INVESTMENT PROSPECTUS:

Productive use of Renewable Energy in select Agricultural value chains in Kenya



NYANDARUA COUNTY GOVERNMENT
PAMOJA TUJENGE

KIMWE KIYUAA
KYAA NDAA

PAMOJA TUJENGE

NAKURU COUNTY

HOMA BAY COUNTY

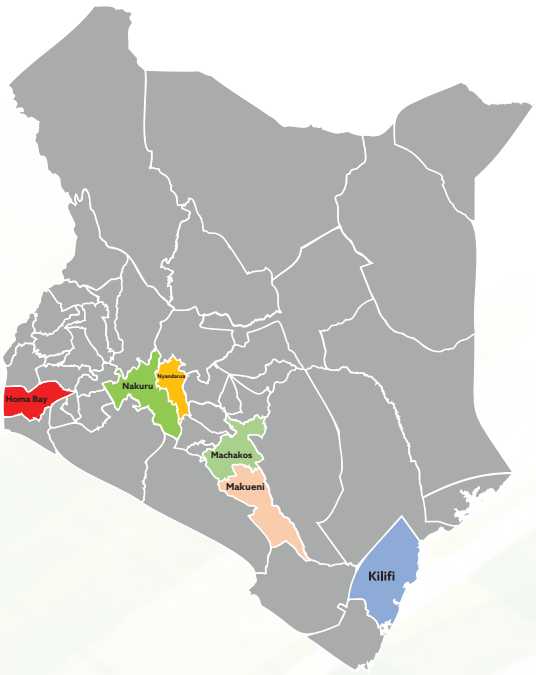

Homa Bay
Nakuru
Nyandarua
Machakos
Makueni
Kilifi

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Foreword

It is with great optimism that we present this investment prospectus documenting productive use of renewable energy (PURE) opportunities in five counties of Kenya: Nyandarua, Machakos, Kilifi, Nakuru, and Homa Bay. This prospectus is intended to guide investors, local financial institutions, PURE suppliers, development partners, and both county and national governments toward unlocking transformative opportunities where clean energy directly powers prosperity.

The urgency to scale PURE solutions cannot be overstated. Across Kenya, smallholder farmers and enterprises face high post-harvest losses, unreliable energy supply, and limited access to affordable financing. By channelling investment into solar-powered irrigation, cold storage, and agro-processing, we can address these barriers, create resilient livelihoods, and strengthen food security.

A critical enabler of this transformation is quality data. Reliable, high-resolution data reduces investment risk and builds confidence in project viability. Tools such as the Energy Access Explorer (EAE) provide the spatial intelligence necessary to identify high-potential investment sites, integrating information on energy demand, agricultural activity, and infrastructure. By deploying such data-driven approaches, investors and policymakers can direct capital where it will generate the greatest economic and social return.

Equally essential is county-level leadership and policy alignment. The counties featured here are demonstrating vision by embedding energy access and productive use within their development priorities. Their leadership, supported by enabling national policies, creates an environment where private investment can thrive and communities can prosper. Together, these counties are signalling that they are open for investment in sustainable, productive energy solutions.

This prospectus is therefore more than a catalogue of projects. It is a call to action to work together in shaping a future where clean energy drives economic opportunity, fosters resilience, and advances Kenya's development and climate goals.

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Disclaimer

This document has been prepared with all due diligence and care, based on the best available information at the time of publication. Whilst informative, this analysis was limited to a sample size of the 20 shortlisted projects. More site visits and further feasibility studies are needed to validate the key findings. Neither WRI Africa, Strathmore University, nor their partners or affiliates, hold responsibility for any errors or omissions within it, regardless of the cause, or for the results obtained from the use of such information. Any decisions made by other parties based on this document are solely the responsibility of those parties, and the liabilities thereof not transferable to the authors of this Investment Prospectus.

Acknowledgment

This prospectus has been developed through a collaboration between **World Resources Institute (WRI)** and **Strathmore University (SU),** with generous funding from the **IKEA Foundation** and the **Charles Stewart Mott Foundation.** Their support and commitment to expanding productive uses of renewable energy have been invaluable in bringing this work to life.

We also acknowledge the leadership and commitment of the five participating counties of **Nyandarua, Machakos, Kilifi, Nakuru, and Homa Bay,** whose vision and partnership have been vital in identifying and advancing PURE investment opportunities.

1.0 Executive Summary

This prospectus showcases a portfolio of investment-ready opportunities poised to transform Kenya's agricultural landscape through the adoption of Productive Use of Renewable Energy (PURE) technologies. Kenya's smallholder farmers and agri-businesses continue to grapple with high post-harvest losses, rising energy costs, and vulnerability to climate change, challenges that collectively constrain profitability and sustainable growth. PURE technologies offer a decisive and scalable solution. By integrating solar-powered irrigation, cooling, and processing solutions, these projects directly address the energy gaps that currently limit productivity. Beyond providing power, this intervention will unlock economic potential, thereby creating resilient livelihoods and ensuring food security.

This prospectus presents a curated portfolio of high-impact projects across the dairy, horticulture, aquaculture, and pulse value chains in Nyandarua, Machakos, Kilifi, Nakuru, and Homa Bay counties. The opportunities range from solarizing juice processing plants and community irrigation schemes to equipping fish farms and women's vegetable cooperatives with essential PURE technologies.

The investment opportunities detailed within this document present strong financial viability, with simple payback periods ranging from 3 to 6 years and significant potential for return on investment through operational savings and increased production. The capital sought for the initial phases of these transformative projects presents a scalable opportunity for investors.

These investments offer a profound social and environmental impact in addition to financial returns. Collectively, they will create and sustain thousands of direct and indirect jobs, especially for women and youth, significantly increase the incomes of over 7,000 smallholder farmers, and reduce carbon dioxide emissions by replacing fossil fuel-powered equipment.

We invite you to partner with us in powering a more prosperous and sustainable agricultural future for Kenya.

2.0 County Investment Profiles

This section spotlights the five counties at the heart of this prospectus - Nyandarua, Machakos, Kilifi, Nakuru, and Homa Bay. Each county profile details the dominant agricultural sectors, energy access landscape, and enabling infrastructure that establish these counties as high-priority zones, creating a fertile ground for high-impact PURE investment.

2.1 Nyandarua County

Nyandarua County has a population of 638,289 and covers an area of 3,304 km^2 (KNBS, 2019). It is located in the north-western part of the former Central Province, sharing borders with five other counties, including Kiambu and Nakuru. The county is divided into five administrative sub-counties of Kinangop, Kipipiri, Ol Kalou, Ol Joro Orok, and Ndaragwa.

Agriculture is the economic backbone of the county. Widely known as Kenya's food basket, the county is a major producer of potatoes, cabbages, and milk. Dairy farming is a dominant enterprise with Nyandarua being the fifth-largest milk producer nationally (KNBS, 2025). This agricultural focus is backed by a supportive county administration. Both the County Integrated Development Plan (CIDP) and the County Spatial Plan identify agro-processing, value addition, and cold storage as key strategic priorities. This approach directly addresses the region's persistent post-harvest losses and provides a strong policy foundation for PURE investments aimed at helping armer groups and cooperatives move up the value chain.

The county benefits from proximity to major markets in Nairobi, supported by a well-connected road network. In terms of energy access, 41% of households are connected to the national grid (KNBS, 2019). However, electricity reliability and affordability remain pressing concerns. Milk processors and cooperatives decry high electricity costs. This challenge is coupled with a high local acceptance of solar energy, as 28% of households already use solar for lighting. This combination of high grid costs and proven solar adoption establishes a prime opportunity for PURE solutions to boost profitability and resilience for the county's key agricultural enterprises.

2.2 Machakos County

Machakos County recorded a population of 1,421,932 in the 2019 census and borders Nairobi and Kiambu counties to the west. The county is a leading producer of beans, green grams, and pigeon peas. Tomatoes are also a key crop, with production in 2023 reaching 49,000 tonnes, valued at KES 2,415 million.

To capitalize on these value chains, Machakos provides a highly structured and investor-friendly environment. The county has established the Machakos Investment Promotion Board (MIPB) as a one-stop shop to guide partners and streamline processes. Its strategic location is enhanced by active partnerships with the Export Processing Zones (EPZA) and Konza Technopolis, both of which are key enablers for the export-focused horticultural projects in this portfolio. This framework is further strengthened by emerging county-level support, including a new draft County Energy Plan and a forthcoming energy policy, both of which promote the productive use of energy and create a welcoming, strategically coherent environment for PURE technologies.

2.3 Kilifi County

Kilifi County is located on the coast of Kenya, spanning an area of 12,245.90 km^2 with a population of 1,453,787 (KNBS, 2019). It is a major producer of fruits, particularly mangoes and pineapples, with mango production reaching 154,000 tonnes in 2022.

The county's development strategy is built on the twin pillars of the blue economy and renewable energy. This is formalized in strategic documents like the County Integrated Development Plan (CIDP) 2023-2027, which prioritizes unlocking underexploited economic opportunities in agriculture, fisheries, and livestock, and the comprehensive Kilifi County Energy Plan (KCEP) 2024-2034. The KCEP explicitly aims to guide investment

and ensure "access to affordable, reliable, and sustainable energy that fosters socio-economic development," directly supporting PURE initiatives.
This strategic planning is backed by a proven track record, including the World Bank-supported Blue Economy Project, which successfully equipped 261 community groups with modern boats and refrigerators. This experience de-risks new investments and positions Kilifi as a proven partner for the mariculture and other PURE projects in this prospectus.

2.4 Nakuru County

Nakuru County is located within the Great Rift Valley and had a population of 2,162,202 in 2019 (KNBS 2019). It is a major agricultural hub, renowned for its significant production of vegetables like kales, cabbages, and tomatoes, with cabbage production alone valued at KES 2,644 million in 2023.

Investing in Nakuru's agricultural sector means entering a mature and well-supported ecosystem. As one of the first counties in Kenya to develop a County Energy Plan (CEP), published in 2022, Nakuru demonstrates a proactive approach to energy planning. This is reinforced by the County Integrated Development Plan (CIDP) 2023-2027 and a robust Climate Change Action Plan (2023-2027), which guides sector priorities towards climate resilience. A key strategic goal is to enhance the adoption of green and clean energy, further signalling support for PURE initiatives.

Recognizing the vulnerability of its vegetable sector to climate impacts such as erratic rainfall, the county prioritizes sustainable irrigation methods and water harvesting, which are key applications for PURE technologies like solar water pumping. The county administration's focus is on helping farmers maximize productivity and profitability, a goal perfectly aligned with the PURE business case. Furthermore, Nakuru is well-served by financial institutions and benefits from high solar radiation (approx. 6 kWh/km^2/day), making it an ideal, low-risk environment for solar energy investments targeting the vegetable value chain.

2.5 Homa Bay County

Homa Bay County is located in South-Western Kenya along the shores of Lake Victoria and has a population of 1,131,950. The county's economy is anchored on its two greatest resources: the blue economy (fisheries and aquaculture) and agribusiness (vegetables, fruits, and edible oils). The county is actively unlocking and unleashing the development potential, as stated in its CIDP (2023-2027), by showcasing bankable opportunities at its Homa Bay International Investment Conference (HoBIIC). This development framework is highly focused on solving post-harvest losses.

For the blue economy, where Homa Bay leads the nation in fish catch, major investments are underway to build modern fish landing sites with cold storage units and processing plants, complemented by a bankable project for a USD 100 million Integrated Fish Processing Plant. In agribusiness, the county is tackling losses in its vegetable and fruit sectors through a proposed Integrated Fruits and Vegetables Processing Plant Project, which is supported by the Kimira Oluch Small Holder Farm Irrigation Project. This clear, policy-driven focus on building infrastructure for processing and cold chains, which are the primary applications for PURE, makes Homa Bay an ideal partner for the projects in this prospectus.

Methodology: A Data-Driven Approach to De-risking Investment

The investment opportunities presented in this prospectus were identified and vetted through a rigorous, multi-phase methodology designed to pinpoint high-impact projects and de-risk investment. This approach integrates top-down strategic analysis with bottom-up, field-based data collection and stakeholder engagement.

Phase 1: Value Chain Prioritization

The process began with a high-level, data-driven assessment to identify agricultural value chains with the greatest potential for transformative impact through PURE interventions. A multi-criteria framework was used, evaluating value chains against four key dimensions: economic impact (commercial viability, scalability), social impact (livelihood improvement, gender equity), environmental impact (emissions reduction), and energy requirements.

This analysis, which cross-referenced national and county priorities, resulted in the selection of the following high-impact value chains: Milk (Dairy), Mangoes, vegetables, Pigeon peas, French beans, Fish & tomatoes.

Phase 2: County Selection, Stakeholder Engagement, and Project Identification

Following the selection of priority value chains, the team identified the five counties with high production volumes and a significant need for productive use of renewable energy. The selected counties are Nyandarua, Nakuru, Machakos, Kilifi, and Homa Bay. The process involved collaboration with sub-national governments and local agricultural officers. Through a series of workshops and meetings, the team aligned on local priorities, agricultural value chains, and jointly identified a long list of promising cooperatives, farmer groups, and private enterprises that formed the basis for on-the-ground assessment.

Phase 3: Granular Data Collection and Vetting

Each potential project underwent an in-depth due diligence process. A project team conducted field visits to at least 15 promising cooperatives, farmer groups, or enterprises in each county. Data was collected using digital mobile-based surveys, capturing detailed information on:

- Group/business structure, membership, and gender (GESI) data.
- Current production volumes, post-harvest losses, and revenues.
- Existing energy sources and monthly energy costs (grid, diesel, petrol).
- Key operational challenges and specific PURE needs (e.g., cooling capacity, water demand).
- Market access and existing off-taker relationships.

Phase 4: Technical Sizing and Financial Modeling

The collected data was analysed and a shortlist of 20 most promising projects was prepared. The field data was used to develop a specific, viable investment case for each shortlisted project. This involved detailed technical and financial analysis, including:

- **Energy System Sizing:** Calculating the precise energy requirements for proposed solutions, such as sizing a solar PV system (kWp) to power a cold room or a solar irrigation pump.
- **Financial Analysis:** Estimating the total investment cost (CAPEX), projecting the annual energy and operational savings (OPEX), and calculating key financial metrics like the simple payback period and Return on Investment (ROI) to demonstrate commercial viability.

Phase 5: Geospatial Analysis with the Energy Access Explorer (EAE)

Finally, the 20 vetted projects were integrated into the Energy Access Explorer (EAE), a geospatial platform, to analyze the viability of the surrounding ecosystem. By overlaying project locations with key datasets, we could assess each project's potential for success and identify geographic risks.

Integration of Investment Prospectus Projects into the Energy Access Explorer (EAE)

World Resources Institute has developed the EAE tool for various geographies across Sub-Saharan Africa, Nepal, and India. The EAE is the first open-source, online, and interactive geospatial platform that enables energy planners, clean energy entrepreneurs, donors, and development institutions to identify high-priority areas for energy access interventions. It enables stakeholders to visualise and analyse high-priority areas where access to energy should be expanded for equitable development.

Data Collection

The process of integrating high-impact, high-potential projects into the EAE (Kenya) began with developing detailed questionnaires for projects across various agriculture value chains in the different counties in Kenya, which have the highest potential for economic, social, and environmental benefits and require energy to

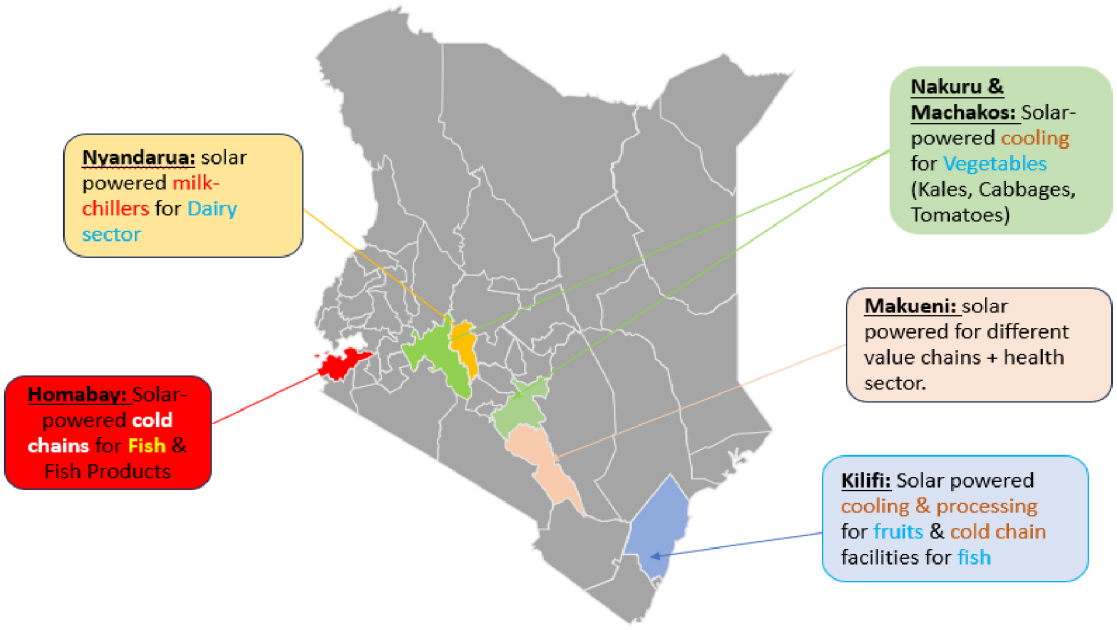


Fig. 1: Map showing different agriculture value chains covered in the selected counties for the project

These questionnaires covered specific information on the projects, including ownership, membership size, types of products handled, market accessibility, total outputs or yield, income generated, energy-dependent appliances, and proposed electrification solutions that would improve productivity, annual energy requirements, and proposed financing models, among others.

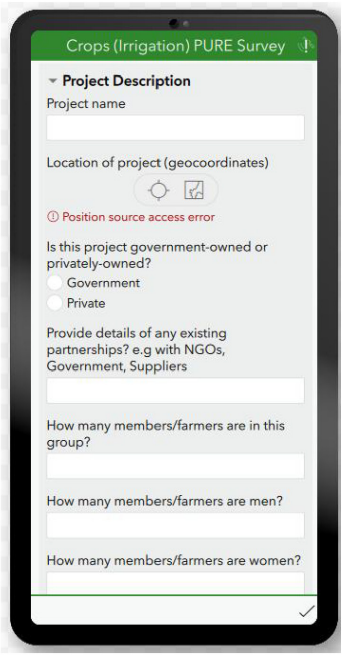
Figure 2 below shows a sample of these questionnaires.

1	PROJECT DESCRIPTIONS (Irrigation)	
2	Project name and location (geocoordinates)	
3	Government-owned or privately-owned?	Govt
4	Details of any existing partnerships? e.g with NGOs, Government, Suppliers	
5	How many members/farmers are in this group?	
6	how many members/farmers are men, women, youth, PLWD etc	
7	What is the value chain/products handled	Fish,
8	What is the average distance from the farm to market and back	KM
9	Are you organised in a group or cooperative	
10	What are your greatest needs in this project(s)?	Cooling
11	CROPS_ IRRIGATION (PRODUCTION)	
12	Type of general crops grown (e.g cereals, legumes, vegetables,etc	
13	List the specific crops grown	
14	Food or cash crops	Cash
15	Growing pattern (how many times a year is the crop grown)	
16	Growing cycles (how many months does a growing cycle take?)	
17	Area climate (take to EAE, check with Kenya Metrological Department Makueni)	
18	Number of acres each farmer has on average now?	
19	Number of acres each farmer intens to have in the future?	
20	Land ownership	male, female, govt, p

... Irrigation | Cold Storage-Crop | Cold Storage_Fish | Fish_Production | Green Grams Value Chain | ...

Fig. 2: Questionnaires used to interview various projects across different agriculture value chains in the different counties

The questionnaires were then converted into digital mobile-based surveys for use by the project teams during field interviews. The intuitive and responsive design of the digital surveys streamlined data collection while incorporating validation constraints to minimize entry errors. Additionally, the digital surveys enabled the



ı project, facilitating seamless integration into the EAE.

Fig. 3: Interphase of the digital mobile-based survey used for one of the questionnaires for the interviews of the project owners and members.

Analysis and Integration of Collected Data into the EAE

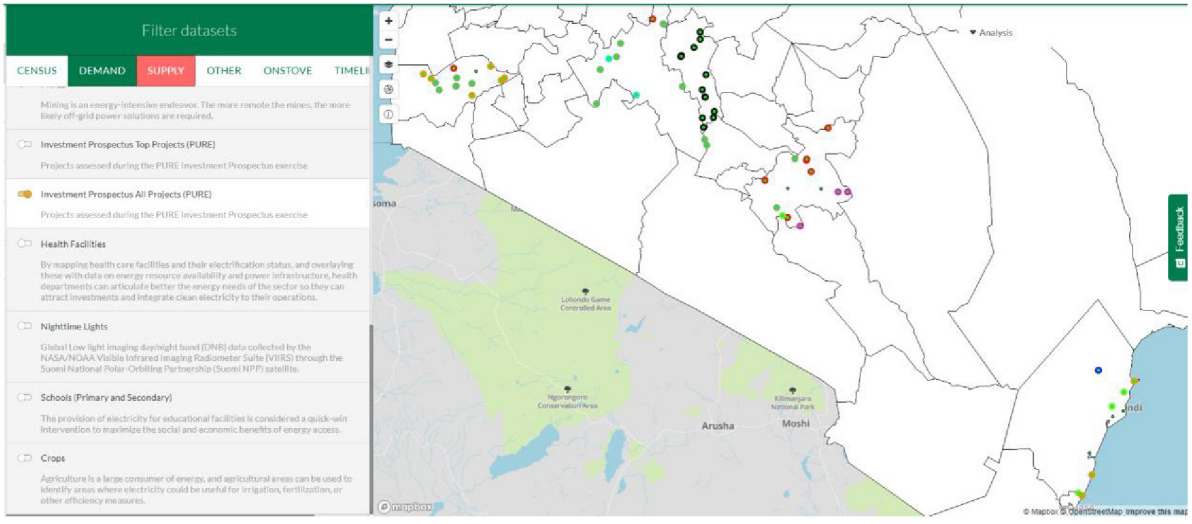
After data collection, the project team analyzed the responses to extract key project attributes that could easily categorize the projects based on their value chains, energy requirements, energy challenges, proposed energy solutions, costs, and GPS coordinates for integration into the EAE.
The figure below presents a selection of the top projects analyzed for integration into the EAE. These projects subsequently formed the basis for the Investment Prospectus to provide investors with a clear guide to high-

	A	B	C	D	E	F	G	H	I	J	K	L
1	Project	Value Chains	Main VCs	Annual Revenue USD	Members and Beneficiaries	Business Info	Daily Energy Consumption kWh	Energy Challenges	Proposed Solution	Financial Analysis	Long	Lat
2	The Crab Shack	Fish	Fish	77,000	200+ community members. 1,000 customers daily	Crab mariculture operation with 50+ cage systems	83.3	High monthly electricity costs. Unreliable grid electricity requiring backup generation	10kW Grid-Tied Solar System. Generating 52.13 kWh daily (more than 50% of energy needs)	Total system cost: $11,280 Annual energy savings: $3,088 Simple payback period: 3.7 years	39.98904	-3.34524
3	Malindi Natural Juice Processors Ltd	Mangoes	Mangoes		364+ farmers, 12,000 potential beneficiaries	Mango pulp processing line (25MT/day) forlocal & regional markets.	1,478.40	High monthly electricity costs. Unreliable grid electricity requiring backup generation	80kW Grid-TiedSolar System. Daily solar contribution: 443.52 kWh daily (30% of energy needs)	Total system cost: $90,240. Annual energy savings: $24,707 (KPLC cost offset). Simple payback period: 3.7 years	40.11279	-3.22303
4	Mau Horticultural Farmers' Society Ltd	Carrots, Irish potatoes, vegetables and maize.	Carrots		200 members	Exports 40 tonnes of carrots daily.		High Water Pumping Costs, Significant Post-Harvest Losses: 15% of the entire harvest is lost and Manual Operations.	Solar-Powered Carrot Washing: Install two automated,solar-powered washing machines to increase throughput andreduce manual labor. Sustainable Water	Solar Washing Machines: $29,300. Borehole & Solar Pump: $24,346.16. Total = $ 53,646. Revenues = $ 4,615.38 per month. Simple payback = 1 year.	36.00079	-0.592
5	The Nyaroya Irrigation Scheme	Kales plus mixed cropping	Kales		153 members	CBO. Carry out mixed cropping with Kales as the maincrop.		Lack of functional water abstraction system from the lakemaking the farmers to use petrol pumps. Energy costs associated with irrigation is high. ApproxKsh.840,000. Post-harvest losses (about	Irrigation systemfor 200 acres, 10T Cold Room and Solar Dyer (Medium size to handle 1-1.5 tonnes per week). Storage.	Investment requirements USD 415,700. (KES 53.21 million) for irrigation system, cold storage and solar dyer. Capacity to generate net income of KES	34.30628	-0.48887
6	Tulaga Farmers Cooperative Society	Dairy	Dairy	3.13 Million	3,500 total members, with3000 active producers (1,560 men, 1,440 women,480 youth, 20 PWDs).	Dairy Enterprise: Evolved from milk collection to milk value-addition.	499	High monthly energy costs. Unreliable grid electricity supply.	40 kWp Solar PV System	Total System Cost: $45,120. Equivalent in KSh: 5,865,000 (at an exchange rate of 130 KSh/USD). Projected Returns: Expected	36.57975	-0.60956

Fig. 4: Analyzed outputs of top projects after data collection for integration into the EAE.
After analyzing the collected data, it was then processed and harmonized to meet the required standards before integration into the EAE. This involved data conversion into GeoJSON format suitable for web applications. Additional data processing was carried out through the automated data processing functionalities of the EAE during upload, such as assigning the correct coordinate system to match other datasets in the EAE, clipping it to extract only the datasets within the country boundaries, and ensuring the data is within the platform's correct resolution of 1km2.

For this project, a consolidated data list of all the projects across the five counties was added to the EAE version of Kenya.

In addition, a county-specific EAE version for each county involved was also created to host only county-specific datasets, extracted from the main EAE version of Kenya. This included, but was not limited to, location-specific resource availability and infrastructure data to represent energy supply, demographic data, and data on social and productive uses of energy to visualize demand for energy services.



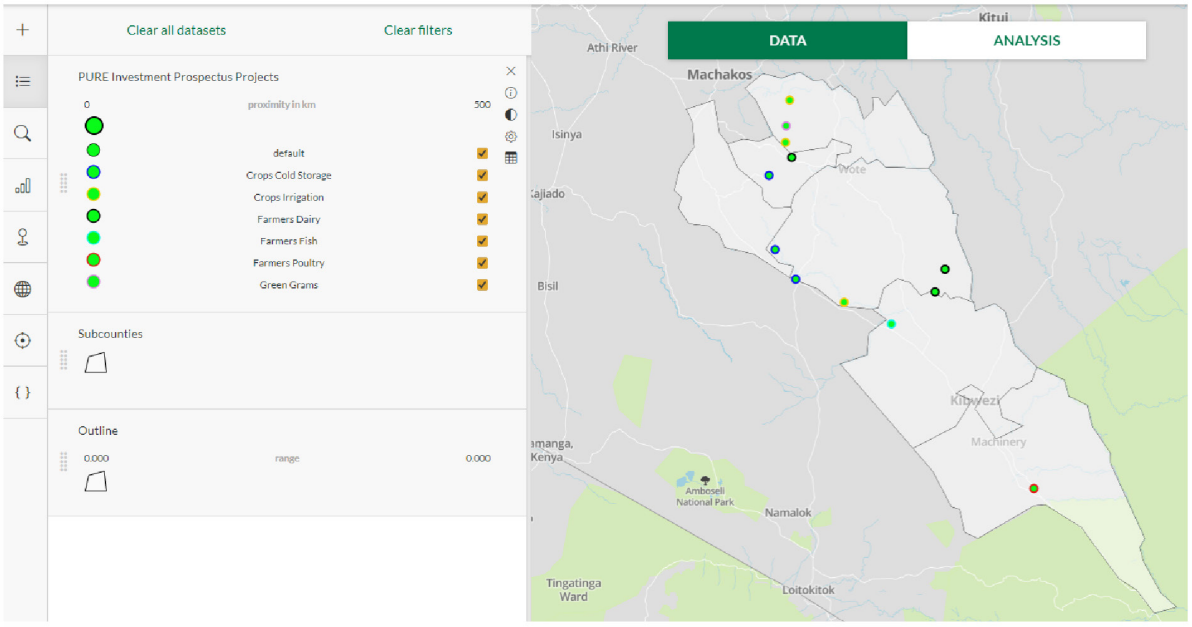


Fig. 6: Investment prospectus projects for one of the counties (Makueni) uploaded into the county-specific version of the EAE

Sample analysis done in the EAE using the uploaded investment prospectus projects

Building on EAE's multi-criteria decision analytical algorithm, users can also carry out custom analysis, which will allow stakeholders (county government, Productive Use of Renewable Energy (PURE) financiers, technology providers, etc.) to identify priority areas/projects for PURE interventions based on a list of criteria.

Such criteria could include geographic information on the selected projects proximity to or accessibility to markets, existing agricultural activity near the projects, population density & distribution, wealth index (or similar income level indicators or asset ownership), renewable energy potential in the project area, proposed technology costs and others which can be found in datasets already available in the EAE or can be uploaded into the EAE from other sources.

By incorporating these into a multi-criteria analysis alongside the projects uploaded into the EAE, investors or other PURE stakeholders can evaluate the geographic viability of these projects and be able to simulate which projects are more investment-ready based on their proximity to the supportive ecosystems, thereby reducing risk and improving the likelihood of success.

The figure below provides an example of a multi-criteria analysis conducted on projects in Makueni County alongside other geographic datasets on the supporting ecosystem.

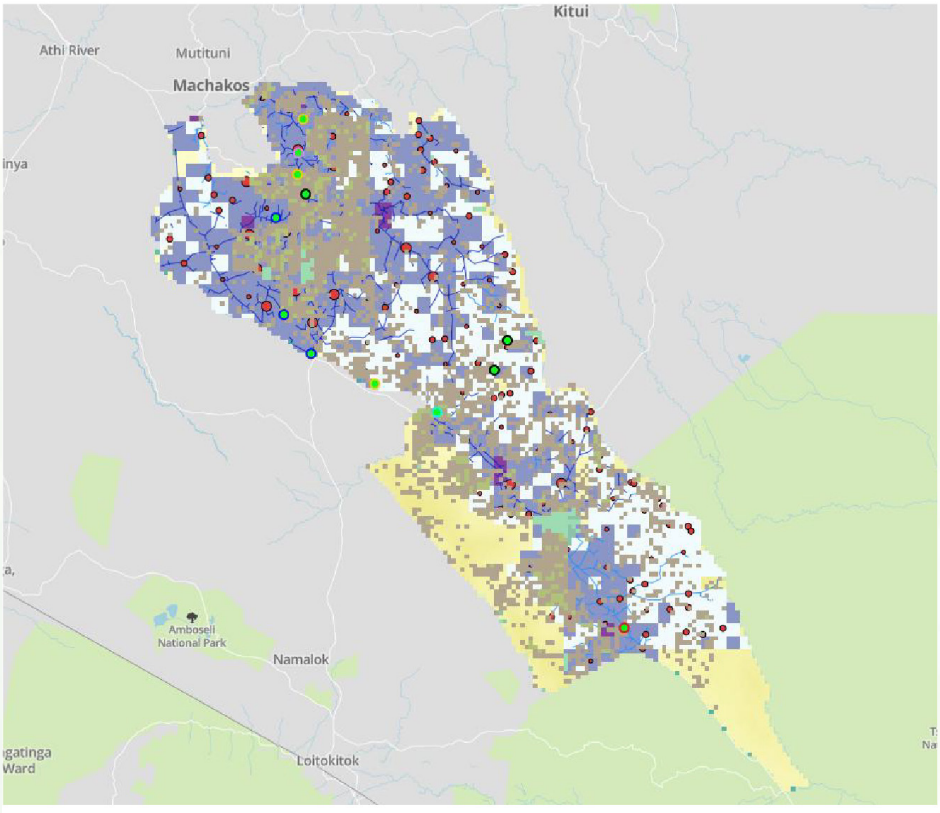


Fig. 7: Investment prospectus projects from Makueni County loaded alongside other datasets, including population density, agriculture markets, croplands, relative wealth index, distribution lines, global horizontal irradiation, windspeed, accessibility to cities, and financial institutions to be used in a multi-criteria analysis to explore the geographic viability of these projects.

The table below lists the datasets used in multi-criteria analysis to explore the geographic viability of the agricultural projects in Makueni County, and the filters applied to them.

Table. 1: List of datasets used in the multi-criteria analysis to explore the geographic viability of the agriculture projects in Makueni County

Dataset	Filters Used
Investment Prospectus Projects in Agriculture	Filter map to retain areas less than 2km proximity to these projects
Population Density	
Relative Wealth Index	Filter map to retain project areas with populations close to or above the average household wealth in Makueni (likely able to pay for proposed solutions)
Agriculture Markets	Project areas less than 5km to agriculture markets (to show existing markets for produce and reduced costs of transportation)
Existing Croplands	Useful to check proximity to projects requiring inputs from farms (agro-processing) or requiring energy appliances for the farms to increase productivity
Distribution Lines	To filter projects within 5km proximity to existing distribution lines to check which ones already have access to electricity from the grid, or would not be too expensive to connect to the grid
Global Horizontal Irradiation	To filter project areas with good solar potential, greater than 1,800 kWh/m2, for those that have been proposed for electrification with solar or to use appliances using solar
Windspeed	To filter project areas with good wind speed, greater than 5m/s, to illustrate areas that could also use wind as a potential electrification supply option
Accessibility to cities	To filter project areas where access to the nearest city or populated place is less than 90 minutes. This illustrates potential for access to supplies for the project, ease of maintenance of appliances, and access to markets.
Financial Institutions	To filter project areas where proximity to financial institutions is less than 15 km. This illustrates potential ease of access to potential financiers for utions and appliances.

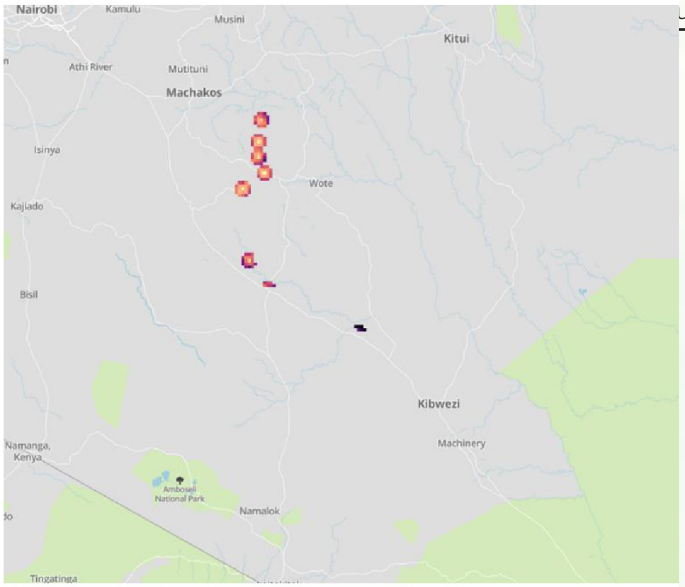


Fig. 8: Analysis output showing the locations of the projects in Makueni County that met the geographic analysis criteria used. 8 out of 15 projects meet defined geographic criteria to show they have a supporting

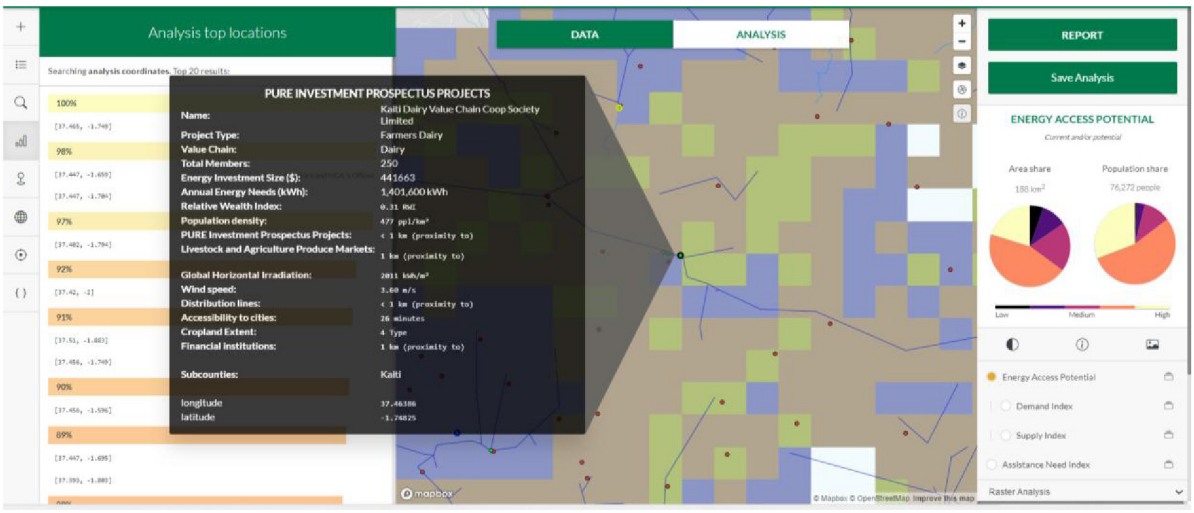


Fig. 9: One of the top 8 project locations identified from this analysis, with a pop-up showing reasons why it met the defined geographic criteria

As has been highlighted, EAE can support investment decision-making by identifying the most viable PURE project to implement, based on their geographic proximity to other supporting factors, such as markets, finance, energy resources, among others. Such analysis can help to de-risk investments by pre-screening critical factors that influence project success prior to implementation. It is also important to note that the example analysis illustrated here can be modified by adding or removing datasets, or changing some of the filters used as per the need or interest of the investor.

3.0 Investment Projects Portfolio

This section presents the detailed investment opportunities. The following project profiles are based on field visits and data collection, outlining the business case, energy needs, financial requirements, and potential impact for each enterprise.

Ol Kalau Dairy Cooperative Society

Project at a Glance:

- **Lead Contact:** General Manager
- **Value Chain:** Dairy (Milk Collection, Cooling, and Processing)
- **Key Need:** Reduce high electricity and fuel costs; acquire a long-life milk processing machine to meet market demands.
- **Investment Ask:** $59,220
- **Payback Period:** 3.07 years

Project Description:

Established in 2002, this cooperative is a key player in the region with 2,400 active members, including 913 women and 118 youth. The society collects 19,500 litres of milk daily and produces pasteurized milk, yogurt, and fermented milk. With a cooling capacity of 80,000 litres, the facility faces high energy costs, spending up to KES 700,000 per month on grid electricity and 80 litres of diesel per week for its backup generator. The cooperative has identified a critical need to solarize its operations to mitigate these costs and is also planning



Investment Needs

The cooperative has identified several needs to enhance its operations and profitability. Broader requirements include the acquisition of a long-life milk machine, a new batch pasteurizer, and a modern yogurt machine to meet evolving market demands. Additionally, they require transport vehicles and comprehensive training for members on feeding practices, financial literacy, and farming as a business.

The most immediate and financially impactful need is the solarization of their operations to address the high and volatile cost of energy.

Energy System Sizing and Calculations:

The proposed system is sized to meet a significant portion of the plant's energy demand, based on the following detailed calculations:

- **Annual Energy Consumption:** The plant consumes 235,356 kWh per year from the grid.
- **Target Solar Contribution:** The goal is for solar to provide 32.9% of the total energy consumed.
- **Required Annual Solar Generation:** This requires an annual solar energy generation of 77,499 kWh
- **Daily Solar Generation Target:** The system must generate an average of 212.33 kWh per day (77,499 kWh / 365 days).

    - ☑ **System Size (kWp) Calculation:** Based on an average of 4.04 peak sun hours (PSH) per day in the location, the final recommended system size is 212.33 kWh / 4.04 PSH = 52.5 kWp.

Financial Analysis:

Investment Cost Analysis:

- The total investment cost of $59,220 is based on the system size and an estimated cost of $1,128 per kWp.
- Calculation (USD): 52.5 kWp * $1,128 / kWp = $59,220.
- Calculation (KSh): Using an exchange rate of 130 KSh/USD, the total cost is KSh 7,698,600.

Financial Returns Analysis:

- **Annual Energy Savings:** Based on an electricity cost of KSh 32.37 per kWh, the projected annual savings are KSh 2,509,641.
- **Calculation:** 77,499 kWh/year * KSh 32.37/kWh = KSh 2,509,641.63.
- **Simple Payback Period:** The time to recoup the initial investment is 3.07 years.
- **Calculation:** KSh 7,698,600 / KSh 2,509,641 per year = 3.07 years.

Project Impact:

- **Environmental Impact:** Reduces reliance on the grid and consumption of diesel, lowering the cooperative's carbon footprint.
- **Social Impact:**

    - ☑ **Job Creation:** The cooperative has created 390 direct jobs in the community.
    - ☑ **Community & Livelihoods:** Reduced production costs will enable better prices for its 2,400 farmer members, directly increasing their household incomes. It also provides productive engagement opportunities for youth in the dairy sector.

Proposed Investment Structure:

- **Models:** Energy-as-a-Service with a savings-based repayment plan.

Nyala Multipurpose Co-operative Society

Project at a Glance:

- **Location:** Nyandarua County.
- **Lead Contact:** General Manager
- **Value Chain:** Dairy (Milk Collection, Processing) and Animal Feeds
- **Key Need:** Reduce extreme energy costs, secure a reliable water source through a borehole, and acquire a complete yogurt processing line.
- **Investment Ask:** $152,280
- **Payback Period:** 2.08 years

Project Description:

Established in 2002, Nyala is a large and diversified cooperative with 9,496 members, including over 2,100 women and nearly 900 youth. The society collects over 90,000 litres of milk daily across five collection points. It processes pasteurized milk and yogurt and is involved in fodder cropping and feed sales. Energy is a major operational challenge, with monthly grid electricity bills reaching KSh 1.5 million and generator fuel costs adding another KSh 400,000. Power surges frequently damage machinery, and daily milk wastage can be as high as 1,000 litres.

Investment Needs:

The cooperative requires investment across several areas to support its large-scale operations. This includes acquiring a long-life milk machine, a complete yogurt processing line (cup filler), and a separator machine to produce high-value products like butter and ghee. A high-priority need is the drilling of a borehole to secure a reliable water source and reduce reliance on expensive municipal water.

The most pressing need is to address energy costs through the solarization of its main processing facility.

Energy System Sizing and Calculations:

The proposed 135 kWp system is designed to significantly offset the facility's high energy consumption, based on the following:

- **Annual Energy Consumption:** The facility's estimated annual grid energy consumption is 600,000 kWh.
- **Target Solar Contribution:** The solar system is designed to contribute 35% of the total energy needs.
- **Required Annual Solar Generation:** This equates to a required annual solar generation of 235,658 kWh.
- **Daily Solar Generation Target:** The system must generate an average of 645.6 kWh per day (235,658 kWh / 365 days).
- **System Size (kWp) Calculation:** Using an average of 4.8 peak sun hours (PSH) per day, the final recommended system size is 645.6 kWh / 4.8 PSH = 134.5 kWp, which is rounded up to a 135 kWp system.

Financial Analysis:

Investment Cost Analysis:

- The total investment cost of $152,280 is based on the system size and an estimated cost of $1,128 per kWp.
- **Calculation (USD):** 135 kWp * $1,128 / kWp = $152,280.
- **Calculation (KSh):** Using an exchange rate of 130 KSh/USD, the total cost is KSh 19,796,400.

Financial Returns Analysis:

- **Annual Energy Savings:** Based on an assumed electricity tariff of KSh 30 per kWh, the projected annual savings are KSh 7,069,740.
- **Simple Payback Period:** The time to recoup the initial investment is 2.08 years.

Project Impact:

- **Environmental Impact:** Significantly reduces dependence on the electricity grid and fossil fuels, lowering the carbon footprint of a large-scale agricultural operation.
- **Social Impact:**
  - ☑ **Job Creation:** Provides direct and indirect employment opportunities for a large community and supports youth engagement in technical machine operations.
  - ☑ **Community & Livelihoods:** Increased profitability from energy savings and value addition allows for better milk prices for its 9,496 members, enhancing rural incomes and economic stability.

Proposed Investment Structure:

- **Models:** Loans using the Cooperative asset ownership with revenue from off-takers providing backing. Also, a lease-to-own model could be explored.

Tulaga Dairy Cooperative Society

Project at a Glance:

- **Location:** Nyandarua County.
- **Lead Contact:** Geoffrey Moko (Chairman) or Joram Gitonga (Manager)
- **Value Chain:** Dairy (Milk Collection, Processing) and Animal Feeds
- **Key Need:** Expand solar capacity to further reduce high energy costs, upgrade pasteurizer and yogurt lines, and diversify into higher-value products like ghee and butter.
- **Investment Ask:** $45,120
- **Payback Period:** 3.02 years

Project Description:

With a history dating back to 1964, Tulaga Dairy is a well-established cooperative with **3,500 members** (1,680 of whom are women) and 50 staff. The society handles **22,500 litres of milk daily** and has successfully diversified into yogurt processing, animal feed manufacturing, and financial services through its own SACCO. Despite having an existing 15 kWp solar system that saves KSh 100,000-120,000 monthly, high electricity costs remain a key challenge. The cooperative seeks to expand its solar infrastructure and upgrade its processing capabilities to improve margins and meet growing demand.

Investment Needs:

Tulaga's investment priorities are focused on scaling its successful value-addition model. This includes upgrading its batch pasteurizer to a 7,000-liter capacity, expanding the yogurt processing line, and diversifying into higher-value products like ghee and butter. An IT system upgrade and land acquisition for future expansion are also planned.

To support this growth, the immediate investment focus is on further solarization to reduce the current high dependence on grid electricity.

Energy System Sizing and Calculations:

The proposed 40 kWp system is an expansion of their existing solar capacity, based on the following analysis:

- **Current Annual Grid Consumption:** Despite the existing 15 kWp system, the cooperative still consumes 179,772 kWh per year from the grid.
- **Target Additional Solar Contribution:** The new system aims to cover an additional 37% of the current grid consumption.
- **Required Additional Solar Generation:** This requires an additional annual solar energy generation of 66,469 kWh.
- **Daily Solar Generation Target:** The new system must generate an average of 182.1 kWh per day (66,469 kWh / 365 days).
- **System Size (kWp) Calculation:** Based on an average of 4.6 peak sun hours (PSH) per day, the final recommended system size is calculated as follows:

    - ☑ **Formula:** System Size (kWp) = Daily Generation Target (kWh) / Peak Sun Hours
    - ☑ **Calculation:** 182.1 kWh / 4.6 PSH = 39.6 kWp, which is rounded up to a 40 kWp system for design purposes.

Financial Analysis:

Investment Cost Analysis:

- The total investment of $45,120 is based on the system size and an estimated cost of $1,128 per kWp.
- **Calculation (USD):** 40 kWp * $1,128 / kWp = $45,120.
- **Calculation (KSh):** Using an exchange rate of 130 KSh/USD, the total cost is KSh 5,865,600.

Financial Returns Analysis:

- Simple Payback Period is based on energy savings, and the time to recoup the investment is 3.02 years.

Project Impact:

- **Environmental Impact:** Further decreases reliance on the electrical grid, enhancing the cooperative's commitment to sustainable energy.
- **Social Impact:**

    - ☑ **Community & Livelihoods:** Strengthens a diverse business model that provides its 3,500 members with multiple income streams, financial services, training, and even health insurance support.
    - ☑ **Value Addition:** Increased processing capacity for higher-value products will directly translate to better profit margins and higher payments to farmers, for whom dairy provides an estimated 70% of their income.

Proposed Investment Structure:

- **Models:** Joint ventures for a phased expansion approach.
- **Instruments:** Blended finance structure with 50% commercial debt, 25% grant-based technical assistance, and 25% cooperative equity.

Taunet Women Group

Project at a Glance:

- **Location:** Solai, Nakuru County.
- **Lead Contact:** Nancy Barno
- **Value Chain:** Horticulture (Tomatoes)
- **Key Need:** Expansion of greenhouse farming capacity for all members, including individual water and solar irrigation systems.
- **Investment Ask:** KSh 5,610,000
- **Payback Period:** N/A (Returns are realized at the individual member level)

Project Description:

Established in October 2018, Taunet Women Group is a self-help group of **11 members**, predominantly women, specializing in organic greenhouse tomato cultivation. The group focuses on high-quality production with minimal chemical inputs, growing determinate tomato varieties such as Anna F1 and Salina. They currently use a solar-powered drip irrigation system to draw water from a 9-meter borehole, but face challenges with water salinity and limited access to capital for expansion. The group sells 100% of its produce to local markets through an aggregator. The main risks include pests and diseases such as bacterial wilt, market price fluctuations, and post-harvest losses.



Taunet women group

Investment Needs

The group's primary goal is to empower each of its 11 members to operate their own sustainable greenhouse, which requires a comprehensive investment in individual farming units. The broad needs include the construction of new greenhouses, the development of shallow wells for each unit, and the installation of dedicated solar-powered irrigation systems. Additional needs include agricultural equipment like knapsack sprayers and tools for tomato grafting to combat soil-borne diseases.

Energy System Sizing and Calculations:

- The investment is for 11 individual PURE solar irrigation systems, each designed to serve one 8x24m greenhouse. Each system includes:
  - ☑ **Solar Water Pump:** A 0.25 kW - 0.37 kW DC solar submersible pump.
  - ☑ **Solar PV Panels:** A 450Wp - 500Wp solar array.

- ☑ **Balance of System (BoS):** Includes a charge controller, wiring, and mounting structures.
- ☑ **Water Storage Tank:** A 2,000-liter plastic tank.

Financial Analysis:

Investment Cost Analysis:

- The total investment cost of **KSh 5,610,000** is the sum of three main components.
- **Greenhouse Units Cost Calculation:** 11 units * KSh 350,000/unit = **KSh 3,850,000.**
- **Shallow Well Development Cost Calculation:** 11 wells * KSh 60,000/well = **KSh 660,000.**
- **PURE Solar Irrigation Systems Cost Calculation:** 11 systems * KSh 100,000/system = **KSh 1,100,000.**
- **Total Investment Calculation:** KSh 3,850,000 + KSh 660,000 + KSh 1,100,000 = **KSh 5,610,000.**

Financial Returns Analysis:

- Individual members will realize financial returns through the sale of tomatoes, with a variation based on yield and market conditions. The average selling price is KSh 1,000 per crate.

Project Impact:

- **Environmental Impact:** Promotes water conservation through efficient drip irrigation and utilizes clean solar energy for water pumping, ultimately reducing the carbon footprint.
- Social Impact:
  - ☑ **Job Creation:** Creates **11 direct jobs** for the women members and additional seasonal labor opportunities.
  - ☑ **Community & Livelihoods:** A significant increase in the income of the smallholder farmer members, promoting financial independence and stability for their households.

Proposed Investment Structure:

- **Models:** Lease-to-Own, with the women's group providing a guarantee.

Mau Horticultural Farmers' Co-operative Society Ltd.

Project at a Glance:

- **Location:** Mau Narok, Nakuru County.
- **Lead Contact:** Michael (Chairman)
- **Value Chain:** Horticulture (Carrots)
- **Key Need:** Mechanize the carrot washing process with solar-powered machines and secure a permanent, low-cost water source with a solar-powered borehole.
- **Investment Ask:** $53,646.16
- **Payback Period:** 1 year

Project Description:

Registered in 2015, this cooperative has **200 members** and is a major producer of carrots for the export market in Eastern Africa. The cooperative manages approximately **1,200 acres** under carrot cultivation, handling large volumes of up to 40 tonnes daily. The current washing process is manual, and water is pumped from a river using a 5.5 HP pump at KSh 4,000 per day, which is costly. Key risks include post-harvest losses estimated at 15%, fluctuating prices, and the potential loss of jobs if operations are mechanized without a just transition plan.



Current carrot washing bay

Investment Needs

The cooperative's investment needs focus on improving efficiency, reducing operational costs, and enhancing working conditions. The main requirements are **two solar-powered carrot washing machines** to mechanize the cleaning process and a permanent water solution, including a borehole with solar pumps, to eliminate the daily cost of pumping from the river. Other needs include cold storage, structures to provide shade for workers, and training on the safe handling of pesticides.

Energy System Sizing and Calculations:

- **Solar Washing Machines:** The investment includes two motorised rotary drum washing machines, each powered by a 5hp electric motor, integrated with a solar power system.
- **Borehole Solar Pump:** The borehole, estimated at a depth of 200m, will be equipped with a suitably sized solar pump to meet the daily water demand for washing 40 tonnes of carrots.

Financial Analysis:

Investment Cost Analysis:

- The total investment cost is **$53,646.16.**
- Solar Powered Washing Machines: 2 units * $14,650/unit = **$29,300.**
- Borehole Development and Solar Pump: The total cost for the complete water solution is **$24,346.16.**
- Total Investment Calculation: $29,300 + $24,346.16 = **$53,646.16.**

Financial Returns Analysis:

- **Simple Payback Period:** The time to recoup the investment is approximately 1 year.
- **Monthly Repayment Calculation:** Based on allocating KSh 0.5 per kg sold, the monthly repayment capacity is calculated as: (KSh 0.5/kg * 40,000 kg/day * 30 days/month) / 130 KSh/USD = **$4,615.38** per month.
- **Payback Period Calculation:** $53,646.16 / $4,615.38 per month = **11.62 months.**

Project Impact:

- **Environmental Impact:** Replaces fossil fuel-powered water pumping with a solar-powered borehole, thus reducing carbon emissions.
- **Social Impact:**
  - ☑ **Job Creation:** The project supports 59 direct jobs per acre and has stabilized the local economy.
  - ☑ **Community & Livelihoods:** Increased efficiency and reduced costs lead to higher income for the 200 members. The investment also provides a safer and more hygienic working environment for those washing the carrots.

Proposed Investment Structure:

- **Models:** Cooperative asset ownership with backing from export revenue.

Limelight Regenerative Agriculture

Project at a Glance:

- **Location:** Nakuru County.
- **Lead Contact:** Albert Ngure (Chairman)
- **Value Chain:** Horticulture (French Beans)
- **Key Need:** A permanent water solution (solar-powered borehole) and a joint cold storage facility to reduce post-harvest losses and mitigate risks from a seasonal river.
- Investment Ask: $38,196.16
- **Payback Period:** 4.32 years

Project Description:

Limelight is a farmers' group with **20 members** (including 8 women and 2 youth) that grows French beans on 10 acres of land for export to markets in Germany, the UK, and India. The group currently relies on petrol-powered pumps to draw water from a seasonal river, which is expensive (KSh 2,000/acre/week) and poses a significant risk to their operations. Other challenges include daily power blackouts that can last up to two weeks and high



Members of Limelight regenerative Agriculture with the team

Investment Needs

The group's most critical need is a reliable and permanent **water solution**, which includes a borehole, piping, a solar pumping system, and storage tanks. This would eliminate their dependence on the seasonal river and reduce the high fuel costs. A **joint cold storage solution** is also a high priority to reduce wastage and give them more flexibility in harvesting, especially when labor is limited. Other needs include mechanization for planting and value-addition capabilities like packaging.

Energy System Sizing and Calculations:

- **Borehole Solar Pump:** The investment includes costs for drilling a 200m borehole and equipping it with a solar pump and a 10,000L storage tank.
- **Cold Storage:** The proposed cold room has a capacity of 2.5 to 10 tons, powered by a dedicated solar system.

Financial Analysis:

Investment Cost Analysis:

- **The total investment:** $38,196.16.
- **Cold Storage Facility:** The machine cost is $13,850.
- **Borehole and Solar Pump:** The total cost of the water solution is $24,346.16.
- **Total Investment Calculation:** $13,850 + $24,346.16 = $38,196.16.

Financial Returns Analysis:

- **Simple Payback Period:** The time to recoup the investment is 4.32 years.
- **Monthly Repayment Calculation:** Based on allocating KSh 3 per kg sold, the monthly repayment capacity is calculated from a net monthly harvest of 31.92 tonnes: (KSh 3/kg * 31,920 kg/month) / 130 KSh/USD = $736.62 per month.
- **Payback Period Calculation:** $38,196.16 / $736.62 per month = 51.85 months, which equals 4.32 years.

Project Impact:

- **Environmental Impact:** Replaces petrol-powered pumps with a solar borehole system, eliminating fuel consumption and associated emissions.
- **Social Impact:**
  - ☑ **Job Creation:** The project has the potential to create 86 jobs per acre.
  - ☑ **Community & Livelihoods:** Increased income stability and production quality, leading to better quality of life for the 20 members and their families, and strengthening their position in the export market.

Proposed Investment Structure:

- **Models:** Group asset sharing with an export off-taker agreement.

Belacom Organic Farmers

Project at a Glance:

- **Location:** Nakuru County.
- **Lead Contact:** Beatrice (Chairlady)
- **Value Chain:** Horticulture (Indigenous Vegetables)
- **Key Need:** A reliable water solution (rainwater harvesting tanks) and additional solar dryers to support their 100% organic farming model.
- **Investment Ask:** $75,773.90
- **Payback Period:** N/A (Investment is for capacity building and infrastructure)

Project Description:

Belacom is a farmer group of **33 members** (18 women and 15 youth), practicing **100% organic farming** of indigenous vegetables like *managu* and *terere*. They maximize their small plots by using modern methods like vertical gardens and sell their produce to local markets, schools, and an aggregation center. The group's main challenge is inadequate water supply, as they rely solely on rainwater harvesting and have limited storage capacity. They also have only one solar dryer, which is shared among all members, limiting their ability to add



Belacom vertical gardens

Investment Needs

The group's needs focus on building resilient infrastructure to support their organic and water-conscious farming model. The most critical need is a **water solution**, specifically **99 large water storage tanks (10,000L each)** to maximize rainwater harvesting. They also require additional **solar dryers** for value addition and **shade nets** to protect their crops.

Energy System Sizing and Calculations:

- **Solar Dryers**: The investment includes a large solar dryer (16m x 15m), with a total cost including installation and VAT of $4,557.28.

Financial Analysis:

Investment Cost Analysis:

- The total investment cost is **$75,773.90.**
- **Water Storage Tanks Cost:** The cost of 99 tanks is **$69,908.85.**
- **Solar Dryers Cost: $4,557.28.**
- **Shade Nets (Grading Shades) Cost:** The cost of 10 rolls is **$1,307.77.**
- **Total Investment Calculation:** $69,908.85 + $4,557.28 + $1,307.77 = **$75,773.90.**

Financial Returns Analysis:

- This investment is primarily for capacity building and is not expected to have a direct, calculable payback period. The returns will be in the form of increased production, reduced crop failure, and higher-value products (dried vegetables).

Project Impact:

- **Environmental Impact:** Promotes a 100% organic farming system and water conservation through extensive rainwater harvesting. The use of solar dryers is a clean energy value-addition method.
- **Social Impact:**
  - ☑ **Job Creation:** Expected to create **4 direct and 20 indirect jobs.**
  - ☑ **Community & Livelihoods:** The investment will lead to increased production and income for the 33 members, particularly women and youth. It will also improve local nutrition by increasing the supply of organic indigenous vegetables and restoring dignity for members through productive engagement.

Proposed Investment Structure:

- **Models:** Grant-based technical assistance model to shift the group from a social enterprise to a commercially viable one.

Machakos County Projects

Goshen Farms Exporters Ltd

Project at a Glance:

- **Location:** Machakos County.
- **Lead Contact:** Management
- **Value Chain:** Horticulture (Dried Fruits)
- **Key Need:** Reduce energy costs and secure a reliable power supply by installing a solar PV system and a dedicated transformer.
- **Investment Ask:** $157,919.10
- **Payback Period:** 2.67 years

Project Description:

Established in 2010, Goshen Farms Exporters Ltd. focuses on exporting fresh and dried horticultural produce, such as mangoes, pineapples, and papayas, to the Middle East and Europe. The company is committed to empowering small-scale farmers through contractual farming, creating sustainable income and resilient markets. Their facility has a processing capacity of 10 MT/day and a cold storage capacity of 40 MT. The company faces high energy costs, with an average monthly electricity bill of KSh 150,000, and power-related le operations.



Dried mangoes (Source: Goshen Farm Exporters Ltd)

Investment Needs

The company's primary investment need is to gain energy independence and reduce its high operational costs. This will be achieved through the installation of a 1**35 kWp grid-tied solar PV system** and the acquisition of a **dedicated 25 KVA transformer.** This infrastructure is critical for powering their processing machinery and 40 MT cold storage unit reliably, thereby enhancing processing efficiency and supporting their network of over 1,000 contracted farmers.

Energy System Sizing and Calculations:

The investment is for a **135 kWp solar system** designed to offset a significant portion of the facility's electricity consumption.

Financial Analysis:

Investment Cost Analysis:

- The total investment cost is **$157,919.10.**
- **Solar PV System required: 135kWp** Cost per kW: **$1,128**[1]
- **Solar PV System Cost Calculation:** 135 kWp * $1,128/kWp = **$152,280.**
- **Dedicated Transformer Cost: $5,639.10.**
- **Total Investment Calculation:** $152,280 + $5,639.10 = $157,919.10.

Financial Returns Analysis:

- **Annual Energy Savings:** The projected annual savings from the solar installation are **$59,224.76.**
- **Simple Payback Period:** The time to recoup the investment is $157,919.10 / $59,224.76 per year = **2.67 years.**

1 https://www.epra.go.ke/sites/default/files/Documents/Revised_Final-Draft-Report_Net-Metering_Ver.2.pdf

Project Impact:

- **Environmental Impact:** The project will reduce the company's carbon footprint by generating clean solar energy and decreasing reliance on the grid.
- **Social Impact:**
  - ☑ **Job Creation:** Securing reliable power will ensure employment stability for the existing workforce and enable future expansion.
  - ☑ **Community & Livelihoods:** Enhanced procurement and processing capacity will support and provide stable incomes for over 1,000 contracted smallholder farmers across multiple counties.

Proposed Investment Structure:

- **Models:** Lease-to-Own with an energy service agreement.

Vert Ltd

Project at a Glance:

- **Location:** Machakos County.
- **Lead Contact:** Management
- **Value Chain:** Horticulture (Processing and Export)
- **Key Need:** Expand existing solar capacity to power a facility expansion and mitigate high and unpredictable electricity costs.
- **Investment Ask:** $231,239.10
- **Payback Period:** 2.64 years

Project Description:

Established in 2000, Vert Ltd is a leader in Kenya's horticulture industry, producing, processing, and exporting a wide range of products, including dried fruits, fruit purees, and fresh vegetables. The company is deeply integrated with the community, working with **more than 5,000 smallholder farmers across** 14 counties. During peak season, the company incurs monthly electricity bills ranging from **KSh 1.5 to 1.7 million** and employs over 100 permanent staff and 300-350 temporary employees (70% women). Vert Ltd already has a 183 kWp solar

ver its ongoing facility expansion.



Dried mango (Source: Vert Ltd)

Investment Needs

To support its significant expansion, Vert Ltd.'s primary investment need is to improve its energy infrastructure. The company plans to install an **additional 200 kWp grid-tied solar PV system** and acquire a **dedicated 25 KVA transformer.** This expansion is crucial for managing the high electricity costs associated with its large-scale processing, packaging, and cold storage operations, and for ensuring that the new facility can operate efficiently and sustainably.

Energy System Sizing and Calculations:

The investment is for an additional **200 kWp solar system** to complement their existing 183 kWp installation.

Financial Analysis:

Investment Cost Analysis:

- The total energy investment amount is **$231,239.10.**
- **Solar PV required:** 200kWp Cost per kWp: **$1,128**[2]
- **Solar PV System Cost Calculation:** 200 kWp * $1,128/kWp = **$225,600.**
- **Dedicated Transformer Cost: $5,639.10.**
- **Total Investment Calculation:** $225,600 + $5,639.10 = **$231,239.10.**

Financial Returns Analysis:

- **Annual Energy Savings:** The additional 200 kWp solar system is projected to generate annual savings of $87,740.38.
- **Simple Payback Period:** The time to recoup the investment is 2.64 years.
- **Calculation:** $231,239.10 / $87,740.38 per year = 2.64 years.

Project Impact:

- **Environmental Impact:** The additional solar capacity will significantly reduce the company's carbon footprint and reliance on grid power.
- **Social Impact:**
  - ☑ **Job Creation:** The investment sustains 100+ permanent jobs and 300-350 seasonal positions, of which 70% are held by women.
  - ☑ **Community & Livelihoods:** It strengthens the value chain for 5,000+ smallholder farmers by providing a ready market, ensuring fair prices, and improving rural incomes across 14 counties.

Proposed Investment Structure:

- **Models:** Build-Own-Operate-Transfer (BOOT) with an off-taker agreement.

Kabaa Irrigation Scheme

Project at a Glance:

- **Location:** Machakos County.
- **Lead Contact:** Ndinda (Chairman)
- **Value Chain:** Horticulture (Tomatoes)
- **Key Need:** Replace costly diesel generators with solar water pumps and establish cold storage to reduce high post-harvest losses.
- **Investment Ask:** $51,013
- **Payback Period:** 3.45 years

2 https://www.epra.go.ke/sites/default/files/Documents/Revised_Final-Draft-Report_Net-Metering_Ver.2.pdf

Project Description:

Started in 2018, the Kabaa Irrigation Scheme is a group of 31 farmers (including 15 women) who primarily cultivate tomatoes. A critical challenge is their reliance on diesel generators to irrigate their farms, with a 10hp pump costing about KSh 4,000 per week per acre to run. This high cost drains their profits. Furthermore, the group suffers from significant post-harvest losses, estimated at 3 crates for every 10 harvested, due to a lack



Discussion with a group in Kabaa irrigation scheme

Investment Needs

The group's investment needs focus on reducing operational costs and post-harvest losses. This includes a **10MT walk-in cold storage unit** to preserve harvested tomatoes, the **solarization of their grading shade**, equipping an existing borehole with a solar water pump, and providing **15 individual solar surface pumps** for farmers to replace their diesel generators. These investments will provide income stability for the 31 farming households.

Energy System Sizing and Calculations:

The investment includes a 260W solar PV system for the grading shade, a solar pump for the borehole, and 15 individual solar surface pumps (approx. 0.58 kW each) for the farmers.

Financial Analysis:

Investment Cost Analysis:

- The total investment: **$51,013.**
- Walk-in Cold Storage: **$40,000.**
- Grading Shade Solarization: **$780.**
- Borehole Solar Pump: **$1,533.**
- 15 Solar Surface Pumps Cost Calculation: 15 pumps * $580/pump = **$8,700.**
- Total Investment Calculation: $40,000 + $780 + $1,533 + $8,700 = **$51,013.**

Financial Returns Analysis:

- Annual Energy Savings: The projected annual savings from replacing diesel pumps are $14,769.23.
- Simple Payback Period is $51,013 / $14,769.23 per year = 3.45 years.

Project Impact:

- **Environmental Impact:** Replaces diesel-powered generators with clean solar energy, significantly reducing carbon emissions and noise pollution.
- **Social Impact:**
  - ☑ **Community & Livelihoods:** The project will provide income stability and reduce exposure to fuel price volatility for 31 farming households. The cold storage will reduce post-harvest losses by an estimated 30%, directly increasing the volume of produce sold.
  - ☑ **Gender Inclusion:** The group has 48% women membership, ensuring inclusivity in the sharing of the project's profits.

Proposed Investment Structure:

- **Models:** Community Aggregator Model.

Mavindoni Farmers SHG

Project at a Glance:

- **Location:** Machakos County.
- **Lead Contact:** Richard Mutua
- **Value Chain:** Horticulture (French Beans)
- **Key Need:** Develop a large-scale (700-acre) irrigation scheme with solar pumps and establish extensive cold storage capacity.
- **Investment Ask:** $4,175,000
- **Payback Period:** 3.59 years

Project Description:

Mavindoni Farmers SHG is a group of **150 members** (including 60 women and 30 youth) that deals in French beans and has a contract with a ready buyer. The group currently faces high input costs, particularly for petrol/diesel to run their 70 irrigation pumps (**KSh 3,800 per day for 20 liters of fuel**). A major opportunity exists to develop a **700-acre piece of land** situated between two rivers, which could transform the group's production capacity. The primary risk is the seasonal nature of the rivers, which necessitates a full feasibility study and



Discussion with members Mavindoni Farmers group next to one of the member's French beans farm

Investment Needs

This is a large-scale agricultural transformation project. The investment needs are substantial and include the establishment of a **community irrigation scheme on 700 acres** and the setup of **47 units of 10MT walk-in cold storage facilities** to handle the projected harvest of 467 MT. The irrigation system will require **10 high-capacity solar submersible pumps** to draw water from the rivers reliably and sustainably.

Energy System Sizing and Calculations:

The proposed irrigation system requires a discharge of 88m^3/h, which will be met by **10 Lorentz solar submersible pumps** (or equivalent), each with a discharge capacity of 9m^3/h.

Financial Analysis:

Investment Cost Analysis:

- **The total investment cost:** $4,175,000.
- **Walk-in Cold Storage Facilities:** 47 units * $40,000/unit = $1,880,000.
- **Irrigation System & Solar Pumps:** The cost to establish the 700-acre irrigation scheme is $2,240,000, plus $55,000 for the 10 solar pumps.
- **Total Investment Calculation:** $1,880,000 + $2,240,000 + $55,000 = $4,175,000.

Financial Returns Analysis:

- **Annual Net Profit:** The projected annual net profit from the 700-acre operation is **$1,163,076.92.**
- **Calculation:** (Gross income of $1,938,461.53 per season * 3 seasons/year) * 20% net profit margin = **$1,163,076.92.**
- **Simple Payback Period:** The time to recoup the investment is **3.59 years.**

Project Impact:

- **Environmental Impact:** The project will utilize solar power for large-scale irrigation, avoiding the significant carbon emissions that would result from using diesel pumps for a 700-acre scheme.
- **Social Impact:**
  - ☑ **Job Creation:** This project has the potential for massive employment creation, estimated at 2,100+ direct jobs in cultivation, harvesting, and post-harvest operations.
  - ☑ **Community & Livelihoods:** This is an agricultural transformation project that would convert underutilized land into highly productive cultivation, significantly boosting the income of the 150 members and the wider community.
  - ☑ **Food Security:** The project will support year-round production of a high-value export crop, contributing to both local economic and national food security goals.

Proposed Investment Structure:

- **Models:** Phased development with results-based financing, as the large-scale infrastructure requires a multi-tiered financing approach.

Malindi Natural Juice Processors Ltd (MNJP)

Project at a Glance:

- **Location:** Malindi, Kilifi County.
- **Lead Contact:** Malindi Farmers' Cooperative Society (MFCS)
- **Value Chain:** Fruits (Mango Puree Processing)
- **Key Need:** Reduce high energy costs to become internationally competitive.
- **Investment Ask:** $90,240
- **Payback Period:** 3.7 years

Project Description:

Incorporated in 2011 and fully owned by the Malindi Farmers' Cooperative Society, MNJP processes high-quality mango puree for juice manufacturers. The cooperative has **364 members** and serves a network of approximately 12,000 mango farmers in the coastal region. The facility has a processing capacity of 50 metric tonnes of mangoes per day but faces significant challenges with high electricity and diesel costs, which make its final product uncompetitive in international markets. The 110kVA backup generator is only sufficient to run partial operations during power outages.



The MNJP processing facility

Investment Needs

The primary investment need for MNJP is the solarization of its processing plant. This will directly address the high energy costs that hinder its competitiveness and profitability. By adopting solar power, the facility can ensure more stable and affordable energy for its key equipment, including the destoner, extractor, filler, and pasteurizer.

Energy System Sizing and Calculations:

- The investment is for an 80 kWp grid-tied solar PV system to offset 30% of the plant's energy consumption.

Financial Analysis:

Investment Cost Analysis:

-System size = **80 kWp** Cost per kW[3] = **$1,128.**
-Total investment cost (USD) = 80 kW×1,128 USD/kW= **$90,240**

Financial Returns Analysis:

Simple payback period = Initial Investment/Annual savings
Annual Savings = Annual Energy Production (kWh)×Electricity Cost per kWh (USD)[4]
= (80kW×5.5hours/day×365×0.8×(Ksh.25/130)) =$ 24,707.69
Payback period = 90,240/24,707.69 = **3.7 years**

Project Impact:

- **Environmental Impact:** Reduces reliance on grid electricity and the diesel generator, lowering the facility's overall carbon footprint.
- **Social Impact:** Enhances the profitability and long-term sustainability of a farmer-owned cooperative, securing and improving the incomes and livelihoods of up to 12,000 smallholder mango farmers in the large coastal region.
- **Economic Growth:** Improves the competitiveness of a key local agro-processor (MNJP), with a potential for increased exports and job stability for employees.

Proposed Investment Structure:

- **Models:** Lease-to-Own, Energy-as-a-Service.

The Crab Shack (Dabaso)

Project at a Glance:

- **Location:** Watamu, Kilifi County
- **Lead Contact:** Dabaso Creek Conservation Group (DCCG)
- **Value Chain:** Eco-tourism & Mariculture
- **Key Need:** Reduce high and unreliable energy costs for the restaurant, particularly for refrigeration.
- **Investment Ask:** $11,280
- **Payback Period:** 3.7 years

Project Description:

The Crab Shack is an eco-restaurant run by the Dabaso Creek Conservation Group, a community initiative with **over 200 members** dedicated to conserving the mangrove ecosystem of Mida Creek. The restaurant's profits are reinvested into the group's conservation and education efforts. A major operational challenge is the high cost of energy; the restaurant spends an average of **KSh 50,000 on electricity and KSh 30,000 on a diesel generator monthly**, with deep freezers being the largest energy consumers.

3 https://www.epra.go.ke/sites/default/files/Documents/Revised_Final-Draft-Report_Net-Metering_Ver.2.pdf
4 Ksh – USD exchange rate as of 2nd February 2025, 130 KES = 1 USD



The Crab Shack restaurant in the mangroves

Investment Needs

The most critical investment need for The Crab Shack is to **solarize its operations.** This would significantly reduce the high monthly energy expenditure and eliminate reliance on the costly and polluting diesel generator. A solar PV system is required to power the heavy refrigeration loads and other kitchen appliances, ensuring operational sustainability and maximizing the profits that can be directed toward conservation work.

Energy System Sizing and Calculations:

The investment is for a **10 kWp solar PV system** designed to offset 50% the restaurant's energy demand, consisting of heavy loads such as deep freezers.

Financial Analysis:

Investment Cost Analysis:

-System size = **10 kWp** Cost per kW = **$1,128.**
-Total investment cost (USD) = 10 kW×1,128 USD/kW= **$11,280**

Financial Returns Analysis:

Simple payback period = Initial Investment/Annual savings
Annual Savings[5] = Annual Energy Production (kWh)×Electricity Cost per kWh (USD)
= (10kW×5.5hours/day×365×0.8×(KES.25/130)) =$ 3,088.46
Payback period = 11,280/3,088.46= **3.7 years**

Project Impact:

- **Environmental Impact:** The project will reduce greenhouse gas emissions by replacing diesel generation with clean solar energy, reinforcing the restaurant's eco-friendly brand.
- **Social Impact:** By cutting energy costs, the investment increases the profitability of the community-owned enterprise. This directly translates to more funding for conservation and education initiatives that benefit the 200+ members of the DCCG.

Proposed Investment Structure:

5 Calculated based on avoided electricity costs

- **Models:** Eco-Tourism Partnership, Lease-to-Own, Energy-as-a-Service.

Ihaleni Kakuluni Self Help Group

Project at a Glance:

- **Location:** Mnarani ward, Kilifi County
- **Lead Contact:** Group Leadership
- **Value Chain:** Mariculture (Prawns and Milkfish)
- **Key Need:** A sustainable water pumping solution to replace expensive petrol pumps and solar power for cold storage.
- **Investment Ask:** $21,176
- **Payback Period:** 5.7 years

Project Description:

This self-help group, consisting of **35 members,** farms prawns and milkfish in 10 ponds. A major operational constraint occurs during the dry season when low ocean levels require them to use expensive petrol pumps to supply water to the ponds. This process consumes **20 litres of fuel per night,** representing a significant and unsustainable cost. The group also faces challenges with unreliable grid power for their office and existing



The group's mariculture ponds

Investment Needs

The group's most pressing needs are for a reliable and cost-effective energy and water management solution. This includes **three solar water pumps** to replace the petrol pumps, **solarization of their office block** to power chest freezers and other equipment, and the acquisition of additional cold storage units. A key component of the proposed solution is a **17 kW solar system to power a 10 hp electric water pump,** which will ensure the ponds are replenished year-round without incurring high fuel costs. The group also has plans to establish a **hatchery for milkfish.**

Energy System Sizing and Calculations:

The investment is for a **17 kW solar PV system** and a **10 hp electric water pump.**

Financial Analysis:

Investment Cost Analysis:

-PV system) cost = 17 kW×1,128 USD/kW= **$19,176**
-Cost of installing a 10 HP water pump = **$2,000**
Total investment cost of solar water pumping system = **$21,176**

Financial Returns Analysis:

Simple payback period = Initial Investment/Annual savings
Annual Savings[6] = Annual fuel consumption (litres)× Fuel Cost per litre
= (20litres/day×30days×5months/year×(Ksh.175per litre/130))
= **$ 4,038.46**
Payback period = 21,176/4,038.46 = **5.2 years**

Project Impact:

- **Environmental Impact:** Eliminates the use of petrol for water pumping, reducing carbon emissions, and preventing potential fuel spills near the marine ecosystem.
- **Social Impact:** The investment will significantly increase the net income and operational stability for the **35 members** of the self-help group by eliminating a major operational cost. This allows them to invest in expansion, such as building a hatchery. Ensures year-round production of prawns and milkfish, contributing to local food supply and economic activity.

Proposed Investment Structure:

- **Models:** Public-Private Partnerships; Community-based financing; Lease-to-Own.

Homa Bay

Muga Aqua Farm

Project at a Glance:

- **Location:** Homa Bay County.
- **Lead Contact:** Mr. George Muga
- **Value Chain:** Aquaculture (Tilapia Hatchery)
- **Key Need:** Reliable backup power to prevent catastrophic stock loss and a solar water pump to ensure a consistent water supply.
- **Investment Ask:** KSh 735,000 (Phase 1)
- **Payback Period:** N/A (Investment is for operational resilience and risk mitigation)

Project Description:

Established in 2013, Muga Aqua Farm is a privately owned company specializing in the production of tilapia fingerlings. The farm is a critical local supplier and a hub for knowledge transfer, employing **10 youth** and offering training and mentorship to aspiring fish farmers. The farm's biggest challenge is power unreliability; frequent grid outages have resulted in significant losses, including the loss of over **50,000 fish eggs** on one occasion. Their existing 2kWp solar freezer system has an aging 6-year-old gel battery that is no longer reliable.
Investment Needs

The farm's investment needs focus on building immediate resilience and efficiency. The highest priority is a **critical power reliability upgrade,** which includes a modern Lithium-Ion battery and hybrid inverter to provide stable 24/7 backup power for the hatchery and cooling storage. A second urgent need is an **efficient solar**

6 The payback is calculated based on the savings from avoided fuel costs.

water pumping system to provide a consistent and cost-effective daily water supply from a local river source.

Moreover, there is need to invest in intensive aquaculture systems to double production.

Energy System Sizing and Calculations:

- **Power Reliability System:** The system is designed to provide reliable backup power and integrates with the farm's existing 2kWp solar array. It includes a **5 kWh LiFePO4 battery** and a **3 kW hybrid inverter.**
- **Solar Pumping System:** This system is sized to deliver 20,000 Liters of water daily. It includes a 1 kW DC solar surface pump, a 1.5 kWp solar PV panel array, and the necessary balance of system components.

Financial Analysis:

Investment Cost Analysis:

- The total Phase 1 investment cost is **KSh 735,000.**
- **Power Reliability Upgrade Cost Calculation:** KSh 260,000 (Battery) + KSh 120,000 (Inverter) + KSh 50,000 (Installation) = **KSh 430,000.**
- **Solar Water Pumping System Cost Calculation:** KSh 100,000 (Pump) + KSh 105,000 (Panels) + KSh 100,000 (BoS & Installation) = **KSh 305,000.**
- **Total Investment Calculation:** KSh 430,000 + KSh 305,000 = **KSh 735,000.**

Financial Returns Analysis:

- The return on this investment is primarily measured by mitigating the risk of catastrophic stock loss. Preventing a single major loss event would provide a return far exceeding the initial investment cost.

Project Impact:

- **Environmental Impact:** Shifts critical hatchery and pumping operations to renewable solar energy, reducing the farm's carbon footprint.
- **Social Impact:**
  - ☑ **Job Creation:** Secures the jobs of 10 current youth employees and has the potential to create 30 more with the planned nursery expansion. The project also supports an estimated 30 indirect jobs.
  - ☑ **Community & Livelihoods:** Enhances the businesses of local fish farmers who depend on a reliable supply of fingerlings. The farm also serves as an important educational and entrepreneurship catalyst in the community.

Proposed Investment Structure:

- **Models:** Pay-As-You-Go (PAYGO) with asset-backed security.

Wahambla Farmers Group

Project at a Glance:

- **Location:** Homa Bay County.
- **Lead Contact:** Moses Agit (Secretary)
- **Value Chain:** Horticulture (Kales)
- **Key Need:** A large-scale solar irrigation system, cold storage, and value-addition facilities (solar dryers) to support their extensive farming operations.
- **Investment Ask:** KSh 123.43 Million (approx. $950,000)
- **Payback Period:** 6 Months

Project Description:

Established in 2022, Wahambla is a group of **42 members** farming on a large scale, with **870 acres** under ownership and **620 acres** currently dedicated to kale cultivation. The group's primary challenge is the extremely high cost of irrigation; they currently share 11 petrol-powered pumps, and the fuel cost per acre is **KSh 45,663** ge of produce, and fluctuating market prices. The k.



Wahambla Farmers group

Investment Needs

This is a large-scale agricultural transformation project. The main investment needs are an **irrigation and solar system for about 800 acres, an aggregation center with 20 MT of cold storage,** and a **1-tonne capacity solar dryer** for value addition. The group also requires at least **42 solar pumps** to replace their current petrol pumps.

Energy System Sizing and Calculations:

- **Cold Storage:** The required **20 MT** cold storage capacity is based on storing one-third of the daily production of 29.76 tonnes for two days. Four 5-MT solar-powered walk-in cold rooms will meet this.
- **Irrigation System:** The investment covers a full irrigation supply using solar-pumped technology with piped distribution for approximately 800 acres.
- **Solar Dryer:** The proposal is for a 1-tonne/day capacity hybrid solar dryer.

Financial Analysis:

Investment Cost Analysis:

- The total investment cost: **KSh 123.43 million.**
- Cold Room with Aggregation Centre Cost: **KSh 21.83 million (USD 130,000 for cold rooms + KSh 5 million for the centre).**
- Solar Dryer Cost: **KSh 1.6 million.**
- Irrigation & Solar System Cost: **KSh 100 million.**
- Total Investment Calculation: **KSh 21.83M + KSh 1.6M + KSh 100M = KSh 123.43 million.**

Financial Returns Analysis:

- **Simple Payback Period:** The time to recoup the investment is approximately **6 months.**
- **Annual Net Revenue Calculation:** Based on an estimated annual revenue of KSh 343.73 million and total operational costs of KSh 62.31 million, the annual net revenue is **KSh 281.42 million.**

- **Payback Period Calculation:** KSh 123.43 million (Investment) / KSh 281.42 million (Net Revenue) = **0.44 years.**

Project Impact:

- **Environmental Impact:** Replaces extensive use of petrol for irrigation with a large-scale solar pumping system, resulting in a massive reduction in carbon emissions.
- **Social Impact:**
  - ☑ **Job Creation:** The project is expected to create 20 direct jobs and 100 indirect jobs.
  - ☑ **Community & Livelihoods:** The investment will dramatically increase the profitability and income for the **42 members** by eliminating huge fuel costs. It will also open new markets for value-added products like dried vegetables.

Proposed Investment Structure:

- **Models:** Public-Private Partnerships; Joint ventures; Lease-to-Own.

Nyaroya Farmers Irrigation Scheme

Project at a Glance:

- **Location:** Homa Bay County.
- **Lead Contact:** Brian Nyakwamba (Project Manager)
- **Value Chain:** Horticulture (Kales)
- **Key Need:** A functional, low-cost irrigation system for 200 acres and cold storage to reduce significant post-harvest losses.
- **Investment Ask:** $177,466
- **Payback Period:** 1.2 years

Project Description:

Established in 2022, the Nyaroya Farmers Irrigation Scheme is a community-based organization with **153 members** managing 200 acres, with 70 acres currently under kale cultivation. The group faces severe challenges with the high cost of using petrol pumps for irrigation from Lake Victoria and experiences massive post-harvest losses, with about **29% of produce going to waste.** A previously installed 6.4kWp solar pump provided by a partner is currently non-functional, highlighting the need for a reliable and sustainable solution. The scheme's daily kale production is estimated at 12.25 tonnes.

Investment Needs

The scheme's investment priorities are a complete overhaul of its value chain infrastructure. The most pressing needs are a **functional solar-powered water abstraction system** to serve 200 acres, a **10-12 tonne capacity cold storage facility** to combat post-harvest losses, and a **solar dryer** for value addition. These investments are critical to transition the farmers from high-cost, inefficient methods to a profitable and sustainable model.

Energy System Sizing and Calculations:

- **Cold Storage Sizing:** Based on a daily production of 12.25 tonnes and a 50% storage rate, a cold room of at least 12.2 tonnes is needed to handle a 2-day delay. The investment covers two 5-MT solar-powered walk-in units.
- **Irrigation System:** The investment is for a complete solar-powered irrigation system to serve 200 acres, including a 5.5kw surface pump, a 65.37m^3 tank and tower, plumbing, and a water sump.
- **Solar Dryer Sizing:** The proposal includes a medium-sized solar dryer capable of handling 1-1.5 tonnes of kale per week.

Financial Analysis:

Investment Cost Analysis:

- The total investment cost: **$177,466.**
- Irrigation System Cost: **$107,828.**
- Cold Room Cost (2 units): **$65,000.**
- Solar Dryer Cost: **$2,319.**
- Electric Fence & Permits Cost: **$2,319.**
- **Total Investment Calculation:** $107,828 + $65,000 + $2,319 + $2,319 = **$177,466.**

Financial Returns Analysis:

- **Simple Payback Period (Overall Investment):** The time to recoup the investment is **1.2 years.**
- **Annual Net Income Calculation:** Based on projected annual revenues of KSh 215.6 million and operational costs of KSh 24 million, the approximate net income is **KSh 191.6 million.**
- **Payback Calculation:** Assuming 10% of net income (KSh 19.16 million) is returned to the scheme for cost recovery, the payback period is calculated as: KSh 22,964,027 (Total Investment) / KSh 19,160,000 (Annual Return) = **1.2 years.**

Project Impact:

- **Environmental Impact:** Eliminates the use of petrol for irrigation, significantly reducing carbon emissions and reliance on fossil fuels.
- **Social Impact:**
  - ☑ **Job Creation:** The project currently supports an estimated 280 direct and 1,900 indirect jobs.
  - ☑ **Community & Livelihoods:** The investment is projected to dramatically increase income for the **153 members**, improve household nutrition, and provide a model for youth engagement in modern agriculture.
- **Proposed Instruments:** A PURE loan for the irrigation system, technical assistance, market linkage support, and a lease-to-own model for the cold room.

Copana Feeds

Project at a Glance:

- **Location:** Homa Bay County.
- **Lead Contact:** Emily Omboto
- **Value Chain:** Animal Feeds (Fish and Chicken)
- **Key Need:** A reliable solar backup system to ensure operational continuity during frequent power outages.
- **Investment Ask:** KSh 1,000,000
- **Payback Period:** N/A (Investment is for operational stability and de-risking)

Project Description:

Established in 2019, Copana Feeds is a privately owned company that processes and packages fish and chicken feeds, with a monthly revenue of **KSh 600,000** and a profit of **KSh 200,000.** The facility relies on grid electricity, consuming about 28 kWh per day. The main challenge to their operation is power unreliability and frequent outages, which cause delays and disable their CCTV security system. The business currently has **6 employees** and provides weekly training to local farmers.

Investment Needs

The most critical investment need for Copana Feeds is a **backup solar system** to address the frequent power outages. This system will power essential equipment, including security systems (CCTV), and allow for the safe shutdown of machinery during outages. Other needs for future growth include an **extruder machine** to produce fish pellets (they currently only produce mash), a feed dryer, and an upgraded mixer machine.

Energy System Sizing and Calculations:

- The system is designed to provide 7 kWh of daily backup energy, which is 30% of their daily consumption. It includes:
- **Solar PV Panel Array:** A **4 kWp** array.
- **Battery Storage:** A 10 kWh LiFePO4 battery to provide approximately 8 kWh of usable energy.
- **Hybrid Inverter:** A 5 kW hybrid inverter to manage the solar array, battery, and critical loads.

Financial Analysis:

Investment Cost Analysis:

- The total investment cost for the solar backup system: **KSh 1,000,000.**
- Solar PV Panel Array Cost: **KSh 260,000**
- Battery Storage System Cost: **KSh 450,000.**
- Hybrid Inverter Cost: **KSh 150,000.**
- BoS & Installation Cost: **KSh 140,000.**
- Total Investment Calculation: KSh 260,000 + KSh 450,000 + KSh 150,000 + KSh 140,000 = **KSh 1,000,000.**

Financial Returns Analysis:

- The primary return on this investment is the de-risking of operations by ensuring continuity and security, which is critical for maintaining profitability.

Project Impact:

- **Environmental Impact:** Reduces reliance on the grid and prepares the facility for greater renewable energy use in the future, lowering its carbon footprint.
- **Social Impact:**
  - ☑ **Job Creation:** Secures 6 direct jobs and supports an estimated **50 indirect jobs.**
  - ☑ **Community & Livelihoods:** The business acts as a catalyst for the local aquaculture sector, supporting farmers with quality feeds and training, thereby increasing their incomes and contributing to regional food security.

Proposed Investment Structure:

- **Models:** Equipment lease with a buy-back guarantee.

Kabondo West Smallholder Aquaculture Group

Project at a Glance:

- **Location:** Homa Bay County. [Insert Project Location Map/Coordinates from Energy Access Explorer Tool]
- **Lead Contact:** Paul Aduol
- **Value Chain:** Aquaculture (Tilapia) & Fish Feeds
- **Key Need:** A solar backup system for the feed processing plant, solar-powered cooling for harvested fish, and solar security systems.

- **Investment Ask:** KSh 1,010,000
- **Payback Period:** N/A (Investment is for operational stability and product quality)

Project Description:

Established in 2018, this is a privately owned farmer group of **30 members** who collaborate on Tilapia fish farming (managing 74 cooperative pond units) and fish feed manufacturing. Their operations are frequently disrupted by power blackouts, which impact their feed processing plant. Other challenges include the high cost of raw materials and limited market access. The group has been earmarked for funding by the Aquaculture Business Development Programme (ABDP).

Investment Needs

The group's investment needs focus on achieving operational stability and improving product quality. The priorities for Phase 1 are a **solar backup system** for their feed processing machinery, a **solar-powered cooler** to reduce post-harvest losses of fish, and **solar-powered security lighting** for their 74 pond units. Future needs include an aggregation center with cooling facilities and an expansion of their fish farming operations.

Energy System Sizing and Calculations:

- **Solar Backup System:** Sized for a daily energy consumption of 6-7.5 kWh for the processing plant. It includes a 3 kWp solar array, a 7.5 kWh LiFePO4 battery, and a 5 kW hybrid inverter.
- **Solar-Powered Cooler:** A 200-300 Liter chest cooler with an integrated solar panel and battery, sufficient for 100kg of fish.
- **Solar Security System:** 6 standalone all-in-one solar LED floodlights.

Financial Analysis:

Investment Cost Analysis:

- The total Phase 1 investment cost: **KSh 1,010,000.**
- Solar Backup System Cost: **KSh 800,000.**
- Solar Fish Cooler Cost: **KSh 120,000.**
- Solar Security Lights Cost Calculation: 6 units * KSh 15,000/unit = **KSh 90,000.**
- Total Investment Calculation: KSh 800,000 + KSh 120,000 + KSh 90,000 = **KSh 1,010,000.**

Financial Returns Analysis:

- The return on this investment will be realized through reduced post-harvest losses, operational continuity in feed production, and improved security, all of which contribute to higher overall profitability.

Project Impact:

- **Environmental Impact:** Reduces reliance on the grid and promotes the use of clean energy in the aquaculture value chain.
- **Social Impact:**
  - ☑ **Job Creation:** The project currently supports approximately **30 direct jobs** and **450 indirect jobs** in the supply chain.
  - ☑ **Community & Livelihoods:** The investment will lead to increased disposable income for the **30 members** by reducing losses and ensuring consistent production. It also enhances regional food security.

Proposed Investment Structure:

- **Models:** Grant-based technical assistance to improve creditworthiness.

Rabisa Enterprises

Project at a Glance:

- **Location:** Homa Bay County
- **Lead Contact:** Hezron Oyanda
- **Value Chain:** Aquaculture (Tilapia Hatchery)
- **Key Need:** A primary off-grid solar power system to enable critical operations, as the facility has no grid connection.
- **Investment Ask:** KSh 1,705,000
- **Payback Period:** N/A (Investment is foundational for enabling the business to operate and grow)

Project Description:

Established in 2020, Rabisa Enterprises is a privately owned fish hatchery that is a crucial link in the aquaculture value chain, providing tilapia fingerlings to local, regional, national, and international markets (**30% of sales are exports**). The business employs **8 staff members**, including 5 youth. The company's single greatest challenge is a **complete lack of a grid electricity connection**, which severely limits its operations and prevents the use of aeration devices that are critical for improving hatchery productivity and survival rates.

Investment Needs

The company's absolute primary need is for a **reliable, off-grid primary solar power system with battery storage.** This is not a backup system but the foundational energy infrastructure that will enable the business to function effectively. The system is envisioned to have a 10kVA output capacity to power critical aeration, water pumping, lighting, and other hatchery equipment, and to support planned expansions. Other needs include additional fishponds, aeration systems, and fencing.

Energy System Sizing and Calculations:

- The system is sized for an estimated daily operational need of 15-25 kWh and includes:
- **Solar PV Panel Array:** A 7 kWp array.
- **Battery Storage:** A 15 kWh LiFePO4 battery to provide reliable overnight power for continuous aeration.
- **Off-Grid Inverter: An 8 kW (10 kVA)** high-quality off-grid inverter to handle peak power demand.

Financial Analysis:

Investment Cost Analysis:

- The total investment cost for the primary solar power system: **KSh 1,705,000.**
- Solar PV Panel Array Cost: **KSh 455,000.**
- Battery Storage System Cost: **KSh 700,000.**
- Off-Grid Inverter Cost: **KSh 350,000.**
- BoS & Installation Cost: **KSh 200,000.**
- Total Investment Calculation: KSh 455,000 + KSh 700,000 + KSh 350,000 + KSh 200,000 = **KSh 1,705,000.**

Financial Returns Analysis:

- This foundational investment will unlock the business's potential for revenue growth. With a monthly revenue of KSh 100,000 and a 10% profit margin even with current limitations, the ROI is expected to be significant as energy enables higher productivity and survival rates.

Project Impact:

- **s** Establishes the business on a 100% renewable energy foundation, creating a model for sustainable, off-grid aquaculture.
- **Social Impact:**
  - ☑ **Job Creation:** Secures 8 current jobs and has the potential to increase this to 20+ with expanded operations. The business also supports an estimated 1,000 indirect jobs in the value chain.
  - ☑ **Community & Livelihoods:** Enhances the entire local fish farming sector by providing a reliable supply of quality fingerlings, which is essential for the success of other farmers. It equally contributes to export earnings.

Proposed Investment Structure:

- **Models:** Loan with a grace period.

INVESTMENT PROSPECTUS:

Productive Use of Renewable Energy in select Agricultural value chains in Kenya

NYANDARUA COUNTY GOVERNMENT PAMOJA TUJENGE

KIMWE KIYUAA KYAA NDAA

PAMOJA TUJENGE

NAKURU COUNTY

HOMA BAY COUNTY