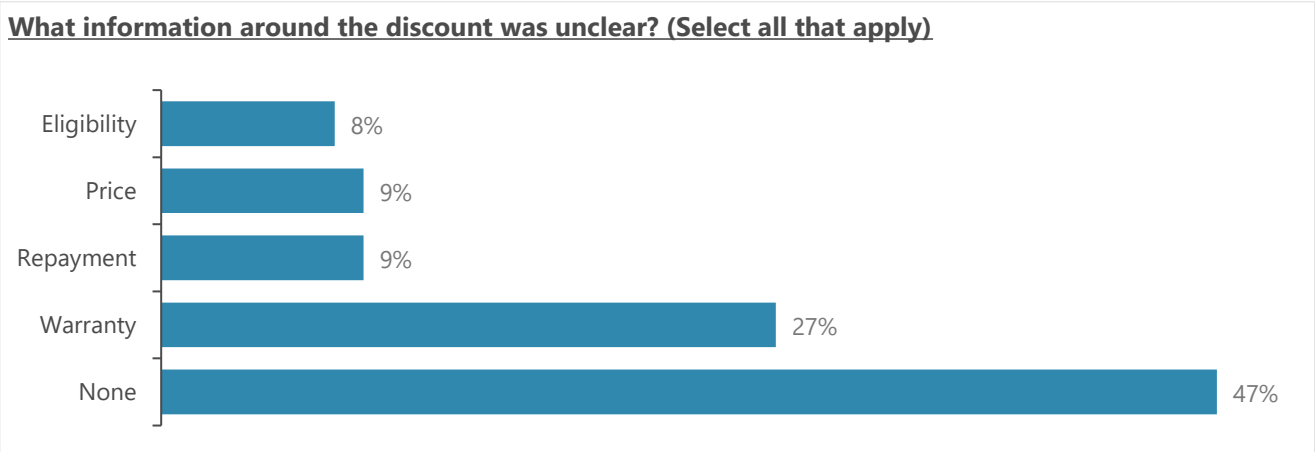
Solar generated immediate, household-wide benefits that translated into both visible welfare gains and productive use. 49% of solar respondents cited better lighting or power as the highest-ranking benefit, 80% reported that the entire household used the product, and 99% reported daily use. 17% of solar households mentioned income-related benefits, twice the rate observed in clean cooking. FGD participants linked these income gains to extended productive hours after dark, allowing home-based activities (small-scale commerce, study) to continue into the evening. This suggests that the welfare benefit of solar accrues across the household and creates a visible economic case that supports broader demand even beyond the subsidised population.

Figure 9: *Product benefits for solar respondents*



Solar customers also reported a specific gap in their understanding of after-sales support. Across the sample, warranty accounted for 30% of all unclear-topic mentions; among solar respondents specifically, 27% reported warranty confusion, alongside 47% reporting that nothing was unclear. Of households that experienced a technical problem, 47% of solar customers did not contact anyone (n=7). Combined with the low residual balance discussed earlier, this suggests that the after-sales channel exists in solar but is not visible to customers.

Figure 10: *Solar product communication and messaging*



Overall, the findings suggest that solar produced strong welfare and behavioural gains and contributed to commercial spillover, but that the visibility of the after-sales service channel, rather than the existence of service capacity itself, is the binding constraint on long-term customer satisfaction.

Clean cooking

Clean cooking benefits were narrower and less visible at the household level. While 43% of respondents identified adult women as the primary user, only 8% reported direct income-related benefits from use. Instead, the gains accrued primarily as day-to-day operational savings for the individual cook, with 34% experiencing reduced fuel costs and 39% benefiting from reduced cooking time. This helps explain why clean cooking adoption depended more heavily on subsidies than solar, as the case for paying full commercial prices is harder to make when the benefits are concentrated on the primary user rather than felt widely by the entire household.

Figure 11: *Product benefits for clean cooking respondents*



Within clean cooking, after-sales service was a more material problem than in solar. 80 households (16% of the total sample, equivalent to 25% of clean cooking buyers) reported encountering a technical issue, and 90% of these issues remained unresolved at the time of the survey. 84% of cookstove customers with a problem did not contact anyone, suggesting that the after-sales channels were not merely underutilized but, in many cases, not clearly understood or accessible to customers. Additionally, uncertainty on warranty provisions was higher among cookstove users than solar customers (33% versus 27%). This suggests that the issue in clean cooking is closer to product design and durability than to a service infrastructure question, because customers experiencing problems do not have a channel to escalate to in the first place.

Communication of selection criteria was also less clear within the cooking buyer base. Overall, 47% of beneficiaries surveyed reported they were not told why their household was able to purchase at a discount. Among the 269 who were told, 49% cited low income and 37% cited the registry, suggesting that, where explanations were given, agents often communicated broad eligibility headlines.

Overall, the findings suggest that clean cooking benefits accrue more narrowly within the household, and selection criteria are insufficiently explained at the household level, each of which compounds the dependence on subsidy mediation.

5.5. Verification

Results: Strong internal controls provided essential program oversight but introduced process latencies that restricted cash flow and inhibited rapid scaling

Solar home systems

Solar verification process maintained its planned timelines and delivered strong compliance outcomes. The verification mechanism proved highly effective, reducing claim rejections from 3% to 1% and achieving a 100% eligibility success rate, with every customer approved during CUMO's internal screening later validated by the IVA audit. Additionally, the program rejected approximately 11 million MWK in non-compliant subsidy claims and recovered 3.5 million MWK from fraudulent agent reporting, which included mandatory refunds for overcharged buyers. Ultimately, by penalizing technical deficiencies and financial irregularities, the verification

process ensured public funding was strictly directed toward VeraSol-certified systems backed by a minimum two-year warranty. However, subsequent administrative bottlenecks in processing and releasing fund disbursements to suppliers created severe working-capital pressures for the participating firms.

However, payment timelines of 1–3 months between claim submission and disbursement contributed to the working-capital pressure experienced by firms. This lag stemmed from internal processing bottlenecks at the Fund Manager level (SHA and CUMO) alongside budget depletion from OGS companies overselling their allocations. These delays were compounded by poor-quality submissions, which forced CUMO to repeatedly return claims for correction and required SHA staff to provide intensive manual support. Furthermore, claims processing lacked a dedicated team and was entirely absorbed by existing CUMO finance staff. While minor Kobo platform downtime added occasional friction, it was not a material driver of the delays.

Overall, solar verification successfully protected public funds and identified non-compliance, but the liquidity constraints firms faced stemmed mainly from Fund Manager processing bottlenecks, rooted in contract and budget mismanagement, diverted staff capacity, and the lack of a dedicated claims-processing team, rather than from the verification methodology itself.

Clean cooking

Clean cooking verification operated under the same framework as solar but interacted with weaker firm-level capacity to absorb administrative friction. The same Kobo-based intake tool, documentation requirements, and reimbursement timelines applied across both technologies. Because the same Fund Manager bottlenecks applied, and because clean cooking firms typically operate at thinner margins than solar distributors, the processing delays had more direct consequences for inventory restocking and operational continuity in the cooking sector. The budget and contract problems took a different form here: rather than overselling, many ICS companies submitted misleading sales projections and then missed their targets, complicating fund allocation. Staff-diversion pressure was also acute on the cooking side, where SHA staff had to provide hands-on support simply to keep distribution moving.

Verification was also the mechanism through which the programme enforced quality standards specific to clean cooking, including Malawi Bureau of Standards certification for locally manufactured wood-burning cookstoves designed to generate fuel savings, and pricing transparency across the supply chain. Where products did not meet these standards, claims were rejected and the subsidy withheld, with verification performing as an enforcer of a product-quality floor in a sector where production is more fragmented than in solar.

Overall, the verification system was functionally identical across technologies, but the liquidity pressure, again rooted in administrative processing bottlenecks, was more constraining for clean cooking firms given their thinner margins, more fragmented production, and weaker working-capital reserves.

5.6. Market distortion assessment

Results: DSS serves as a viable bridge to bring private sector competition into areas that were previously considered unreachable

Solar home systems

Because the poorer and poorest UBR/MSR categories together cover a significant portion of the population in the target districts, the DSS effectively functioned as a driver of solar demand in those

communities. This placed concentrated commercial pressure on participating companies, who needed to scale rapidly to meet that demand while continuing to depend on hard-currency liquidity to import stock. During periods of constrained forex access, this dependency limited how much demand could be served, regardless of how accurately the registry identified eligible households. This suggests that, in this programme design, last-mile social outcomes are tied directly to the commercial health of the upstream supply chain.

Despite this dependency, companies viewed the DSS pilot as a strategic market-entry tool. Distributors reported establishing satellite shops and localised agent networks in deep-rural villages previously considered commercially unviable and indicated an intent to maintain these structures long-term with diversified product portfolios at multiple price points. The localised presence also produced commercial spillovers, with ineligible households who saw products demonstrated locally going on to purchase solar systems at full cash prices.

Overall, the findings suggest that the solar market did not experience distortion in the conventional sense; instead, the pilot built physical distribution capacity in last-mile geographies that the commercial market had not previously reached, and these capabilities show signs of persistence beyond the subsidy itself.

Clean cooking

Clean cooking presented a different distortion profile, dominated by the absence of supply-side capacity. Because clay-based stove production cannot scale during the rainy season and regional production capacity is unevenly distributed across districts, the programme could not generate the kind of commercial footprint observed in solar. Subsidy levels were sufficient to drive demand, but supply could not respond at the scale required.

This pattern reinforces that in fragmented, infrastructure-constrained sectors, social precision in targeting and commercial viability in delivery are functionally interdependent. Even accurate eligibility decisions become difficult to operationalise when there are no products available to deliver to the households identified. The clean cooking experience suggests that the binding constraint on the cooking market is the absence of a reliable upstream production base.

Crucially, this physical bottleneck is compounded by financial limitations that stifle commercial delivery. As observed by distributors, the regulated market price for basic cookstoves is not cost-reflective. While price caps set by the National Cookstove Steering Committee (NCSC) help preserve affordability for end-users, these limits restrict companies' ability to adjust to rising raw material and transport costs. Because companies cannot cover their operational costs and operate on a purely commercial basis, the cooking sector remains highly dependent on donor subsidies. Ultimately, this indicates that future programmes will need to address production capacity directly rather than relying on demand-side instruments alone.

6. Recommendations

The Malawi DSS pilot demonstrated that demand-side subsidies can effectively reach low-income households in ultra-poor markets while producing meaningful welfare and commercial benefits. At the same time, the findings highlighted distinct operational trade-offs between targeting accuracy, supplier financial resilience, verification efficiency, data privacy, and the structural realities of the clean cooking supply chain. The recommendations

below focus on practical implementation choices that future programmes could consider when scaling the model in Malawi and similar contexts.

1. Refine targeting precision through periodic registry updates and complementary verification mechanisms

The findings indicate that registry-based targeting was accurate where the UBR/MSR was current but produced visible inclusion gaps where data was outdated. Future programmes will need to navigate trade-offs between accuracy, cost, and speed.

One option is to synchronise the UBR/MSR with the Government of Malawi at 2-to-3-year intervals aligned with funding cycles, including mini-censuses in target districts before mobilisation. This approach maximises auditability and rebuilds the targeting tool on a refreshed framework, but requires significant pre-funding and donor alignment, and may delay programme launch.

A second option is to maintain the UBR/MSR as the primary eligibility filter while introducing a secondary vetting protocol, conducted by district officers or third-party verifiers, to capture households missing from the registry through social wealth ranking. This closes registry gaps in real time and improves community acceptance but increases the cost-to-serve per household and introduces a risk of favouritism without strict oversight.

A third option is to continue using the existing registry as the sole gatekeeper while investing in mass-media communication, such as radio, to explain the pre-vetted nature of eligibility. This is the fastest and most cost-effective path to scale but accepts a permanent margin of unmet eligibility and requires comprehensive communication to manage the resulting community friction.

These approaches reflect a core trade-off between targeting precision, cost-efficiency, and community legitimacy that future programmes will need to weigh based on funding scale and political risk tolerance.

2. Strengthen supplier resilience through institutional embedding, technical assistance, and performance-linked allocation

The findings suggest that allocated distribution cost subsidy levels alone could not insulate participating firms from macroeconomic volatility (forex scarcity, inflation) or operational capacity gaps. Future programmes will need to decide whether to focus on external financial safeguards, internal capacity building, or both.

Nesting future iterations within established institutional frameworks such as the World Bank's MEAP could leverage existing regulatory windows for USD-denominated incentives, including options such as the Ngwee Ngwee Ngwee fund, to shield suppliers from currency devaluation. This addresses the forex shock at the source but requires firms to meet the more rigorous administrative and compliance standards associated with national-scale World Bank projects.

Bundling financial incentives with integrated technical assistance and business development support (BDS) in cash-flow management, inventory forecasting, and digital after-sales tracking would directly support the performance-based allocation model by ensuring firms have the internal systems required to meet quality standards. This positions the implementing partner as a market builder but requires significant upfront investment in training and monitoring.

Maintaining the performance-based allocation model, where budget tranches adjust based on monthly sales and verified after-sales service quality, channels funds to the most efficient distributors. However, this approach offers

limited protection against systemic shocks and accepts that smaller or less resilient firms may underperform during periods of high economic volatility.

These options can be combined to varying degrees, but each carries explicit cost and complexity implications that future programme designers will need to weigh against fund-efficiency targets.

3. Streamline digital verification and address fund manager disbursement bottlenecks to preserve data integrity while reducing company liquidity constraints

The findings indicate that the verification framework effectively protected public funds, but payment lags introduced severe working-capital pressure for participating firms. Crucially, the primary driver of these delays was the late release of funds by the fund managers, while operational workflow issues such as Kobo platform downtime, manual re-entry requirements, data-entry errors, and a literacy gap among sales agents served as secondary contributors.

The Fund Managers must establish a streamlined, milestone-based capital disbursement pipeline that decouples initial working-capital releases from prolonged final verification cycles. While maintaining rigorous financial oversight, fund managers should institute automated triggers for partial advances or rolling payouts once initial batch compliance is met.

To mitigate these secondary bottlenecks, future designs must balance optimizing the digital pipeline with field training. Streamlining digital intake through metadata pre-population and mandatory technical training could eliminate clerical errors and reduce manual re-entry. However, this requires a heavier upfront investment in agent onboarding, which raises the cost-per-agent and can slow initial scaling. In parallel, data privacy remains a non-negotiable constraint; while QR scanning was explored to accelerate data entry, it captured personal information beyond the program's scope. A double-entry verification protocol was maintained to preserve accuracy and compliance, accepting a slower input speed to protect sensitive customer data. Ultimately, relief for distributor working capital requires pairing these optimized verification workflows with the resolution of fund-manager capital disbursement bottlenecks to ensure reliable, timely funding releases.

4. Invest in upstream supply-chain capacity for clean cooking

The findings indicate that the binding constraint within the clean cooking sector was the supply-side fragility, specifically the seasonal collapse of clay-based stove production during the rainy season and the uneven distribution of SPGs across districts. Future programmes will need to decide whether to invest in the structural development of SPGs or accept seasonal supply volatility as an inherent market constraint.

One option is to invest in climate-resilient infrastructure, such as improved kilns and solar-assisted drying sheds, to decouple production from weather patterns. This approach ensures year-round inventory and prevents market blackouts but reduces the funding available for end-user price discounts. It shifts the programme's focus from buying units to building capacity, transforming fragile artisanal clusters into reliable commercial partners.

A second option is to formally integrate SPGs into the commercial supply chain through subsidy-incentivised, long-term, bankable subcontracts. The DSS programme could provide targeted technical assistance to help SPGs manage inventory forecasting and quality consistency, allowing them to absorb the operational pressures of a commercial supply chain. Operationally, this reinforces the existing NCSC mandate by making compliance a prerequisite for accessing more sophisticated procurement contracts and working-capital bridges.

These approaches may be particularly relevant where future cookstove programmes intend to operate in remote districts or during seasonal supply gaps. However, they require longer implementation timelines and divert resources away from direct end-user subsidy in the near term.

7. Conclusion

The Malawi DSS pilot demonstrated that demand-side subsidies can effectively expand access to modern energy services in highly affordability-constrained contexts. Across both solar home systems and clean cooking technologies, the programme reduced upfront capital barriers, stimulated household-level uptake among low-income segments, and produced meaningful welfare benefits including improved lighting, longer productive hours, reduced cooking time, and reduced fuel dependence. The findings further suggest that the DSS acted as a strategic de-risking tool for participating distributors, incentivising private firms to establish localised sales networks in deep-rural areas previously considered commercially unviable.

At the same time, the pilot revealed that solar home systems and clean cooking operate under significantly different market and operational realities. Solar delivery benefited from PAYGo financing, more established distribution systems, and meaningful commercial spillover beyond eligible households. Clean cooking faced narrower household-level benefits, more fragmented production, persistent stockouts driven by seasonal supply collapse, and weaker after-sales service infrastructure. The findings suggest that future programmes will benefit from differentiated approaches across technologies rather than a single uniform delivery model.

The pilot also showed that several of the operational friction observed, including registry gaps, payment lags, and stockouts, reflected structural constraints in the broader market and policy environment rather than weaknesses in programme design. Future programmes will therefore likely need to balance subsidy depth with complementary investments in registry maintenance, supplier liquidity, agent training, and upstream production capacity, particularly within the clean cooking sector.

Importantly, the findings indicate that significant unmet demand for modern energy services persists across the target districts and beyond. Survey data confirm near-universal continued reliance on subsidy support among current beneficiaries, alongside substantial visible demand from households not reached during the pilot. Future scale-up opportunities are therefore likely to extend beyond the pilot geographies into additional impoverished districts where energy access gaps remain substantial and where supply-side infrastructure, particularly for clean cooking, requires further development.

Overall, the Malawi DSS pilot provides important evidence that demand-side subsidies can support both energy access and commercial market development objectives when designed with sufficient operational flexibility and recognition of the structural constraints associated with last-mile delivery in deeply constrained environments. Nesting the model within established institutional frameworks such as MEAP, while continuing to refine targeting, verification, and supplier-support mechanisms, offers a credible pathway from pilot to durable, nationwide energy access.