



Evaluation of the SunScale Project

West Nile and Acholi Sub-regions, Uganda

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Introduction

The SunScale project is a pilot initiative based on the **Market System Development (MSD)** approach, implemented in Adjumani, Obongi and Lamwo districts in the West Nile and Acholi Sub-regions, Uganda. Its main objective is to enhance access to renewable energy for agricultural production and modern cooking. Instead of directly providing goods and services, the MSD approach aims to strengthen market systems by integrating private sector actors and promoting sustainable solutions for refugee populations and host communities.

The evaluation of the SunScale project was developed with two primary objectives:

- **To assess the impacts of the intervention**, with a particular focus on the effectiveness of the MSD approach in achieving sustainable and scalable results.
- **To generate learning to improve future interventions**, identifying best practices, challenges, and opportunities to refine the approach and enhance future programming.

To ensure a relevant and well-aligned evaluation, a participatory process was carried out to define the evaluation questions. This process involved the SunScale project team, as well as



regional and sectoral coordination teams, identifying evaluation needs at a systemic level and in terms of the project's impact on the population and its sustainability.

The evaluation prioritizes a **learning-oriented** approach aimed at improving the program, while also validating the impact of the intervention and the adoption of the MSD approach. Specifically, the assessment focused on four key MSD elements that determine the sustainability of results: **Adapt, Adopt, Respond, and Expand**.

From a methodological perspective, the evaluation combines **quantitative and qualitative techniques** to ensure data triangulation. Secondary data sources were also utilized to better understand the project's structure, processes, and the extent to which the MSD approach was integrated into all phases of implementation.

Context

Access to modern energy is a crucial factor for agricultural development and poverty reduction in Uganda. While 80% of Uganda's land is arable, only 35% is currently cultivated, partly due to the lack of reliable energy for agricultural production, processing, and storage. In the West Nile and Acholi sub-regions, this challenge is exacerbated by the presence of refugee communities and the heavy reliance on traditional energy sources, which contribute to environmental degradation and limit economic opportunities.

Globally, clean energy remains a critical driver for achieving numerous development goals, yet access is severely limited for the 120 million forcibly displaced people worldwide. In Africa, 85% of refugees lack access to electricity, and 93% lack clean cooking solutions, mirroring similar conditions in their adjacent host communities. This not only stifles economic growth and livelihood opportunities but also undermines food and water security, exacerbates environmental degradation, and strains relationships between refugees and host communities.

In Uganda, energy access disparities are particularly pronounced in rural areas, where only 10% of the population has access to electricity, compared to 57.2% in urban areas and a national average of 22.1%¹. This highlights the urgency of expanding clean energy solutions, particularly in refugee-hosting regions like Northern Uganda.

The **SunScale project** was designed as an innovative response to these challenges by promoting the **productive use of renewable energy** through a market-based approach. Instead of directly distributing products or services, the project focuses on strengthening the market ecosystem by engaging key stakeholders, including private companies, financial institutions, and local governments.

The **Market System Development (MSD) approach** applied in SunScale involves:

- Facilitating private sector participation in providing clean energy technologies such as solar-powered irrigation systems and energy-efficient cooking solutions.
- Reducing access barriers through strategic subsidies and financing mechanisms for smallholder farmers and households.
- Strengthening demand for renewable energy by raising awareness and generating evidence of its economic and environmental benefits.
- Ensuring the sustainability of the intervention, allowing market actors to continue offering solutions beyond the project's duration.

From a **gender perspective**, the SunScale project is expected to have a significant impact on women's lives, particularly in Adjumani, Lamwo, and Obongi, where women spend between 2 and 4 hours daily collecting firewood and between 2 and 5 hours cooking. The adoption of clean energy technologies should not only improve their health and well-being but also contribute to gender equity by reducing their workload and expanding their economic opportunities.

¹ <https://www.humanitarianenergy.org/what-is-the-gpa/why-energy-is-important/>?
<https://www.unrefugees.org/refugee-facts/statistics/>?

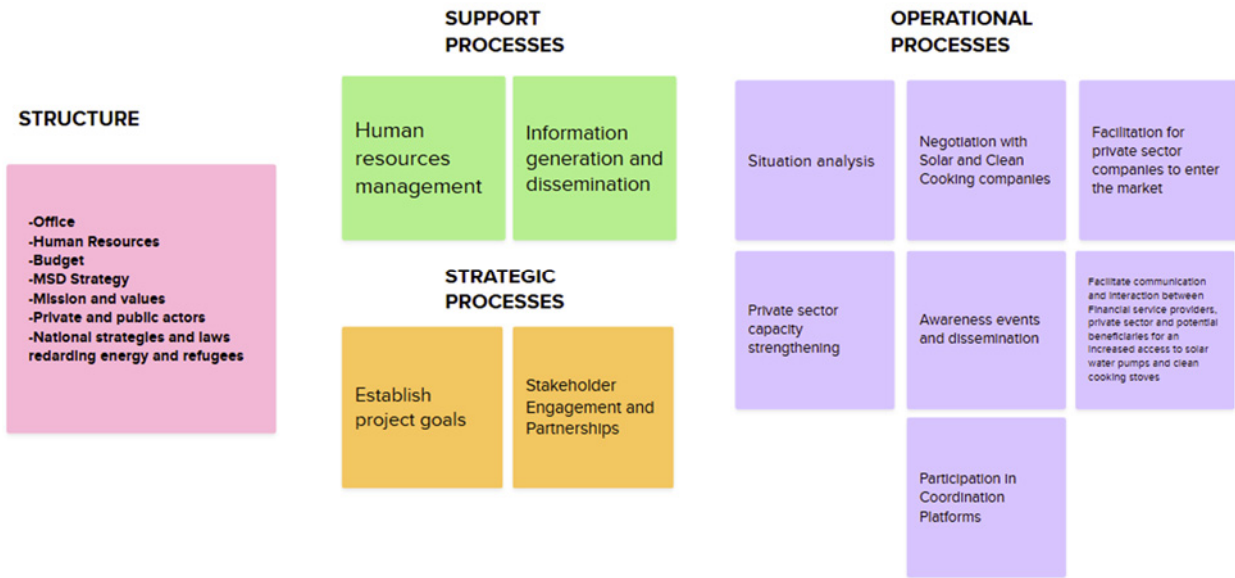
Given the scale of the challenge and the interconnected nature of energy access, displacement, and economic development, evaluating the project's impact from a **systemic perspective** is essential. This ensures that the changes introduced are both sustainable and scalable within the local energy market.

Methodology

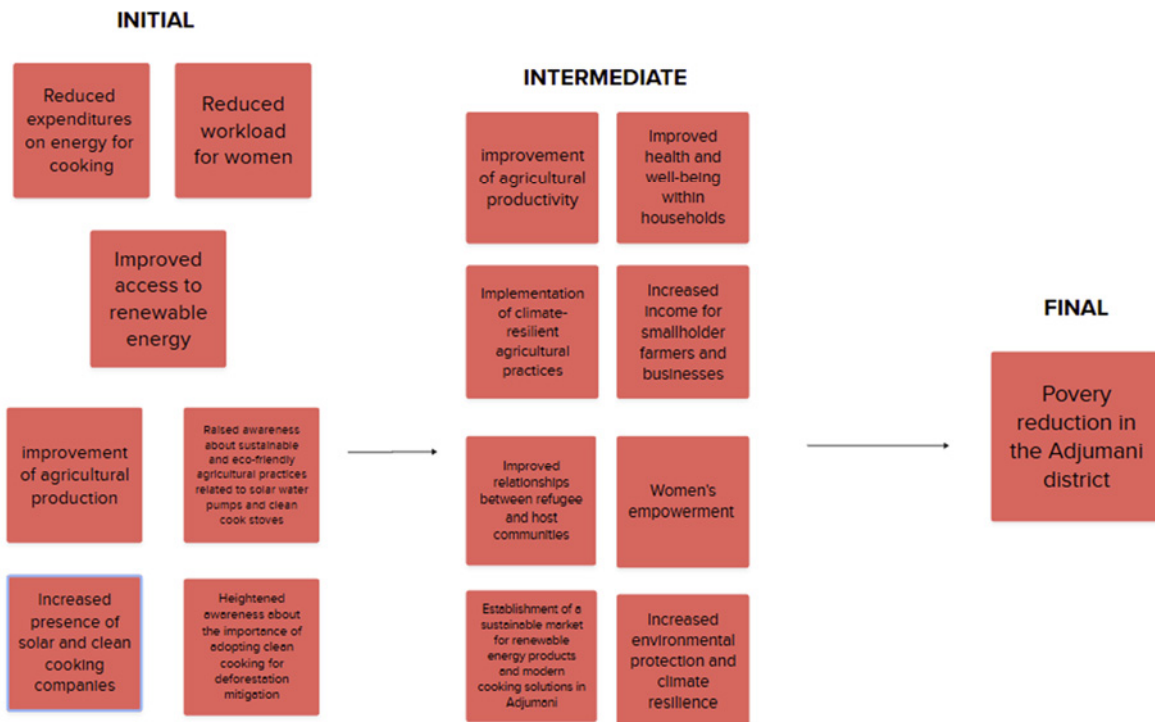
The evaluation of the **SunScale** project was structured around a mixed-methods approach, incorporating both qualitative and quantitative techniques to provide a comprehensive analysis of the project's implementation, results, and sustainability. Given that the SunScale project is grounded in the Market Systems Development (MSD) approach, the evaluation assessed not only the direct outcomes for beneficiaries but also the systemic changes within the market for renewable energy and clean cooking solutions.

This evaluation was conducted as an internal assessment, primarily oriented towards learning and program improvement, while also validating the project's impact. The evaluation was able to capture rich insights into the intervention's effectiveness and sustainability, guided by the MSD monitoring framework developed for the project.

The definition of the evaluative needs and the elements to be addressed during the evaluation were based on the logical model defined by the SunScale Team as follows:



OUTCOMES



Evaluation Design and Focus

A participatory process was followed to identify key evaluation questions, ensuring that the assessment responded to the needs of stakeholders. This involved consultations with the Ayuda en Acción Uganda team responsible for the SunScale project, as well as coordination teams at the regional and sectoral levels. These discussions helped shape the evaluation to address **three core dimensions**:



Structure and Processes

Analyzing the internal organization of the project, including human re-sources, partnerships, communication, and facilitation mechanisms of the logical model.



Results at Different Levels

Examining initial, intermediate, and final outcomes, particularly in terms of energy access, agricultural productivity, gender empowerment, market growth, and sustainability, identified in the logical model.



Systemic Change and MSD Adoption

Evaluating whether companies and financial institutions have internalized MSD principles, showing signs of long-term engagement, adaptation, and scaling beyond the project's direct support.

A series of key evaluation questions were developed across these dimensions, ranging from operational effectiveness (e.g., adequacy of human resources, delays in implementation) to

impact assessment (e.g., increase in agricultural production, reduction of women’s workload, and sustainability of technology use). These questions were intentionally designed to align with the MSD framework, particularly focusing on whether market players have “Adapted, Adopted, Responded, and Expanded”—a crucial indicator of long-term sustainability.

Data Collection Methods

To ensure a **robust and triangulated analysis**, the evaluation combined **primary data collection** (interviews, surveys, and focus groups) with a **review of secondary sources**.

Qualitative Data Collection

A **series of semi-structured interviews** were conducted to capture insights from different project stakeholders. The qualitative component of the evaluation was crucial in understanding how the intervention influenced market actors and whether there were signs of systemic change.

- **Internal project stakeholders:** Four interviews were conducted with Ayuda en Acción Uganda team members at operational and coordination levels, providing insights into implementation challenges, partnerships, and overall project effectiveness.



- **Private sector partners:** Eight interviews were conducted with representatives from Ebenezer, Tulina, and Sunculture, three of the main companies engaged in the project. These discussions focused on business model adaptation, sustainability, and market opportunities created by the intervention.
- **Financial institutions:** Only one interview was conducted with a representative from a key local bank to explore the challenges and successes of brokering funding for renewable energy products.

In addition to individual interviews, **eight focus group discussions (FGDs)** were held across the districts of **Obongi, Lamwo, and Adjumani**. These were divided into:

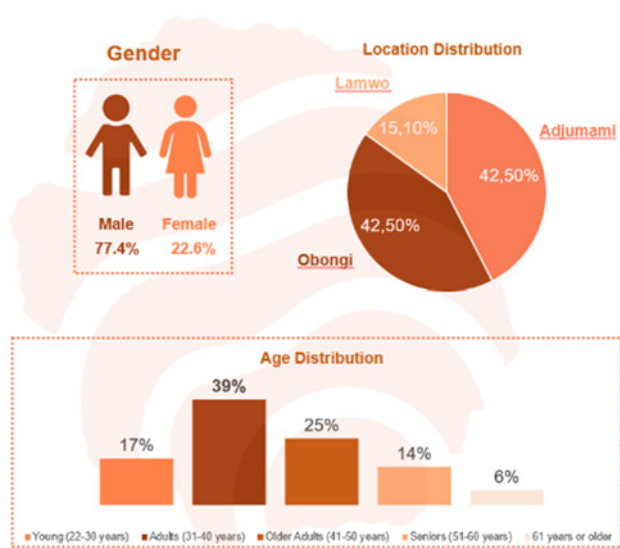
- **Five FGDs with individuals who purchased the technology**, assessing their experiences with product use, affordability, and perceived benefits.
- **Three FGDs with non-adopters**, exploring reasons why they chose **not** to invest in the technology despite receiving information about it.

A particular emphasis was placed on **gender dynamics** within these discussions. Given the disproportionate burden women face in household energy use, the evaluation sought to understand **whether clean cooking solutions and solar water pumps had tangible benefits for them**. To this end, women were specifically asked about:

- Time saved from reduced firewood collection and cooking duties.
- Changes in household decision-making power.
- Opportunities for income generation or improved well-being.

These qualitative insights were essential in interpreting the results of the quantitative data, particularly in understanding why some interventions worked while others faced adoption challenges.

Quantitative Data Collection



To measure the broader impact of the intervention, a **survey was administered to 106 individuals who had purchased the promoted technology**. The sample included **24 women and 82 men**, allowing for a gender-sensitive analysis. This sample came out of a database of 139 people that bought either these technologies between June 2023 and June 2024 (104 men, out of which only 13 bought CCS and 91 SWP; and 35 women, out of which 22 bought CCS and 13 bought SWP).

The survey was designed to capture:

- **Access and affordability:** Whether purchasing renewable energy solutions was financially accessible and if households experienced cost savings.
- **Changes in agricultural production:** Whether access to solar water pumps led to increased yields or expansion of cultivated land.
- **Reduction in women's workload:** time saved on household tasks due to clean cooking and solar water pumps and how it's being used.
- **Satisfaction and sustainability:** Whether users were satisfied with their products and intended to continue using them.

Secondary Data Review

To complement the primary data, a comprehensive review of project documentation and monitoring reports was conducted. This included mainly internal documents about the project, its MEAL system, the products developed (baselines and other studies) and information from the Result Management System in action. Documents detailing implementation progress, challenges, and achievements. From the baseline and other studies conducted, annual reports, reports from companies on their operational progress and challenges and others.

Analytical Areas

The collected data was analyzed across three core levels:

1. **Systemic Level:** Did the intervention lead to broader market changes? Are there new market players entering the West Nile and Acholi Sub-regions? Has the presence of renewable energy companies expanded? Are companies and financial institutions adopting MSD principles independently?
2. **Enterprise Level:** Are private-sector partners committed to continuing beyond Ayuda en Acción's support? Have they adapted their business models to serve low-income consumers?
3. **End-Beneficiary Level:** Has the project improved household energy access, agricultural productivity, and quality of life? Have women experienced tangible benefits in terms of time savings and empowerment?



Key Findings

The evaluation addressed the identified questions as follows, based on the elements of the project identified by the logical model: first, we examined those related to the **structure of the project**, assessing aspects such as human resources, implementation challenges, and financial management. Next, we analyze the **strategic, support, and operational processes** that have been key to the implementation of the intervention, including partnership facilitation, awareness-raising activities, and the effectiveness of communication channels. Finally, we present the **results**, starting with the **initial outcomes**, followed by the **intermediate impacts**, and concluding with the **final results**, assessing the sustainability and long-term effects of the intervention.

Structure

The evaluation highlights the project's notable efforts to implement the Market Systems Development (MSD) approach within the constraints of a limited budget and staffing. Despite these constraints, the project delivered core activities and adapted its goals effectively, demonstrating agility and commitment to systemic change.

The team strategically aligned facilitation processes with available resources, making deliberate choices to prioritize critical activities. For example, agronomic support was successfully integrated into energy access initiatives, demonstrating an adaptive response to the evolving needs of target communities. The commitment to coordination and company engagement led to growing investment from private actors, a promising indicator of sustainability.

However, the experience also underscores important lessons for future MSD-oriented interventions:

- **Staffing and Adaptive Management:** The iterative nature of MSD requires sustained facilitation, regular follow-up, and ongoing capacity-building. Staffing limita-

tions constrained the project's ability to fully implement these components. Challenges such as turnover among partner companies highlighted the importance of maintaining continuous support to embed systemic change.

- **Learning and Feedback Loops:** While the MEAL system provided valuable insights, limited resources hindered its ability to feed real-time findings into program adaptation. This affected the potential to refine strategies and strengthen market actor roles more dynamically.
- **Implementation Pace and Scope:** Financial constraints led to difficult trade-offs, including scaled-back coordination, reduced field presence, and limitations in outreach and training efforts. Despite this, the team navigated these challenges with focus, ensuring core objectives were met. The experience demonstrates the value of flexibility and prioritization under financial pressure.
- **Sustainability and Private Sector Engagement:** With anticipated budget cuts ahead, companies are increasingly taking ownership of activities. This shift is encouraging, but sustaining and expanding systemic change will require continued support mechanisms to maintain momentum and quality of facilitation.

The project's implementation provides strong evidence that the MSD approach can be pursued under constrained conditions—but with trade-offs. To fully realize the potential of MSD, adequate staffing and resource allocation must be embedded from the outset. Investing in adaptive management systems, continuous capacity building, and strategic coordination is essential to maximize long-term, sustainable impact.

Processes: support, strategic and operational

Are the MEAL systems developed useful in supporting effective monitoring of outcomes and adaptation?

The MEAL system developed for the project is well-structured, aligned with the MSD approach, and plays a key role in supporting adaptive management and market-driven decision-making. It has been designed to track systemic changes, facilitate learning, and ensure that interventions remain responsive to market dynamics. The system incorporates routine data collection, sale verifications, partner engagement, and internal learning sessions, ensuring that insights are continuously generated and used to refine implementation strategies.

The MEAL system has led to concrete adaptations. For example, companies improved after-sales services and adjusted their training processes based on feedback collected through MEAL reports. Learning sessions with field staff and partners have helped businesses refine last mile consumer engagement strategies, addressing challenges such as delays in solar water pump installations and improving overall service delivery. The structured reporting mechanisms, including monthly and bi-weekly updates, have also enabled companies to identify operational challenges and respond proactively.

The MEAL system developed by the project played a critical role in informing decisions and supporting adaptive management. MEAL tools introduced by AeA have become valuable resources for both internal planning and partner decision-making. Over time, companies have adapted to the reporting structures, and there is growing evidence of the system's contribution to strategic alignment and learning.

At the same time, the experience points to several lessons for strengthening MEAL within MSD-oriented interventions. In particular, the effectiveness of the MEAL function relies on the ability to maintain consistent field engagement, stakeholder coordination, and timely

data flows. To enhance these dimensions, future MSD projects should consider integrating adequate budget allocations for:

- Regular field visits and direct engagement with market actors;
- Periodic stakeholder coordination meetings and learning workshops;
- Systematic feedback collection to strengthen continuous improvement; and
- Capacity building for Private Sector Actors (PSAs) to improve the quality and timeliness of reporting.

A well-resourced MEAL system is a cornerstone of successful MSD implementation. Ensuring dedicated resources for ongoing engagement, learning, and feedback mechanisms can significantly enhance the depth and sustainability of market systems change.

Overall, the MEAL system has been effective in monitoring progress, facilitating learning, and driving adaptations, despite operational constraints. Its alignment with MSD principles ensures that insights contribute to long-term market development rather than short-term interventions. To further enhance its impact, scaling cost-effective approaches such as digital monitoring tools or private sector-led data collection could strengthen learning and adaptation processes while optimizing resource use.

Have the reports and studies developed by AeA led to a change or feedback of the intervention?

The reports and studies developed by Ayuda en Acción have played an important role in shaping the intervention, leading to adjustments in company operations, improved last mile consumer service, and strategic refinements in project implementation. The MEAL system has provided ongoing feedback that influenced decision-making and adaptation at various levels.

Reports were actively used to identify gaps and inform changes in partner operations. For instance, they highlighted challenges in after-sales service, leading companies to enhance last mile consumer care and training processes. Some companies refined its last mile consumer engagement model based on insights from reports, addressing specific concerns raised by farmers. Similarly, others adjusted its product line, particularly by developing a surface pump tailored to Adjumani's, Obongi's and Lamwo's contexts, as a direct result of market feedback collected through reports.

The MEAL system also contributed to strategic adjustments in facilitation efforts. Reports helped identify gaps in data collection and agronomic support, leading to scaled-up outreach activities and refinements in training modules. Regular reporting allowed for ongoing monitoring of market dynamics, which influenced facilitation strategies and helped track the emergence of new market players. Additionally, companies used report feedback to improve follow-up visits, strengthening last mile consumer retention and long-term engagement.

Beyond direct company adaptations, the MEAL system played a role in fostering collaboration and learning among stakeholders. Reports facilitated problem-solving sessions, refresher training, and knowledge-sharing workshops, ensuring that partners remained aligned with project objectives. The system's emphasis on managing directives and learning sessions with field staff further supported adaptive management approaches that kept the intervention responsive to evolving market needs.

In summary, reports and studies developed by AeA have been instrumental in driving changes across multiple aspects of the intervention. They have helped companies refine their operations, informed strategic decisions, and supported ongoing market facilitation efforts. By ensuring that learning and feedback processes remain active, the MEAL system has strengthened the intervention's ability to respond to challenges and continuously improve its impact.

What challenges exist in ensuring effective partnerships between companies and banks?

There were efforts by the project team and companies, including Ebenezer, SunCulture, and Tulima, to build partnerships with banks to facilitate access and affordability of renewable energy products. However, these efforts faced significant challenges, primarily due to high interest rates, rigid banking processes, and mistrust among beneficiaries. As a result, companies largely opted to develop their own financing models, such as pay as you grow, to overcome these obstacles.

Companies reported that banking terms were often unattractive for both businesses and smallholder farmers. In particular, banks were hesitant to lend to refugees, who frequently lack collateral or land ownership. Additionally, the financial products offered by banks were often viewed as too small or not suitable, and many companies found that formal financing did not align well with their clients' profiles.

Mistrust in banks among rural and refugee communities further exacerbated the issue. Many people preferred informal savings mechanisms, such as Village Savings and Loan Associations (VSLAs), over formal institutions, citing past negative experiences and the perception that banking services are slow, bureaucratic, and require excessive guarantees. This was reflected in focus group discussions, where participants in locations such as Obongi, Lamwo, and Adjumani confirmed that they had not accessed bank services to purchase clean cooking stoves and generally preferred VSLAs.

While some companies did attempt to work with banks, the loan requirements—such as predictable monthly income—tended to favor civil servants, making it difficult for smallholder farmers to qualify. Consequently, companies chose to expand their pay-as-you-grow models, which proved more effective in reaching their target groups. Some banks do offer green loans and microloans, particularly for women and small businesses, but uptake remains low due to

limited awareness and accessibility. Most people continue to rely on mobile money, reflecting a broader preference for alternative financing mechanisms over traditional banking.

What is the assessment of AeA's approach to companies?

The approach to companies taken by Ayuda en Acción was effective in building trust and fostering collaboration, although it required continuous adaptation and training due to initial resistance and capacity gaps. The negotiation process was initially challenging, as companies were unfamiliar with the MSD approach, leading to difficulties in aligning expectations. Over time, however, companies gained confidence in the model, conducted market assessments independently, and even expanded operations beyond the initial target areas, demonstrating their increasing ownership of market-driven strategies. The learning process was mutual, with both AeA and the companies adjusting their strategies to align better with market facilitation principles. However, turnover within companies and gaps in technical knowledge and outreach to remote areas remained challenges, highlighting the need for continued capacity building.

To ensure a structured and transparent selection of partners, AeA developed a Partner Selection Criteria and Process document, outlining the key factors considered when identifying potential collaborators. The selection process focused on companies' willingness to invest in new market entry, operational capacity, technical expertise, alignment with project goals, and product quality to ensure that supported companies do not provide sub-standard, unsustainable products in the new markets. The criteria emphasized the importance of companies' ability to expand into underserved areas through community engagement and long-term sustainability. While rural market expertise was not a primary criterion, it was considered an advantage, as companies familiar with these markets were able to communi-

cate key challenges and the reasons preventing them from expanding and establishing service centers in rural areas. These insights informed the areas where AeA facilitated interventions and structured collaborations accordingly.

The process of engaging companies in the MSD model also revealed differences in readiness and willingness to participate. AeA initially engaged companies listed under the Uganda Solar Energy Association (USEA), conducting one-on-one interviews to explain the subsidy model and MSD principles. However, many local companies were not prepared, requiring too much external support, while international companies found it easier to integrate into the model. Some companies expected larger budgets for expansion, lacked an understanding of rural market dynamics, or did not participate at the village level, which made them unsuitable for the intervention. Additionally, budgetary limitations led to the discontinuation of some partnerships, as AeA could not continue to facilitate some companies due to limited funding. This was the case for OMIA, whose agronomic training for farmers was identified as crucial for increasing productivity among smallholder farmers but could not be continued due to funding constraints.

The model of agreement with companies was tailored to their specific needs, focusing on subsidy adaptation, logistical support, and market expansion facilitation. Instead of prioritizing strategic marketing perspectives, AeA's approach focused on community-driven market facilitation, ensuring that companies engaged directly with last mile consumer and built relationships in underserved areas. Agreements included assistance in setting up offices, maintaining robust communication channels, and conducting due diligence to assess companies' capacity and willingness to adapt to the MSD approach.

While the approach was largely effective, there are indications that further refinements could have strengthened the intervention. The approach helped companies adopt market mapping and local engagement strategies, but also recognized that budget constraints limited some aspects of facilitation.

The partner selection process relied heavily on one-on-one interviews with companies, which proved to be time-consuming. An alternative approach could have been to issue a call for expressions of interest, allowing for a broader selection of companies while streamlining the engagement process. Additionally, actors already implementing MSD in the area were not engaged, which might have provided valuable insights and opportunities for collaboration, avoiding duplication of efforts.

The facilitation process primarily addressed market demands and gaps while aligning them with the specific gaps and needs of companies. Placing greater emphasis on aligning support with broader market demands has strengthened sustainability and empowered businesses to evolve beyond their immediate operational needs. These strategic adjustments have contributed to a more efficient selection process, fostered stronger partnerships, and facilitated a more cohesive and well-integrated market ecosystem.

Was AeA's facilitation process for integrating SWP and CCE companies executed as planned?

The facilitation process was mostly executed as planned, achieving key milestones such as introducing companies to local actors, supporting market entry, and facilitating awareness campaigns. However, budget constraints, limited staff resources, and affordability challenges restricted the full implementation of some planned activities.

AeA successfully linked solar and clean cooking energy (CCE) companies with government officials and district representatives, ensuring a structured introduction to the local market. In the first year, planned activities, such as inception meetings and local stakeholder engagement, were carried out as intended. Additionally, companies were provided office space initially within AeA's premises and later transitioned to independent offices, a key milestone in ensuring long-term sustainability. From the companies' perspective, AeA's logistical and market support accelerated their market entry by up to three years, allowing them to reach communities that would have been difficult to access independently.

AeA also played a crucial role in awareness creation, with companies reporting that media campaigns and market activations significantly boosted product visibility and adoption rates. The introduction of subsidy models and alternative financing mechanisms, such as 'pay as you grow,' was instrumental in increasing affordability, with companies estimating that 90% of beneficiaries used these financing options.

Despite these achievements, some planned activities were impacted by financial and logistical constraints. Budget cuts affected networking and advocacy efforts, limiting outreach and engagement with financial institutions. Limited staff capacity made follow-ups and facilitation more difficult, affecting the ability to provide consistent after-sales support. Companies also struggled to reach remote areas despite AeA's logistical support, and some field assessments faced delays due to resource constraints.

Both AeA and companies adjusted their approaches to address these challenges. Companies adapted their sales models, shifting to group-based sales and introducing flexible payment systems to align better with market needs. Feedback mechanisms led to improvements in last mile consumer service, with companies reducing installation times and enhancing follow-up support.

However, certain gaps remain, particularly in engagement with financial stakeholders, which was minimal, making it harder to establish viable partnerships for credit access. Awareness efforts were effective, but last mile consumer adoption was still highly dependent on seeing tangible results from peers, indicating a need for stronger community-based demonstration strategies.

The facilitation process achieved key goals in market entry, awareness creation, and logistical support for companies, but some planned activities had to be scaled down or adapted due to budget and resource limitations. While companies successfully transitioned from AeA-supported offices to independent operations, and product adoption increased, affordability and financial stakeholder engagement remained challenges.

Is the level and training content given to companies from AeA considered appropriate?

The training provided by Ayuda en Acción (AeA) was relevant and aligned with the MSD approach, equipping companies with skills in reporting, accountability, community engagement, and last mile consumer service. However, some gaps were identified, particularly in ensuring continuous capacity-building to address challenges like staff turnover in companies.

The training approach was necessity-based, ensuring that companies understood the MSD model and their role beyond just selling products. Companies were trained to recognize the broader social impact of their work and to proactively identify and address gaps to improve beneficiaries' livelihoods. The focus on reporting and accountability ensured that companies became familiar with structured documentation and monitoring systems, while training on community engagement helped companies maintain a positive reputation and improve last mile consumer relations.

From a company perspective, the training was particularly valuable in establishing last mile consumer service and repair processes, which contributed to higher adoption rates of solar water pumps and clean cooking energy solutions. Additionally, the reporting systems introduced by AeA, though initially challenging, became useful tools for planning and decision-making, improving company operations over time.

While the training materials were relevant and effectively introduced companies to the MSD approach, gaps remained in providing continuous capacity-building, particularly due to high staff turnover in companies. This resulted in a need for ongoing training sessions, as newly hired staff often lacked the same level of understanding and engagement. Additionally, while companies improved their beneficiary follow-up and after-sales services, further reinforcement of these practices through additional training could have strengthened their long-term effectiveness.

Was it sufficient the analysis carried out by Ayuda en Acción at the level of actors, needs and risks

The analysis conducted by Ayuda en Acción (AeA) effectively mapped key market actors and initial needs, supporting companies' entry into the market and helping them understand the dynamics of the sector. This foundational work was instrumental in identifying opportunities for engagement and tailoring early interventions.

At the same time, the evaluation identified several areas where the analysis could have been strengthened to enhance its comprehensiveness and long-term strategic impact.

While the actor mapping enabled useful insights, it did not fully engage all relevant stakeholders, particularly those already applying Market Systems Development (MSD) approaches in the region. Engagement with financial institutions took place during the initial stages, especially around identifying entry points. However, this was not followed by more strategic collaboration efforts aimed at facilitating access to and sustained use of energy products. Planned networking activities were affected by budget constraints, which limited continued engagement with these institutions.

The market-driven nature of the approach was evident in the baseline assessment's focus on community-level access and affordability of energy products. However, financial constraints also led to the exclusion of certain key partners, such as agronomic service providers, who had initially been envisioned to complement the intervention. This resulted in gaps in complementary services, such as agronomic training and supply input, which could have reinforced the broader market ecosystem.

The risk assessment component provided some useful insights but did not fully anticipate several operational challenges, including high costs, reliance on external funding, and logistical barriers such as spare parts availability, fuel costs, and transport to remote areas. These unforeseen issues required companies to adapt on their own during implementation.

While financial institutions were included in initial assessments, and participated in events like renewable energy expos and networking activities with PSAs and beneficiaries, their inclusion remained limited beyond early engagement. The challenge appeared to lie less in their absence and more in the lack of a sustained strategy to engage them meaningfully. Constraints in the flexibility of financial products and perceived risks in serving rural, low-income populations may have also contributed to limited progress in this area.

Are the channels used by companies to raise awareness about their products considered effective?

The communication channels used by Solar Water Pump (SWP) and Clean Cooking Energy (CCE) companies were generally perceived as effective by beneficiaries, **with 98% of buyers (104 out of 106) reporting that they received information from the company where they purchased the product**. Of these, 68% stated that this was their primary source of information, while 28% considered it useful but preferred other channels. Only 4% felt it was ineffective. However, preferences for communication varied, with radio and social networks (60%) being the most favored channels, followed by word of mouth and NGOs (30%), while brochures and television were the least preferred. Additionally, other channels were mentioned, such as WhatsApp, company agents visiting communities, and community leaders.

Companies played a crucial role in awareness-raising, providing live demonstrations, marketing campaigns, and maintaining direct communication with last mile consumers. In Lamwo, farmers reported that company agents and existing users of the technology were key sources of knowledge, with live demonstrations and visible gardens motivating others to purchase solar water pumps. Similarly, in the West Nile and Acholi Sub-regions, workshops and direct marketing efforts were instrumental in spreading awareness.

Despite the overall positive reception, some participants in Obongi noted that demonstrations were not always adequate, suggesting that more in-depth product demonstrations could encourage greater adoption.

Radio played a major role in disseminating information about renewable energy products, particularly in Adjumani and Lamwo, where several respondents mentioned learning about products through radio announcements and talk shows. A participant specifically noted learning about vegetable growing through radio.

Social networks, including WhatsApp groups and referrals from fellow farmers, were also identified as effective means of communication. In Obongi, participants suggested that learning from friends who had already adopted the technology was an effective way to spread awareness and encourage adoption. Additionally, some companies used WhatsApp groups to maintain ongoing engagement with last-mile consumers, ensuring consistent information flow and peer learning.

Follow-up communication was another key factor in the effectiveness of the channels used. Companies maintained regular interactions with beneficiaries through phone calls and monthly reports, ensuring last mile consumer satisfaction and prompt resolution of issues. Participants in Adjumani confirmed that companies maintained stable relationships with them through regular interactions and follow-ups, even after purchasing the products.

Companies emphasized using radio programs to engage with farmers by first understanding their concerns before tailoring their messages. However, there were significant gaps in demonstration quality and outreach. In Obongi, participants expressed dissatisfaction with the practical demonstrations of solar water pumps, emphasizing the need for more hands-on training to build confidence in the technology.

Social networks, learning from fellow farmers, and lessons shared from successful adopters played a major role in spreading awareness. In the West Nile and Acholi Sub-regions, OMIA provided training and encouraged members to share knowledge among themselves, while in Obongi, participants learned about products through trade shows, social networks, and marketing campaigns. The use of role model farmers in settlements was suggested as an effective way to accelerate technology adoption.

Despite these positive aspects, some participants highlighted the need for stronger community outreach initiatives, such as road drives and community-led engagement efforts. However, both companies and beneficiaries agreed that more outreach is required, especially in remote areas, with increased reliance on local radio stations and enhanced demonstration events suggested as key improvements.

Moreover, there is a need to strengthen gender-sensitive messaging, ensuring that women are not only considered as consumers but also engaged as active participants in the value chain, such as agents, distributors, or resellers. Encouraging the inclusion of women in promotional activities and training could enhance technology adoption and create economic opportunities for them.

Additionally, beneficiaries suggested better facilitation of awareness events, such as providing snacks and transportation to encourage participation.

Have companies held awareness sessions on the use of solar energy?

The data indicates that **98% of people interviewed had received some form of information about solar energy, yet the depth of their knowledge varied significantly**. Among them, 67% demonstrated a sufficient level of understanding, while 13% had a high level of knowledge. However, 29% had an insufficient level of understanding, as they could only mention one aspect of solar energy despite having received awareness. Additionally, among the small percentage (2%) that did not receive any awareness, 80% were individuals who had purchased solar water pumps (SWP). Among those with insufficient awareness, the proportion of SWP and Clean Cooking Energy (CCE) buyers was similar, suggesting that knowledge gaps exist across both sectors.

Company-led initiatives, including live demonstrations, training sessions, and follow-ups, played a crucial role in providing knowledge about solar energy. Farmers in Lamwo reported acquiring adequate knowledge from company agents and experienced users of the

technology. Similarly, marketing campaigns, community workshops, and social networks were highlighted as effective awareness tools.

While most beneficiaries have received some awareness about solar energy, the level of knowledge varies, with nearly a third (29%) having insufficient understanding. Company-led training, demonstrations, and peer learning networks have been effective in spreading awareness, but gaps remain, particularly in outreach to remote areas and the quality of demonstrations. Strengthening interactive learning, increasing follow-ups, and enhancing facilitation efforts could further improve awareness levels and encourage greater adoption of solar technologies.

Were effective communication channels established and maintained throughout the process between companies and costumers?

The effectiveness of communication channels between companies and last mile consumer varied, with only 51% of last mile consumers maintaining effective communication with the company from which they purchased their product, meaning they engaged in discussions at least once every three months. The remaining 49% communicated only once every six months or less, highlighting a gap in sustained last mile consumer engagement. While company representatives were accessible through phone calls, follow-ups, and visits, the frequency and depth of these interactions varied among companies and beneficiaries.

Nonetheless, during focus groups, some beneficiaries appreciated the regular visits and follow-ups conducted by companies, where staff checked on the functionality of solar water pumps and stoves, provided feedback, and addressed any technical issues. The agent-based cluster system used by some companies ensured a steady connection with farmers, allowing for quick responses to client needs. Participants also confirmed that their relationships with the companies remained stable due to continued interactions after the initial purchase, mainly during the first weeks after the purchase.

However, despite these positive aspects, a significant portion of beneficiaries expressed the need for more proactive outreach. Some participants suggested that companies increase localized demonstrations and engagement through road drives and in-person awareness efforts to ensure more effective communication with potential and existing last mile consumers. Additionally, some beneficiaries who communicated less frequently with companies found it difficult to get technical support or product-related guidance when needed.

Overall, while communication channels between companies and last mile consumers were maintained through regular follow-ups, field visits, and phone accessibility, nearly half of the beneficiaries had infrequent engagement with companies, pointing to the need for more structured and proactive outreach efforts.

Have the communication channels used been sufficient?

As mentioned in the previous question, the communication channels have been partially sufficient, with **51% of last mile consumers maintaining effective communication** (at least once every three months). However, a significant **49% reported less frequent interactions**, speaking with the companies only once every six months or less. Moreover, **80% of all respondents expressed a desire for more communication**, indicating that even those with regular engagement would appreciate increased contact.

Several communication channels have been used effectively, including local agents, direct visits, radio announcements, WhatsApp groups, and social networks. Participants in multiple focus group discussions confirmed that companies do maintain relationships with last mile consumers through follow-ups and direct check-ins. Sales agents present within the localities provided an accessible means of support, ensuring prompt responses to last mile consumers concerns. Beneficiaries also highlighted that radio programs and WhatsApp groups were useful tools for receiving updates and learning about product use.

Despite these efforts, beneficiaries emphasized that follow-ups could be more frequent and proactive outreach should be expanded. In Lamwo and Adjumani, participants noted that while communication through agents was generally reliable, they would appreciate more frequent visits to address ongoing challenges. In Obongi, farmers mentioned that word-of-mouth and social networks played a crucial role in spreading information, but also called for simplified access to financial institutions to better support solar product purchases.

Results

Initial

Has access to renewable energy improved?

Access to renewable energy has improved across multiple dimensions, including the availability of stores selling renewable energy products, the presence of agents in communities, the variety of products available, the time required to reach these stores, access to financing options, and the availability of maintenance and support services. Currently, **17% of respondents report high accessibility, 55% moderate accessibility, 26% low accessibility, and 2% limited or no accessibility.** Moreover, **77% of respondents stated that renewable energy product stores are now closer compared to 18 months ago**, indicating a substantial improvement in geographic access.

Qualitative data further supports these findings, highlighting an increase in sales agents operating in rural areas and an expansion of distribution networks. In Lamwo, Padibe, Palabek Kal, and Paluda Trading Centre, agents facilitate access to SWPs. In Obongi, stores remain accessible, and companies provides necessary spare parts, though concerns persist about high transportation costs and difficulties in moving pumps to gardens. In Adjumani, spare parts are reportedly easy to access, with companies ensuring their availability in stores and through designated technicians. Furthermore, some companies have provided repair



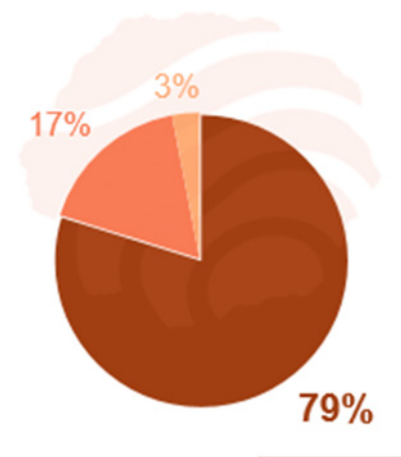
services for stoves under warranty, reducing the need for immediate spare parts purchases.

Despite these clear improvements in accessibility, several challenges remain, particularly regarding long-term sustainability of access. Limited awareness about where to obtain spare parts and repairs was cited as a barrier in Lamwo, while in Obongi, spare parts are considered expensive and difficult to access, potentially affecting long-term usability. This suggests that while physical access to renewable energy products has improved, affordability and knowledge about product maintenance still hinder broader accessibility.

Has agricultural production increased?

Agricultural production has increased significantly among participants, with **79% reporting a significant increase, 17% a moderate increase, and only 3% experiencing little to no increase.** This growth is primarily attributed to **the ability to cultivate during the dry season, expansion of cultivated land, and an increase in production destined for sale rather than household consumption.**

Qualitative data supports this trend, with **farmers in Adjumani, Lamwo and Obongi reporting that solar water pumps (SWPs) have allowed them to grow crops beyond the rainy season, leading to higher sales and improved income.** In Obongi, households noted increased productivity and the ability to engage in commercial agriculture, while in Lamwo, farmers expanded their cultivated land, benefitting from sufficient irrigation and reduced labor costs. Additionally, markets have expanded in locations like Palabek Kal, Ogili, and Paluda Trading Centre, creating more opportunities for farmers to sell their produce.



The impact of solar water pumps on dry-season farming has been widely acknowledged, with farmers noting that they can now plant vegetables year-round, securing a steady income. Reports indicate that farmers have been able to increase their food security, and that vegetable farming provides quick financial returns.

However, while production has increased, some limitations remain. The lack of sufficient agronomic support has been noted as a challenge, with some farmers needing more training to maximize the potential of their expanded production. Despite this, the overall trend is clear: solar water pumps have played a key role in increasing agricultural output, ensuring year-round farming, and boosting incomes among smallholder farmers.

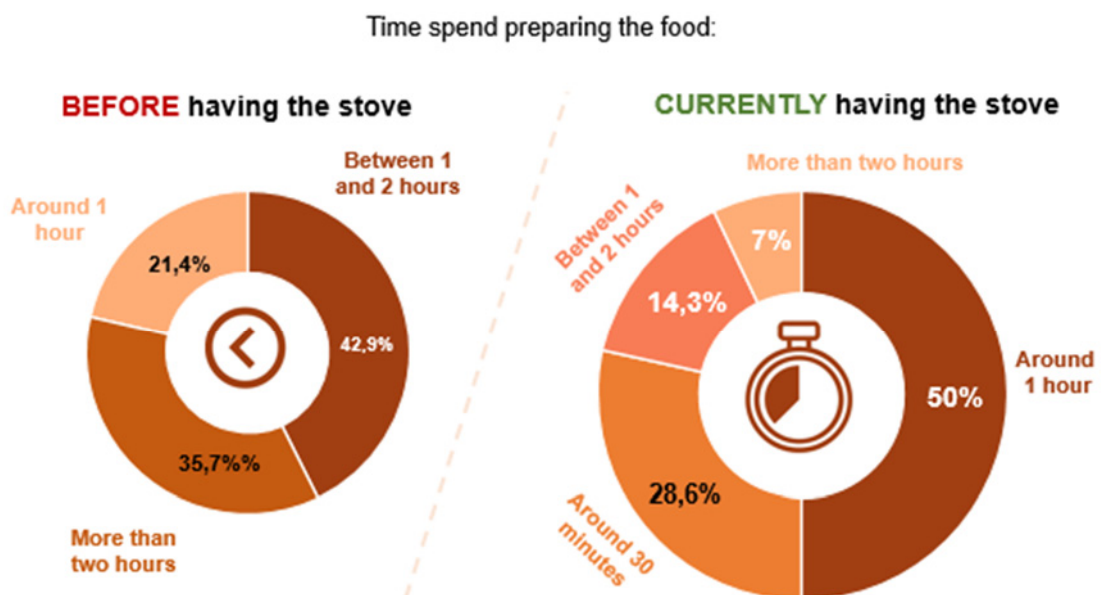
Has women's workload been reduced?

The reduction in women's workload due to the adoption of solar water pumps (SWP) and clean cooking energy (CCE) technologies is significant, with 75% of surveyed women reporting a high reduction in workload, 21% a moderate reduction, and only 4% experiencing no change. The impact is particularly pronounced among women who purchased CCE, where almost 80% reported a reduction in time spent on cooking-related activities, compared to 70% of those who purchased SWP. These findings indicate that CCE has had a slightly greater direct impact on reducing women's workload, likely due to the time-intensive nature of traditional cooking methods.

However, women have only represented 25% of direct clients for these technologies between June 2023 and June 2024 (a percentage maintained in the interviewed sample), with approximately 65% of female last mile consumers purchasing CCE and only 35% purchasing SWP. This low adoption rate among women suggests potential cultural and contextual barriers, such as male-dominated financial decision-making in households and the perception that SWP is a higher-priority investment compared to CCE. As Ebenezer highlighted,

men often control financial decisions in households, making it less likely for women to purchase stoves, despite the significant impact these technologies have on reducing their workload.

Qualitative data further supports the positive impact of both SWP and CCE on reducing women’s workload. Several reports indicate that SWP has alleviated the physical burden of manual irrigation, allowing women to rest more, engage in other productive activities, and reduce health issues like back pain and muscle strain. In Lamwo, women noted that SWP helped them manage time better, reducing labor-intensive tasks such as carrying water manually. Similarly, in Obongi, women’s groups reported that the technology enabled them to redistribute irrigation tasks, freeing up time for household chores. Additionally, the ability of children to operate SWP has further alleviated the burden on women, allowing them to focus on family responsibilities.



The impact of CCE is also evident in reducing cooking-related burdens. In Adjumani, women noted that clean cooking stoves reduced cooking time, required less charcoal, and produced

less smoke, allowing them to stay in the kitchen without irritation and spend less time collecting firewood. The faster cooking times and improved efficiency of the stoves have provided women with more time for other household tasks or economic activities.

The saved time is predominantly utilized by women for productive work, such as farming for the ones with CCE or managing businesses, highlighting their active contribution to household and community economies. A significant portion of this time is also allocated to family or household care, demonstrating the continued emphasis on caregiving responsibilities. Rest and self-care are prioritized by many, underscoring the importance of addressing physical and mental well-being. Additionally, women use the time saved to engage in social activities, such as visiting friends or attending social events, which helps foster community ties and personal networks. A smaller but noteworthy group invests the time in education or training, enhancing skills and expanding opportunities for personal and professional growth. These patterns reflect a balance between economic, personal, and social priorities in how women choose to utilize the time saved.

From an MSD perspective, multiple staff members and company representatives highlighted that these technologies are effectively reducing dependency on manual labor for women. Staff from AeA noted that both SWP and CCE are reducing women's physical strain and providing them with more time for other responsibilities, and emphasized that better time management and reduced physical effort have been notable positive impacts. Companies also recognize that these technologies have improved women's quality of life, as irrigation has become more efficient and cooking has become less time-consuming and physically demanding.

Have companies implemented changes in their operation to adapt to the Adjumani, Obongi and Lamwo context?

Companies operating in Adjumani, Obongi, and Lamwo have made adjustments to their operations to better align with local market conditions, addressing last-mile consumer awareness gaps, affordability constraints, and product suitability. These changes include expanding their local presence, modifying financial models, engaging in targeted awareness efforts, and adapting their products to meet the specific needs of smallholder farmers. Through its monitoring system and reflection and learning meetings, AeA staff has continuously shared a list of potential adaptation actions with companies, many of which were implemented during the course of the project.

The adoption of renewable energy technologies, such as solar water pumps (SWPs) and clean cooking stoves, is influenced by multiple factors, particularly affordability, awareness, and behavioral barriers. Many potential users struggle with upfront costs, making subsidies and financing models like "Pay as You Grow" essential in facilitating access. However, reliance on banks for credit has proven challenging, as traditional financial institutions often view smallholder farmers and refugees as high-risk clients. To address this, some companies developed internal credit systems, but sustaining these mechanisms without external support remains a concern. Additionally, it is important to confirm whether companies financed these adaptations using their own funds or if they relied solely on AeA's support, as cost-sharing challenges were identified, such as OMIA's inability to procure bikes that were intended to supplement those provided by AeA.

Beyond financial constraints, awareness and behavioral factors play a significant role in adoption. Many beneficiaries are unfamiliar with these technologies, requiring extensive sensitization efforts through demonstrations, radio campaigns, and customer testimonials. Additionally, cultural dynamics, particularly gender roles, influence decision-making, with men often controlling household finances, which can limit women's ability to invest in clean energy solutions. Despite these challenges, companies have observed positive impacts where adoption has occurred, including increased agricultural productivity, improved income lev-

els, and time savings. However, ensuring long-term sustainability beyond donor-funded subsidies and overcoming logistical barriers in remote areas remain key challenges for broader adoption.

Companies expanded into new areas where they had not previously operated, engaging local agents to address low last-mile consumer awareness and build trust in their products. The companies noted that in rural areas, people are unfamiliar with their technology and hesitate to adopt it until they experience its benefits firsthand, especially with clean cooking energy. SWP companies modified their sales approach, shifting from individual sales to a group-based model, allowing them to work closely with local NGOs and district officials to facilitate adoption. They also adjusted their sales strategy to tailor products to each farmer's situation rather than applying a standardized approach.

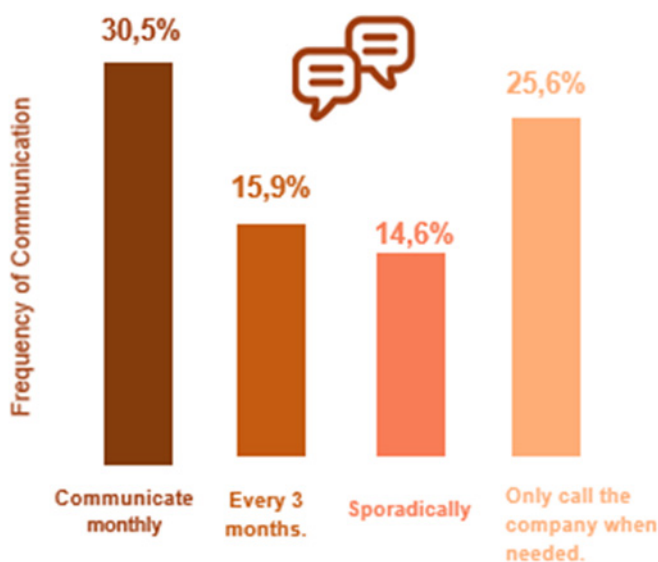
To improve financial accessibility, companies introduced flexible payment options. SWP companies implemented a 'pay as you grow' model, allowing last mile consumers to pay a small deposit (10%) and complete payments over 24 to 30 months, making solar water pumps more accessible. They also adapted its product line to serve smallholder farmers with limited water access, ensuring that their solutions were relevant to the specific challenges of the West Nile and Acholi Sub-regions.

Companies also invested in awareness campaigns and localized demonstrations to increase product visibility. SWP companies organized grassroots awareness campaigns and demonstrations to promote the adoption of solar water pumps. Companies acknowledged the importance of continuous engagement, recognizing that awareness-building takes time in rural communities and is key for building trust in the products.

Finally, some companies adjusted their product offerings to fit the local environment. For example, they focused on developing a surface pump suited for the region's proximity to the Nile, ensuring that their technology was compatible with the available water sources. Others also emphasized a value-based approach, tailoring its marketing to address farmers' specific needs, including water access and market constraints.

In conclusion, companies have made targeted operational changes to enhance last-mile consumer engagement, improve affordability, and tailor their products to local conditions. These adaptations indicate a commitment to long-term market presence and sustainability. However, ensuring continued awareness-building and further refining financing models could enhance adoption rates and strengthen company operations in the West Nile and Acholi Sub-regions. It is also essential to confirm whether companies made their own financial contributions to these adaptations or relied solely on AeA’s support, as cost-sharing remains a key challenge for sustainability.

Is there a direct and stable relationship between participating companies and people?



The **direct and stable relationship between participating companies and people is evident for 50% of the respondents**, who maintain communication at least once every three months through **direct visits or phone calls**. However, **the other 50% do not have regular interactions**, which aligns with previous findings indicating the need for improved follow-up and outreach efforts.

Qualitative data reinforces this division. Many respondents noted that companies maintain a presence through local agents

and regular visits, fostering trust and ensuring proper product use. For example, participants in Lamwo and Obongi reported that company sales agents are present in their localities, allowing direct support when needed. Similarly, beneficiaries in Adjumani and Lamwo confirmed that company representatives check in periodically, organize meetings, and address their technical concerns.

Some beneficiaries noted that agents are the first point of contact and ensure a steady connection between the company and last mile consumers, strengthening trust. Reports from multiple locations, including Adjumani and Obongi, confirmed that companies adapted their approaches over time, incorporating consistent follow-ups and technical support to enhance last mile consumer satisfaction.

However, despite these positive engagements, many participants still requested more frequent follow-ups. In Obongi, for example, farmers suggested that relationships could be improved, indicating that while companies have built trust with their last mile consumers, and gaps remain in the follow up long term. Additionally, in Adjumani, participants suggested that companies should proactively increase interactions beyond the initial sale, ensuring that they remain engaged with users to address ongoing needs.

Overall, while half of the participants benefit from a strong and stable connection with companies, the remaining half experience less frequent interactions, highlighting the need for more proactive outreach, follow-up mechanisms, and enhanced engagement beyond the initial purchase.

Intermediate

Are there other players that have entered the market in the West Nile and Acholi Sub-regions, not initially included in the process?

The presence of new market players in the Sub-regions has been noted, though systematic tracking of these actors has been limited due to challenges in data collection. While some reports indicate that competition has increased, the extent to which these new actors are influencing the market remains partially documented. New agro-input companies and small solar product shops have entered the market, and some solar and clean cooking energy

companies are now making periodic visits—though they are not yet permanently established.

There is also evidence that NGOs continue to play a role in distributing solar products, which suggests that while the market is evolving, it may still be dependent on external facilitation rather than being fully self-sustaining. Additionally, the lack of systematic tracking of emerging market actors' means that the full picture of competition and market expansion is not yet fully captured.

From an MSD perspective, the emergence of new players is a positive sign of market responsiveness and potential crowding-in effects. However, without structured monitoring of these new entrants, it is difficult to assess whether they are scaling sustainably, competing effectively, or relying on short-term interventions. Strengthening market intelligence efforts and local monitoring mechanisms could provide a clearer understanding of how these actors are influencing West Nile and Acholi Sub-regions renewable energy and clean cooking sectors.

Do companies have an interest on continuing beyond AeA support?

The companies involved in the project have shown a clear interest in remaining in the Sub-regions beyond AeA's support, with many already taking steps toward financial and operational sustainability. While some still face challenges related to high operational costs and revenue generation, their commitment to staying in the market and expanding their reach is evident across multiple testimonies. According to monthly reports from partners, the project facilitated the employment of 50 sales agents in the first year, 40 in the second year, and 12 full-time staff primarily in service centers, totaling 102 personnel involved in the market ecosystem.

Some companies have demonstrated strong progress toward sustainability, having moved their office from AeA's premises to a self-funded, centrally located space on the main street of Adjumani. This transition has improved accessibility and visibility, reinforcing their long-term commitment to the region. The company plans to remain in the market beyond AeA's direct support, leveraging its credit facilities and improved last-mile consumer service to drive growth. By 2025, they aim to expand operations within Adjumani, Lamwo, and Obongi and into other districts, fully integrating operational costs without reliance on subsidies.

Others are also positioned to sustain their presence, estimating that within a year, they will be able to operate independently in the region. AeA's facilitation accelerated their market entry by three years, and they now believe they are on track to establish a fully independent, co-branded offices in the Sub-regions. However, concerns remain about price sensitivity, as higher prices without subsidies could deter farmers from purchasing solar water pumps.

Other companies recognize the market potential in the Sub-regions and are planning to expand operations through local agents and a self-sustaining market network. However, they still face financial challenges related to fuel, advertising, and revenue generation. While they have made significant progress, they are not fully satisfied with their sales volume and acknowledge that sustainability will require further expansion and cost reductions.

From AeA's perspective, companies have embraced the market opportunity, transitioning from reliance on logistical and financial support to self-financed operations. This includes opening their own offices, expanding through independent market mapping, and adopting new business strategies. Despite budget cuts in 2025, companies remain committed to staying, expanding, and investing their own resources.

Overall, the market system is moving toward sustainability, with companies increasingly taking ownership of their operations. While some still require external support for specific costs, their long-term interest in remaining in West Nile and Acholi Sub-regions is clear, and they are actively working to ensure financial independence.

Nonetheless, in a facilitation-based approach like the one implemented by AeA, the first 2-3 years are critical for companies to enter and establish themselves in a new market. The current reliance on subsidies and logistical support does not indicate an unsustainable model but rather reflects an ongoing market maturation process. Many MSD initiatives in emerging markets require 5-7 years before companies can operate independently, and the foundations built in the first two years—such as increased sales, product adoption, and last-mile consumer trust—suggest strong potential for long-term sustainability. Over the next 3-5 years, companies are expected to transition away from external support, provided that market growth continues to be nurtured and support is phased out strategically rather than abruptly.

Has the presence of solar energy and clean cooking companies increased in the Sub-regions?

The presence of solar energy and clean cooking companies in Adjumani, Lamwo and Obongi has increased, driven by new market entrants, expansion by existing players, and rising demand. While systematic tracking of new actors remains limited, AeA staff indicate that competition has grown, and more companies are now engaging in the market.

Several new market players have emerged, including local vendors, small shops selling solar products, and new agro-input companies that have entered the renewable energy and clean cooking sectors. In addition, new distributors and smaller vendors have joined the sector, further increasing competition. Though some companies only visit West Nile and Acholi

Sub-regions periodically, their presence has contributed to greater awareness and accessibility of clean energy solutions.

Existing companies, such as Tulima and SunCulture, have expanded their market reach, establishing sales agents in new villages and surrounding districts. This increase in agent networks has improved last-mile distribution, making products more accessible in previously underserved areas.

Growing interest from local communities has further encouraged companies to invest more in the Sub-regions. Participants in focus groups confirmed that they learned about solar energy products through local sales agents, radio campaigns, and referrals from other last mile consumers, highlighting the impact of awareness campaigns and market linkage efforts.

From an MSD perspective, this increase in market activity is a positive indicator of market responsiveness and potential crowding-in effects. While competition is emerging, the lack of structured monitoring of new entrants and their impact limits a full assessment of market expansion. Ensuring better tracking of new players and understanding their role in market dynamics could help identify gaps, opportunities, and areas where facilitation can be adjusted to strengthen long-term sustainability.

Has a sustainable market for renewable energy and clean cooking products been developed?

The development of a **sustainable market for renewable energy and clean cooking products in the area is progressing**, with companies transitioning toward **self-reliance and long-term market engagement**. Businesses such as Tulima, SunCulture, and Ebenezer have established operations, built trust within the community, and reduced their reliance on Ayuda en Ac-

ción support. Companies are now adopting market-driven strategies, including market mapping, localized distribution models, and enhanced last mile consumer engagement, which are key indicators of a growing and maturing market.

In the solar water pump sector, companies have made significant strides toward sustainability. One of the companies anticipates becoming fully independent in the Sub-regions within a year, having benefited from AeA's support in market entry and logistics. The other has moved its office from AeA's premises to a self-funded location, signaling its ability to operate independently while integrating its own costs. Companies are focusing on expanding their credit facilities and increasing awareness, ensuring greater market penetration despite existing financial constraints.

In the clean cooking energy market, the focus has shifted toward localized agent deployment and awareness sessions to establish a self-sustaining market network. While the company recognizes the market potential in the area, it still faces financial limitations, including high fuel and advertising costs, which may hinder full independence in the short term.

Despite these positive developments, affordability, logistical barriers, and market awareness remain key challenges. Some companies still require external support, particularly in maintaining subsidies to keep products affordable and expanding outreach efforts to hard-to-reach areas. While the MSD approach has been instrumental in reducing dependency and promoting sustainability, companies were initially slow to internalize transformational practices and focused primarily on sales rather than systemic change. However, they are now adapting their business models to sustain operations independently.

From an MSD perspective, the foundations for sustainability have been established, but ongoing facilitation is crucial. If in just two years, companies have reduced their reliance on subsidies, assumed operational costs, and seen growth in sales, it is reasonable to expect that in the next 3-5 years, they will be able to sustain themselves without external financial support. The key will be maintaining and strengthening market growth without abruptly withdrawing facilitation, ensuring that companies continue to build independent networks and internal financing mechanisms.

Overall, the market is on a trajectory toward sustainability, with companies increasingly investing their own resources and embedding market-driven strategies. However, to fully achieve sustainability, challenges related to affordability, technical capacity building, and financial access must still be addressed.

Have companies internalized the MSD approach and show interest and appropriation of the learning resulting from the project?

The companies involved in the project have internalized the Market Systems Development (MSD) approach and are applying key learnings to their operations, though this process was not immediate. Initially, some companies were hesitant to fully embrace MSD principles, focusing more on direct sales rather than market facilitation and long-term sustainability. However, over time, they have demonstrated a clear shift toward sustainability, strengthening local networks, reducing reliance on subsidies, and tailoring their strategies to market conditions. Due to AeA's recommendation, for example, some companies now work closely with local agents to build a sustainable market network, acknowledging that awareness takes time to develop in rural areas and that last mile consumers need to experience product benefits before trusting them. Regular follow-ups and community awareness sessions further highlight their long-term market engagement. Similarly, other companies have established partnerships with local organizations and district officials, adapting its sales strategy to focus on group-based sales rather than individual transactions to improve adoption rates.

Adaptability has also been evident in how companies refined their financial models and product offerings. SWP companies developed a surface pump tailored to Adjumani's conditions, demonstrating a direct response to market needs. SWP Companies also introduced

flexible financing models like “pay as you grow” to address affordability constraints, allowing last mile consumers to pay a deposit and spread payments over time. These changes reflect a growing ability to adjust business models to real market conditions.

A key shift has been companies’ recognition of the importance of reducing dependency on external support. Market mapping, engagement with local stakeholders, and investment in sustainable distribution strategies have become central to their operations. Their grassroots awareness campaigns and agent-based cluster system indicate a deeper understanding of market-driven expansion rather than project-led support. They also view participation in the market as essential for trust-building and long-term sustainability. Companies now acknowledge that long-term success depends on their ability to operate independently, strengthening networks and improving last mile consumer engagement.

Despite initial reluctance, companies have demonstrated a willingness to learn from the project and adjust their strategies accordingly. Their increasing use of structured feedback mechanisms and adaptation of operations to match last mile consumer needs confirm their commitment to sustaining market presence beyond external facilitation. Their ability to enhance local presence, refine financing models, and respond to farmer-specific constraints reflects their alignment with MSD principles. While challenges remain in fully embedding MSD practices across all areas of operations, companies have made significant progress in developing sustainable market systems that are less reliant on external funding and more responsive to market realities.

Have there been any unforeseen impacts?

The project initially aimed to increase agricultural production through solar water pumps (SWPs), improve access to clean cooking energy (CCE), and support environmental protection and gender empowerment. However, some unforeseen impacts have emerged, expanding the scope of benefits beyond the initial objectives.

One key unanticipated outcome is the diversification of how SWPs are used. While primarily intended for agriculture, pumps have also been used for brickmaking, to supply social events and livestock watering, generating additional household income. The ability of solar pumps to support multiple agricultural cycles has resulted in surplus production, allowing some farmers to start small businesses. Furthermore, some families have begun preserving vegetables through drying, strengthening food security in ways not initially anticipated.

Some unexpected but quite limited environmental benefits have also emerged. Tree planting and vegetation restoration efforts have been reported as a result of SWP use, with communities engaging in self-led environmental conservation initiatives. Additionally, the adoption of clean cooking stoves has led to improved air quality, with beneficiaries reporting unexpected health benefits due to reduced smoke exposure.

At the social level, gender roles and community engagement have also evolved. The ability for children to operate the pumps has freed up time for women, allowing them to focus on other household and income-generating activities. SWPs have also been used for community gardening projects, strengthening cooperation among local farmers. Additionally, SWPs have been utilized for small gatherings and public activities, demonstrating their role in broader community resource sharing.

The implementing partners are satisfied with the results of the project?

Most implementing partners express satisfaction with the project's outcomes, particularly in terms of market expansion, increased last mile consumer bases, and long-term business prospects. The project has accelerated companies' growth trajectories, facilitated market entry in Adjumani, Lamwo and Obongi and introduced sustainable business practices. However, some concerns remain, particularly regarding sales volume, sustainability without external support, and operational costs.

Most companies highlight strong satisfaction with the results. They acknowledge that the project has accelerated their commercial goals allowing them to prioritize West Nile and Acholi Sub-regions as a key market. Moreover they report that the project has aligned with their expansion goals, and they now consider long-term sustainability achievable due to the momentum built through the intervention. Companies note that Ayuda en Acción's (AeA) facilitation has been instrumental in their growth, and they are committed to continuing operations even as external support decreases.

Beyond market growth, companies acknowledge the adoption of the MSD approach as a key project success. They have conducted independent market assessments, expanded beyond the initial target areas, and now trust the model as a viable business strategy. This confidence is further reflected in the fact that even with budget cuts, companies are continuing to invest their own resources to maintain operations in the area.

However, some present a more mixed perspective. While they recognize the progress made, positive feedback from last mile consumers, and improvements in operations, they remain concerned about long-term sustainability due to insufficient sales growth, especially regarding clean cooking stoves. They fear that without AeA's support, maintaining current operations will be difficult, particularly given high operational costs and the need to increase sales volume significantly.

Are people more aware of the importance of adopting clean cooking to mitigate deforestation?

The awareness of the importance of adopting clean cooking energy (CCE) to mitigate deforestation is moderate to high among those who have purchased these stoves. **Among CCE buyers, 45% demonstrated a high level of awareness regarding deforestation, the role of firewood collection in its acceleration, and the environmental benefits of clean cooking energy. The remaining 55% showed a moderate level of recognition.**

However, it is important to note that **CCE adoption remains limited compared to Solar Water Pumps (SWP)**, as the latter presents more immediate and tangible benefits. Ebenezer has reported challenges in selling CCE products, as men who often make household financial decisions prioritize investments in SWP over CCE, indicating that deforestation is not widely perceived as a pressing issue. The lower adoption rate of CCE reflects a gap in public awareness and prioritization of clean cooking solutions as a deforestation mitigation measure.

Qualitative data reinforces this trend. Some community members recognize that CCE helps reduce deforestation by lowering charcoal consumption, particularly for those using stoves in business activities like baking. In Adjumani, participants acknowledged that clean cooking stoves contribute to reducing deforestation, even though this was not a primary objective of the intervention. The link between CCE adoption and environmental benefits is understood by those who have purchased the stoves, but the wider community has yet to fully embrace this perspective.

Despite the moderate to high awareness among CCE buyers, the overall challenge remains increasing public recognition of the environmental impact of traditional cooking methods. Greater sensitization efforts could enhance awareness and encourage broader adoption, helping position CCE as a viable and impactful solution to deforestation.

Has the health and well-being of the home improved?

The health and well-being of households have improved significantly following the adoption of solar water pumps (SWP) and clean cooking energy (CCE) technologies. **Among those interviewed, 77% reported a high perception of improved health, 13% a moderate improvement, 6% a low improvement, and 4% did not perceive any change or reported worsening conditions.**

The positive health outcomes are linked to two main factors: the reduction in respiratory issues and physical strain due to the transition from traditional cooking stoves to cleaner

cooking technologies, and the improved nutrition, reduced workload, and financial benefits enabled by solar water pumps.

The adoption of clean cooking stoves has led to significant health improvements by reducing exposure to harmful smoke and physical discomfort. Beneficiaries noted that the stoves produce less smoke, improving indoor air quality and preventing respiratory illnesses. Additionally, they cook food faster and use less charcoal, which lowers household expenditures and minimizes environmental degradation. Participants emphasized that clean cooking has created a healthier cooking environment, reducing ash spread and contamination inside the home.

SWPs have reduced the physical burden of irrigation, particularly for women, who previously carried heavy water containers over long distances. Users reported experiencing fewer back pains and less exhaustion, allowing them to rest and engage in other productive activities. Households also gained more time for family chores and personal well-being as the pumps reduced the time needed for irrigation.

The impact of SWPs on nutrition and food security has been another major contributor to well-being improvements. Many families have expanded their production, growing a variety of vegetables throughout the year, which has enhanced their diets and food stability. Preserving vegetables through drying has further contributed to food security, ensuring a more stable and nutritious food supply. Some participants highlighted that eating three meals a day had become more common thanks to their ability to farm throughout the year.

Beyond direct health benefits, increased agricultural production and savings from reduced charcoal and firewood expenses have improved overall household well-being. The additional income generated from increased production has allowed families to afford home necessities and medical bills, contributing to an improved standard of living. The ability to grow and sell produce, even during the dry season, has increased financial stability, allowing for better household conditions and access to essential services.

Have climate-resilient agricultural practices been implemented?

The **implementation of climate-resilient agricultural practices among farmers using solar water pumps (SWP) remains an area for further improvement.** According to the data, **60% of SWP buyers reported not having received training on agronomic and good farming practices, while 40% did.** Among those who received training, **82% diligently apply these practices, whereas 18% do so only to a certain extent.** This highlights a crucial gap: **strengthening training efforts could enhance the impact of SWP adoption, improving agricultural productivity and resilience.** The discontinuation of OMIA as a partner has affected this process, as OMIA previously played a critical role in training farmers.

Nonetheless, even without this knowledge, people reported that solar water pumps have facilitated year-round farming and crop diversification, helping farmers grow vegetables during the dry season and expand their agricultural activities. Farmers in multiple regions reported that using solar irrigation allows them to produce food outside of the rainy season, reducing their dependency on unpredictable rainfall.

Despite these successes, the lack of widespread agronomic training remains a limitation. Farmers who received training from OMIA were better equipped to manage soil health, use intercropping techniques, and apply climate-smart farming methods. However, with OMIA no longer involved, many new SWP users lack access to critical agronomic knowledge. Farmers also emphasized the need for further training on pest control, improved irrigation strategies, and market linkages.

Are the participants satisfied or do they perceive that it is being useful to them?

The satisfaction levels among participants regarding the use of solar water pumps (SWP) and clean cooking stoves (CCE) are notably high. Based on quantitative data, **74% of users**

report being highly satisfied with the products, 24% have moderate satisfaction, and only 3% express low or no satisfaction. Key aspects valued by users include the time saved through the use of these technologies, ease of use, efficiency, and, to a lesser extent, the impact on health. In addition, CCE users appreciate the cleanliness of the stoves, while SWP users highlight portability as a significant advantage.

Qualitative responses further support these findings. All participants in the Adjumani focus group expressed satisfaction, citing improvements in food security, the ability to pay school fees, and the ease of irrigation compared to manual watering methods. Additionally, they indicated that they foresee continued usage due to the tangible benefits. Similarly, in Obongi, participants noted increased household income and improved living standards as a result of enhanced productivity and commercial opportunities provided by SWPs. However, some limitations were noted, such as the SWP's inability to cover large areas (e.g., one acre), though no negative impact was reported.

For CCE users, responses were equally positive. Participants appreciated that stoves cook faster, use less charcoal, reduce costs for small businesses, and minimize exposure to smoke, leading to cleaner air. While the majority found the design efficient and easy to use, some noted minor limitations, such as the inability of certain models to charge phones.

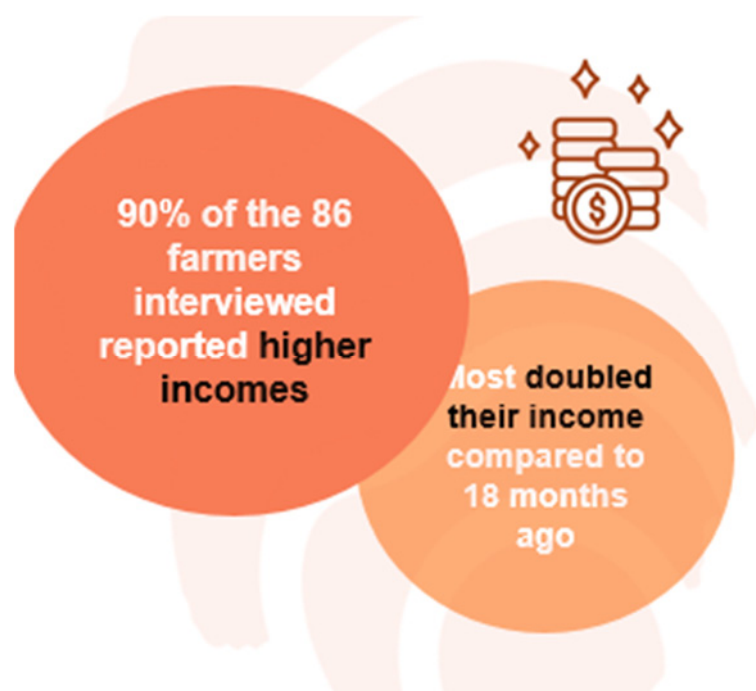
In Lamwo, six out of eight respondents expressed satisfaction, citing increased incomes from vegetable farming, the ability to cover school fees and medical bills, and the lower costs associated with using solar power for irrigation instead of human labor. The pay-as-you-grow model was also highlighted as a farmer-friendly financing option that encourages wider adoption.

Have the incomes of small farmers increased?

The data indicates a **significant increase in income among small farmers and businesses** following the adoption of solar water pumps. **Over 90% of the 86 farmers interviewed reported an increase in their income, with the majority more than doubling their earnings compared to 18 months ago.** This substantial growth is largely attributed to improved agricultural productivity, year-round farming, and increased market access. However, it is important to note that while many farmers experienced substantial income gains, others reported only minimal increases, as reflected in monitoring feedback and past figures.

Qualitative findings further support this trend. Farmers in Adjumani highlighted that SWPs allowed them to grow and sell vegetables even in the dry season, improving both individual and group income. Similarly, in Lamwo, participants reported that vegetable farming with solar pumps provides instant income throughout the year, enabling them to cover school fees and medical expenses. Likewise, in Obongi, farmers observed that household incomes have risen due to higher productivity, increased commercial production, and better year-round yields.

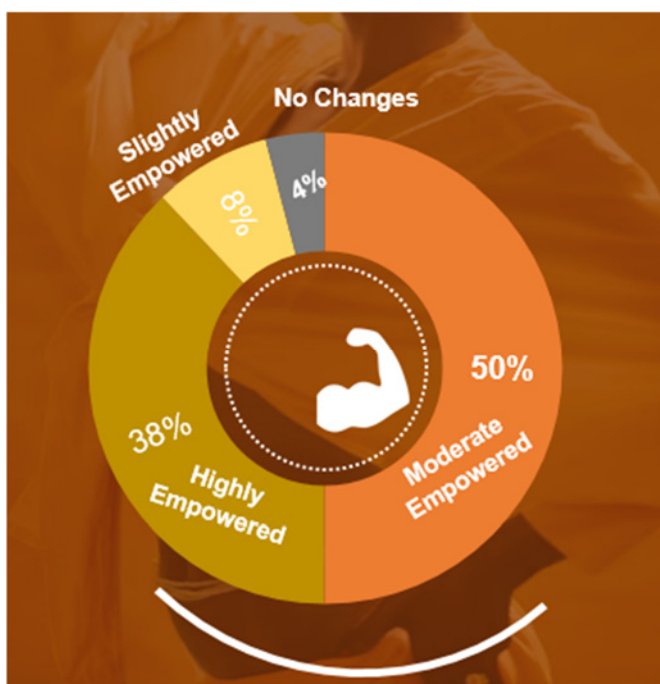
From the perspective of project staff, they confirmed that the intervention was financially impactful, as SWPs generated quick returns within three months. Additionally, they observed that higher crop yields translated into greater surpluses for market sale, boosting profitability. Similarly, companies stated that year-round vegetable farming through SWP irrigation had led to increased earnings, especially during the dry season when produce



prices are higher. Finally, they affirmed that farmers using their SWPs have seen measurable increases in household income and expanded business investments.

In summary, there seems to be a strong correlation exists between access to renewable energy solutions and higher income levels for small farmers and businesses. The ability to farm year-round, expand cultivated land, reduce operational costs, and access larger markets has driven significant financial gains. However, the scale of these income increases varies, and while some farmers have seen substantial improvements, others have experienced more modest gains according to the continued monitoring implemented by AeA's staff.

While the **findings indicate a positive trajectory for smallholder farmers, the long-term sustainability of these income increases will depend on continued access to technology, tailored financing options, and complementary agronomic training.** Additionally, expectations regarding income improvements should be framed realistically, as individual results may differ based on factors such as farm size, access to markets, and external economic conditions.



Are women being empowered? Are solar water pumps and clean cooking energy having positive effects for them?

The assessment of the impact of Solar Water Pumps (SWP) and Clean Cooking Energy (CCE) on women's empowerment and well-being reveals significant improvements in various dimensions of their daily lives. Based on the collected data, **38% of women report feeling highly empowered, while 50% experience**

moderate empowerment. A smaller proportion, **8%, feel only slightly empowered,** and **4% state that they have not experienced significant changes.**

Several factors contribute to these empowerment levels. Women using SWP have expressed that their ability to carry out agricultural activities has improved significantly, allowing them to be more efficient in their work and make better use of their time. In many cases, they now have greater control over decision-making within their households, reinforcing their autonomy and role in resource management. Testimonies from different communities indicate that the introduction of SWP has reduced the physical burden of irrigation and increased agricultural productivity, making it easier for both men and women to allocate time to other activities.

Health and physical well-being have also seen notable improvements, particularly for those using CCE. Many women report fewer respiratory issues due to reduced smoke exposure, as well as less back and joint pain, which were previously aggravated by the need to collect firewood. In Lamwo, women emphasized that using SWP has led to a decrease in the physical strain of carrying water, improving their overall health. Additionally, some households have observed a general improvement in family health due to the use of these technologies.

A key aspect of empowerment has been the reduction of the workload and the redistribution of time. Women using CCE report that cooking times have decreased significantly, giving them more time for household chores, economic activities, or personal development. SWP users highlight the ease of irrigation, which has not only saved time but has also allowed them to diversify their crops and increase agricultural yields. In Obongi, women have even formed groups to share irrigation responsibilities, ensuring that each member has more time to focus on other household duties.

The economic impact of these technologies has been particularly evident among SWP users. Many women have reported an increase in household income, as they can now grow and sell vegetables throughout the year. In Lamwo, some women explained that this additional income enables them to pay school fees and cover medical expenses, contributing to overall

family stability. Moreover, improved food security has been another benefit, with some families adopting food preservation techniques such as drying vegetables, ensuring a more stable food supply.

While the overall impact of SWP and CCE has been highly positive, the findings also indicate that **12% of women feel only mildly empowered or see no significant change**. This suggests that additional support may be needed to maximize the benefits of these technologies. Strengthening community networks, providing training in technology maintenance, and improving access to financial resources could help ensure that more women fully experience the transformative potential of SWP and CCE.

The findings highlight that SWP and CCE are not just tools for improving agricultural productivity or household efficiency; they can be catalysts for women's empowerment, health, and economic stability. By reducing the physical burden of daily tasks, enhancing decision-making power, and increasing financial independence, these technologies are reshaping gender dynamics and fostering a greater sense of autonomy among women in these communities. However, further efforts are required to ensure that all women can fully benefit from these innovations and overcome existing barriers to empowerment.

Have environmental protection and resistance to climate change increased?

The intervention has contributed to environmental protection and climate resilience, particularly through the adoption of solar water pumps (SWP) and clean cooking energy (CCE). The use of solar irrigation has reduced reliance on diesel pumps, while clean cooking stoves have decreased charcoal consumption, helping mitigate deforestation. However, adoption remains uneven—only 45% of CCE buyers have a high level of awareness about deforestation, and decision-making dynamics often favor investments in SWP over CCE, limiting the latter's impact. While farmers recognize the benefits of climate-smart practices, the lack of

widespread adoption shows that environmental concerns are not yet a priority for many households.

Water conservation has improved, with SWPs allowing for more efficient irrigation, yet challenges remain in access to spare parts and maintenance. Farmers report that broken pumps are difficult to repair due to high costs and limited availability of parts, threatening sustainability. Additionally, while the intervention has successfully raised awareness of climate-smart practices, it has not ensured their consistent application. Without continued reinforcement, there is a risk that progress will stall. Expanding training, improving access to spare parts, and addressing gender-based decision-making barriers will be necessary to achieve lasting environmental and climate resilience.

Is the use of technology sustainable?

The sustainability of the technology used in the intervention appears promising, with **100% of respondents rating its usability and sustainability as either high (35%) or moderate (65%)**. No participants reported a low level of sustainability, suggesting that the technology is generally reliable and functional in the long term. A key factor in this perception is that most users have received maintenance guidelines and apply them, ensuring that solar water pumps (SWP) and clean cooking energy (CCE) technologies remain operational. Additionally, many have been able to use the technology throughout the year, reinforcing its practical application and relevance in their daily lives.

However, while the technology itself is durable, the ability of users to independently manage repairs remains a challenge. A significant number of respondents expressed concerns about the cost of unexpected repairs and the availability of spare parts, particularly for SWPs. Farmers in different regions noted that while the pumps have improved irrigation and agricultural productivity, accessing maintenance services remains difficult due to distance and

affordability. Similarly, while CCE users appreciate the efficiency of the stoves, continued reliance on warranty-covered repairs suggests that long-term maintenance could become a financial burden once warranties expire.

The expectation of durability among users is high, with many confident in their ability to use the technology in the long run. However, this confidence is partially dependent on external factors, such as company support, availability of technicians, and affordability of replacement parts. While companies have established local support networks, some users still experience difficulties accessing repairs, especially in remote areas. Ensuring long-term sustainability will require strengthening local repair services, expanding technical training for users, and reinforcing access to spare parts to prevent disruptions in use.

Final

Is poverty being reduced?

The data indicates a clear **trend toward poverty reduction among participants, with 36% reporting a significant reduction, 58% a moderate reduction, and only 3% experiencing limited or no change.** This reduction is largely attributed to increased income from agricultural production, cost savings on fuel and labor, and the ability to reinvest earnings into education, health, and household improvements. Solar water pumps (SWP) have enabled farmers to cultivate crops year-round, including during the dry season, which has led to higher agricultural yields and a more stable source of income. Farmers report being able to sell surplus produce, expand their markets, and reduce costs associated with manual labor or traditional irrigation methods. The increased financial stability has allowed some households to invest in livestock, pay school fees, and afford medical expenses, further contributing to long-term poverty reduction.

The adoption of clean cooking energy (CCE) has also played a role in improving household economic conditions. Many participants report reduced spending on charcoal and firewood,

which has freed up income for other necessities. Additionally, the improved efficiency of CCE has allowed women more time to engage in income-generating activities, further strengthening household finances. Some women highlighted that they have started small businesses, while others noted that the reduction in smoke-related illnesses has decreased medical costs, further supporting their economic resilience.

Despite these positive developments, **challenges remain in ensuring sustained poverty reduction**. The affordability of these technologies remains a barrier for many, particularly in households where men make the primary financial decisions and prioritize investments in SWPs over CCE. Furthermore, while many respondents reported an increase in income, long-term financial stability will depend on continued access to markets, financial services, and agronomic training. While SWPs and CCE are helping households move out of poverty, additional efforts in capacity-building, financial access, and broader market linkages will be needed to sustain these gains over time.

Conclusions and recommendations

- **Challenges in Ensuring Effective Partnerships Between Companies and Banks:** The lack of effective partnerships between companies and banks is largely attributed to **high interest rates, rigid bank requirements, and deep-seated mistrust among communities**. Companies found it more practical to implement **alternative financing models**, such as **pay as you grow**, rather than depend on banks. Efforts to raise awareness about banking options were **limited or absent** in several locations, further restricting access to financial services. While some banks, such as **Equity Bank**, have introduced **green loans and targeted financing for women entrepreneurs**, **beneficiary adoption remains low** due to slow processing times and accessibility barriers. To improve financial inclusion, companies and Ayuda en Acción could explore **stronger collaboration mechanisms with banks**, potentially through **referral pathways or flexible financing models tailored to smallholder farmers**.
- **Sustainability:** From an **MSD perspective**, the sustainability of interventions **requires a balance between facilitation and local ownership**. While **companies are now investing their own resources and expanding independently**, ensuring **systemic change and scalability** still requires adequate human resources for **advocacy, strategic guidance, and ongoing adaptation** (Pauline_AeAStaff). The **current staffing levels and budget constraints limit these efforts**, potentially slowing down **the long-term impact and resilience of market actors**. Given these challenges, it is crucial to consider whether **future facilitation efforts should focus more on system-level change rather than direct implementation** to align better with MSD principles.

Overall, **the market system is moving toward sustainability**, with companies increasingly taking ownership of their operations. While **some still require external support**

for specific costs, their long-term interest in remaining in the West Nile and Acholi Sub-regions is clear, and they are actively working to ensure financial independence

- **The presence of solar energy and clean cooking companies in Adjumani, Lamwo and Obongi has grown, with new players entering the market and existing companies expanding their reach. This growth has been driven by rising demand, increased distribution networks, and facilitation efforts such as awareness campaigns and local sales strategies. However, systematic tracking of new actors remains limited, making it difficult to fully evaluate the long-term impact of these emerging businesses.**
- **Companies have made targeted operational changes to enhance last mile consumer engagement, improve affordability, and tailor their products to local conditions. These adaptations indicate a commitment to long-term market presence and sustainability. However, ensuring continued awareness-building and further refining financing models could enhance adoption rates and strengthen company operations in the West Nile and Acholi Sub-regions.**
- **The expected collaboration between companies and banks did not materialize in a way that provided meaningful financial solutions. Companies adapted by implementing their own credit schemes, while banks remained largely disconnected from the market, limiting their role in facilitating access to renewable energy solutions for smallholder farmers and rural last mile consumers.**
- **The facilitation process achieved key goals in market entry, awareness creation, and logistical support for companies, but some planned activities had to be scaled down or adapted due to budget and resource limitations. While companies successfully transitioned from AeA-supported offices to independent operations, and product adoption increased, affordability and financial stakeholder engagement remained challenges. Given the perspectives from both AeA staff and the companies, it is important to acknowledge potential biases, as companies expressed strong appreciation for AeA's role but also benefited directly from the facilitation efforts. Further independent**

assessment could help evaluate long-term sustainability and areas where facilitation could be improved.

- Overall, the **majority of companies express high satisfaction with the project, citing its role in accelerating market entry, fostering business growth, and embedding sustainable business models.** While some companies **have successfully transitioned toward independent operations, others remains concerned about long-term viability,** highlighting the **need for continued efforts to strengthen sales and financial sustainability.** This suggests that **while the project has laid a strong foundation, targeted support in business growth strategies may be necessary to ensure that all implementing partners can sustain operations beyond the project's duration.**
- While the analysis **successfully laid the foundation for market entry,** these **gaps in financial analysis, risk assessment, and a market-driven approach required companies to navigate additional challenges on their own.** Strengthening **actor mapping, integrating financial stakeholders, and expanding risk assessment** would enhance the effectiveness of similar interventions in the future.
- While **most beneficiaries have received some awareness about solar energy, the level of knowledge varies, with nearly a third (29%) having insufficient understanding.** **Company-led training, demonstrations, and peer learning networks have been effective** in spreading awareness, but **gaps remain, particularly in outreach to remote areas and the quality of demonstrations.** Strengthening **interactive learning, increasing follow-ups, and enhancing facilitation efforts** could further improve awareness levels and encourage greater adoption of solar technologies.
- Overall, communication between companies and last mile consumers has been effective in many cases but remains **inconsistent in frequency and depth.** The **strongest channels have been direct visits, local agents, and radio programs,** but beneficiaries expressed a **need for increased follow-ups and more proactive engagement.** In contrast,

communication between companies and financial institutions has been weak, with companies choosing to **avoid banks due to rigid processes and instead rely on internal financing mechanisms**. Strengthening last mile consumer engagement strategies and addressing financing challenges through improved bank collaborations could further enhance the effectiveness of communication efforts.

- **While the technologies have proven effective in reducing women's workload, gender dynamics and financial decision-making within households continue to limit women's direct access to these solutions.** The lower adoption rate among women suggests the need for targeted interventions to increase their direct ownership of SWP and CCE technologies, ensuring that the benefits of reduced workload and time savings are more equitably distributed within households.
- **Access to renewable energy has improved significantly in terms of geographic availability of stores and agents, as well as financing mechanisms.** However, **challenges remain in ensuring affordability, awareness of spare part availability, and long-term sustainability of access to repairs and maintenance services.** While more people now have renewable energy stores closer to them, **the ability to fully utilize and maintain these technologies remains uneven**, highlighting the need for **continued market development efforts to strengthen affordability, knowledge-sharing, and post-sale services.**
- While production has increased, some limitations remain. **The lack of sufficient agronomic support has been noted as a challenge, with some farmers needing more training to maximize the potential of their expanded production.** Despite this, the overall trend is clear: **solar water pumps have played a key role in increasing agricultural output, ensuring year-round farming, and boosting incomes among smallholder farmers.**
- The combination of **reduced exposure to harmful smoke, lower physical strain, improved nutrition, and economic benefits** has **enhanced the well-being of families adopting renewable energy technologies.** While the majority of participants report improve-

ments, some challenges remain in reaching all households with these benefits. **Sustained efforts in awareness and accessibility will be key to further increasing the adoption and maximizing long-term impacts.**

- **While climate-resilient agricultural practices are being implemented through SWPs and improved farming techniques, gaps remain in agronomic training and ongoing support.** The lack of structured agronomic training for **60% of SWP users** underscores the need for reinforcement in this area to ensure that farmers fully integrate sustainable practices that enhance resilience against climate change..
- The satisfaction with SWP and CCE is overwhelmingly positive, with participants recognizing the **time savings, efficiency, affordability, and economic benefits** of these technologies. While some limitations exist, particularly in the capacity of SWPs to irrigate larger plots, the majority of users see long-term value in their continued use.
- **The data shows a correlation between access to renewable energy solutions and higher income levels for small farmers and businesses.** The ability to **farm year-round, expand cultivated land, reduce operational costs, and access larger markets has driven significant financial gains.** While the impact is widespread, the scalability of these results depends on continued access to technology, financing options, and complementary agronomic training to maximize productivity.

