Solarizing Key Agricultural Value Chains in East Africa

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Kenya Climate Innovation Center

DREEM HUB
Distributed Renewable Energy Ecosystem Model

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1 **An Eye-Opening Pilot:** The PUSE Potential in East Africa

MARIA GORRETI NAKANWAGI was nearing her wits end, as she agonized over the wastage and loss she edured daily with her fellow mushroom farmers at the Nakasero market in downtown Kampala. The founder of Umami Mushrooms recalls how they would be forced to either surrender their produce to middlemen at throw-away prices, or lose them altogether when they were no longer
fresh.

> "As I was trying to figure out how to dry and preserve my mushrooms to avoid these losses, that is when
> I saw the KCIC opportunity, which changed everything" **she recalls.**

PUSE Program Coordinator Saumu Ismail (Right) with Maria next to one of her solar dryers

Musa Njue(Tecsols Limited) explains a point to Dr. Robert Ddamulira, Program Officer, Mott Foundation, during a field visit in 2024

"The program helped me set up a production unit, solar dryers, and expand my capacity. I have created jobs as a result, and empowered other women. I no longer just sell mushrooms, but also mushroom gardens. We have also come up with mushroom value-added products, including skin care products and even beverages," she adds.

Due to her expanded capacity and ability to dry and preserve her products, Maria has taken Umami mushrooms beyond Ugandan borders.

Agriculture remains pivotal to East Africa's economy, yet many farmers and agribusinesses remain shackled by unreliable and costly energy sources. The Kenya Climate Innovation Center (KCIC) sought to change this narrative with the successful implementation of its pilot program dubbed 'Productive Use of Solar Energy' (PUSE), running from 2023-2024.

Funded by the Charles Stewart Mott Foundation, the initiative marked KCIC's first venture beyond Kenyan borders, extending its impact to Uganda and Tanzania. It sought to enhance agricultural productivity, create jobs, and mitigate climate change by supporting small and medium-sized enterprises (SMEs) integrating solar energy into their business models.

"We've been supporting this work for nearly ten years in East Africa, with the objective of creating a model that can be scaled to other developing countries to help farmers better address the climate emergency," says Dr. Robert Ddamulira, Program Officer at the Mott Foundation.

A Transformative Approach to Renewable Energy Adoption

The 'Better Financing Solutions for Local Productive Use of Solar Energy Entrepreneurs in East Africa's Agriculture Sector' dubbed PUSE pilot program was designed to address a critical challenge: the slow adoption of solar energy solutions within key agricultural value chains such as dairy, horticulture, and fisheries for productive purposes. The program aimed to bridge this gap through:

1. **Business Mentorship & Advisory Support –** Providing technical expertise, financial literacy training, and business strategy development for 30 shortlisted enterprises.
2. **Technical Assistance –** Facilitating access to product testing, certification, and regulatory compliance, ensuring solar solutions met industry standards.
3. **Access to Finance –** Enabling SMEs to secure performance-based financing and external investment, reducing barriers to scaling their businesses.
4. **Market Linkages & Strategic Partnerships –** Connecting enterprises to potential investors, customers, and industry stakeholders through exhibitions, forums, and networking events.
5. **Capacity Building & Knowledge Sharing –** Conducting training sessions, webinars, and field visits to enhance entrepreneurs' technical and operational capacities.

Key Milestones and Impact

Through the pilot, KCIC has made significant strides in fostering renewable energy adoption in agriculture, yielding impressive results:

407 direct jobs and over

1,200 indirect jobs created

23,516

new customers adopted solar-powered agricultural solutions

Enterprise revenues grew by

USD 2.05

million **(a 19% increase)**

USD 763,256

in external funding secured for SMEs, against a target of **USD 50,000**

342,543

tonnes of CO_2 emissions mitigated, againsta a target of 100,000, reinforcing the program's climate impact

Notable innovations by entrepreneurs in the program included solar-powered cooling olutions (cold rooms, refrigerators, milk chillers and ice making machines), solar thermal (i.e solar dryers, pasteurisers, solar water heaters), solar water pumping , solar lighting, solar powered knapsack sprayers, integration of e-mobility in agriculture, which have significantly reduced post-harvest losses and increased farm productivity. The program also facilitated knowledge-sharing platforms, industry experts to refine their business models and enhance market penetration.

> 'Prior to KCIC support, we were doing just a few of our dairy cooling and heating units. Right now that has changed, not just in quantity but also quality and volume of sales, thanks to the support in acquiring new production equipment and technical assistance. Our brand trust has also significantly improved thanks to our association with KCIC,' **says Queen L'Ombaka, Marketing Lead at the Kenya-based Techwin Limited.**

Techwin's Queen L'Ombaka demonstrates the operation of one of their equipment

"Through this support, KCIC has walked with us from concept to solution. We are currently set to produce solar-powered cold storage units for dairy farmers," says Prosper Magali, Founder of Ensol Ltd, Tanzania.

Lessons from the PUSE Pilot

While the program achieved remarkable successes, it also revealed critical gaps that must be addressed for long-term sustainability:

- **Gender Inclusivity Strengthening –** Only 25% of enterprises were women-led, highlighting the need for targeted outreach and support for female entrepreneurs.
- **Rural Penetration–** Most onboarded enterprises were based in urban areas, limiting the accessibility of PUSE solutions to rural farmers.
- **Dairy Sector Challenges –** Despite its economic importance, fewer innovations targeted the dairy value chain, presenting an opportunity for future interventions.
- **Over-Reliance on Grants –** Many SMEs sought financing but lacked investor-readiness, underscoring the need for enhanced training in financial sustainability.

KCIC CEO, Joseph Murabula opines, "The transition to productive use of solar energy in agriculture is not just about energy access; it is about building resilient economies, empowering SMEs, and fostering climate action. This pilot program demonstrated that with the right support, enterprises can drive meaningful impact in their communities."

The high cost of traditional energy sources and the vulnerability of agricultural activities to climate change make renewable energy adoption a critical component of sustainable food systems and climate action.

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Beyond PUSE: Distributed Renewable Energy Ecosystem Model (DREEM) Hub

In a strategic continuation of its efforts, KCIC is implementing the Distributed Renewable Energy Ecosystem Model (DREEM) Hub, with support from the Charles Mott Foundation. Running from June 2024 to July 2027, it builds upon the PUSE pilot program by embedding solar energy solutions into last-mile communities, with a primary focus on key agricultural value chains, and an enhanced implementation approach, emphasizing ecosystem building for sustainable solutions.

Program Overview

The Distributed Renewable Energy Ecosystem Model (DREEM) Hub, is an initiative aimed at solarising key agricultural value chains in Kenya

Rural farmers, particularly youth and women, lack access to reliable energy solutions, financial resources, and business skills to transition into climate-smart agriculture. The dairy and horticulture value chains in particular, which are key to Kenya's economy, suffer from post-harvest losses, inefficient production methods, and high energy costs due to reliance on diesel-powered equipment or unreliable grid electricity.

Two fundamental challenges arise:

1. **Energy Poverty:** Many smallholder farmers have no access to affordable, reliable energy for productive use, which limits their ability to preserve milk, store horticultural produce, or mechanize farm operations.

2. **Limited Financial Access:** Solar-powered agricultural solutions exist, but high upfront costs and lack of financing options prevent their widespread adoption.

The DREEM Hub seeks to solve this dual problem by enabling access to clean, affordable solar energy for productive use in horticulture and dairy value chains by last-mile communities, and ensuring they get financial and capacity-building support to sustain agrisolar entrepreneurship.

Through this intervention, the program aims to enhance economic and environmental sustainability. The initiative aligns with Kenya's commitment to reducing greenhouse gas (GHG) emissions by 32% by 2030, as part of its Nationally Determined Contributions (NDCs) under the Paris Climate Agreement.

The DREEM Hub is designed as a multi-stakeholder platform that fosters entrepreneurship, provides financial support, develops technical skills, and strengthens market linkages for youth and women agrisolar entrepreneurs.

Operationally, it takes a "hub-and-spoke" model, where KCIC acts as the central coordination unit (the Hub), and multiple partners (spokes) extend specific services such as training, financing, and market linkages to farmers and agrisolar entrepreneurs.

The DREEM Hub in Operation

Solarising Key Agricultural Value Chains in East Africa

The program has a three-year implementation period (2024–2027), executed in two phases:

1. **Design and Planning Phase (6 months) –** Established the program framework, conducted baseline studies, and identified implementation partners.
2. **Implementation Phase (24 months) –** Deploying solar-powered agricultural solutions, providing financing, and scaling up agrisolar entrepreneurship.

DREEM Hub Pillars

- Enterprise Support and Development
- Access to finance
- Skills and Capacity Development
- Community Livelihood Impact
- Research and Development
- Agrisolar Demonstration Farm

Key Objectives and Interventions

1. **Access to solar technology for productive use in agriculture value chains**

2. **Capacity Building and awareness creation for Agrisolar Entrepreneurs:**
   - Train and support 1,000 youth and women agrisolar entrepreneurs by equipping them with business and technical skills to integrate solar energy solutions into dairy and horticulture value chains.
   - Provide mentorship and business acceleration support to agrisolar startups to enhance commercialization and scale-up.

3. **Access to Affordable Financing:**
   - Establish a USD 460,000 concessional loan facility to enable cooperatives and agrisolar entrepreneurs to access solar-powered equipment.
   - Work with financial partners to manage fund disbursement and provide financial literacy training.
   - Offer low-interest loans (6%) with flexible repayment terms to support agrisolar entrepreneurs in acquiring and scaling up their solar-powered businesses.
   - Establish a self-sustaining Revolving PUSE Loan Fund to provide concessional loan financing for agrisolar entrepreneurs and cooperatives, improving access to solar technologies.

4. **Market linkages and strengthening value addition**
   - Engage cooperatives, county governments, and private sector players to create demand and markets for agrisolar solutions.
   - Enhance access to export markets for horticultural produce through improved solar-powered cold chain infrastructure.

5. **Ecosystem coordination and sustainability:** Establish an independent, well-governed DREEM Hub to provide long-term stakeholder coordination, capacity building, and continued market development for agrisolar innovations.

   - Set up a physical and digital hub to provide long-term business support, market linkages, and enterprise incubation.
   - Implement a multi-stakeholder governance model with participation from KCIC, financial institutions, government agencies, training institutions, and private sector partners.

Target Beneficiaries

- **Secondary beneficiaries:** Youth and women agrisolar entrepreneurs operating within dairy and horticulturesector.
- **Primary beneficiaries:** Cooperatives or farmer-led groups that integrate solar technologies into their value chains to enhance productivity and reduce energy costs.
- **Geographical focus:** Rural and off-grid communities, with the specific selection of cooperatives and counties based on baseline assessments.

Expected Impact and Outcomes

- **Economic Growth:** Increase annual incomes of agrisolar entrepreneurs by at least 30% through solar-powered agricultural innovations.
- **Job Creation:** Generate 700 direct and 2,100 indirect jobs through agrisolar value chains.
- **GHG Reduction:** Cut 300,000 tonnes of CO2 emissions over three years by transitioning dairy and horticulture farmers from fossil fuel- powered equipment to solar energy solutions.
- **Financial Inclusion:** Improve access to finance for 15 cooperatives (6dairy and 9 horticulture), enabling them to invest in agrisolar technologies.
- **Sustainable Energy Adoption:** Scale up solar solutions to 1000+ smallholder farmers, enhancing resilience to climate change.
- Increase adoption rate of solar in agriculture by 60%

Sustainability & Long-Term Vision

For long-term sustainability, the DREEM Hub_ Kenya is designed to evolve into an independent institution post-2026/27 to ensure long-term support for agrisolar entrepreneurs, with a governance model that allows for:

- Revenue generation strategies such as service fees, consulting, and continued fundraising to sustain operations.
- Continued financial partnerships to expand the revolving loan mechanism.
- Integration with government policy frameworks to secure long-term support.
- Expansion into other key agricultural value chains beyond dairy and horticulture and counties, leveraging lessons learned to support broader climate-smart agriculture initiatives.

Participants at the inaugural Entrepreneurs Bootcamp for PUSE clients in Tanzania, July 2023

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DREEM Hub Regional Coordination

The Charles Stewart Mott Foundation is supporting two other institutions across East Africa to drive the Distributed Renewable Energy Ecosystem Model (DREEM) Hub concept in the region. Heifer International Uganda is spearheading DREEM Hub Uganda, whereas WWF Tanzania is implementing DREEM Hub Tanzania.

The effectiveness and efficiency of these programs can be significantly enhanced with a coordinated approach to harness synergies, with structures in place to support cross-learnings and improvement. On this backdrop, the Kenya Climate Innovation Center (KCIC) has been allocated additional funding by the Mott Foundation to undertake a coordinating role across the three DREEM Hubs.

This coordination will ensure a shared vision, shared learnings, and ultimately sustainability beyond the life of the DREEM Hubs. The coordination will lead to:

- Coordinate shared learnings through networking forums among the DREEM Hubs
- Ensure Sustainability of the hubs through resource mobilization

The DREEM Hub coordination across the region will entail benchmarking visits, an annual DREEM Partners and Ecosystem Conference, leveraging of digital networking platforms, centralized knowledge management systems, synchronized monitoring and evaluations, impact studies, exchange of expertise, capacity building and trainings.

Additionally, it shall facilitate cross-cutting stakeholder coordination & ecosystem support towards the sustainability plan for the DREEM Hubs. This will be actualised through cross-country market access support, joint fundraising efforts, combined investor-investee matchmaking forums, as well as coordinated documentation and communication efforts.

More than 70% of the industries in the EAC are agro-based and depend on agriculture as the main source of raw materials. The agriculture sector represents a significant opportunity for climate adaptation and mitigation efforts. However, the productive use of solar energy in the sector still remains nascent, with few examples of scalable business models.

According to the KCIC PUSE pilot project, there is limited adoption of cooling solutions in agribusiness in the region, which is attributed majorly to their unavailability and high initial cost. The DREEM Hubs will seek to address this by contributing towards solarizing key agricultural value chains.

A Call for Ecosystem Collaboration

We invite all partners and stakeholders to join us in this initiative. The DREEM Hub is more than just another program, it is an ambitious movement towards a sustainable, solar-powered future for Agriculture in East Africa. By integrating renewable energy, financing, market systems, and enterprise support, we are reshaping the way farmers, entrepreneurs, and agribusinesses operate.

However, transformational change cannot happen in silos, it requires a strong, interconnected ecosystem where governments, financial institutions, investors, development partners, technology providers, and cooperatives work together towards a shared vision.

Partnership Rationale

- Join a network committed to clean energy adoption, economic empowerment, and climate resilience.
- Position your organization at the forefront of the growing agrisolar economy in East Africa.
- Support the empowerment of youth and women agrisolar entrepreneurs, fostering job creation and financial inclusion.
- Contribute to climate action, promoting sustainable agricultural practices.

Ways to Collaborate

- **Investment & Financing:** Expand access to affordable solar solutions through impact-driven funding mechanisms.
- **Knowledge & Research Partnerships:** Co-develop training programs, case studies, and policy insights that drive agrisolar adoption.
- **Technology & Innovation:** Provide cutting-edge solar solutions that enhance productivity in the dairy and horticulture value chains.
- **Policy & Advocacy:** Support enabling frameworks that accelerate agribusiness financing, renewable energy adoption, and climate-smart agriculture.

Join Us in Building the Future of Agrisolar! Be part of a scalable, self-sustaining agrisolar ecosystem that endures beyond the life of the program.

Additional Resources: Scan for More

KCIC: Our Story

2024 DREEM Conference

KCIC PUSE Docu

Launch Event Programme

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