Concept Note

Productive Use of Energy (PUE) Proposals for Socio-Economic Development in Rural Africa

Introduction

Access to reliable energy remains a significant challenge across rural Africa, where large portions of the population continue to live without electricity. While electrification efforts are expanding, there is an urgent need to go beyond mere access and prioritize **productive use of energy (PUE)**—targeted applications that generate income, promote enterprise development, and deliver essential services.

Sunray Power supports a modular, scalable, and energy-enabled ecosystem of mobile units—including agricultural processing, cold storage, healthcare, education, and vocational training—deployed alongside mini-grid or standalone solar power systems. These rapid-deployment solutions are designed for off-grid operation and integration into community-led development strategies, enabling both energy access and socio-economic upliftment.

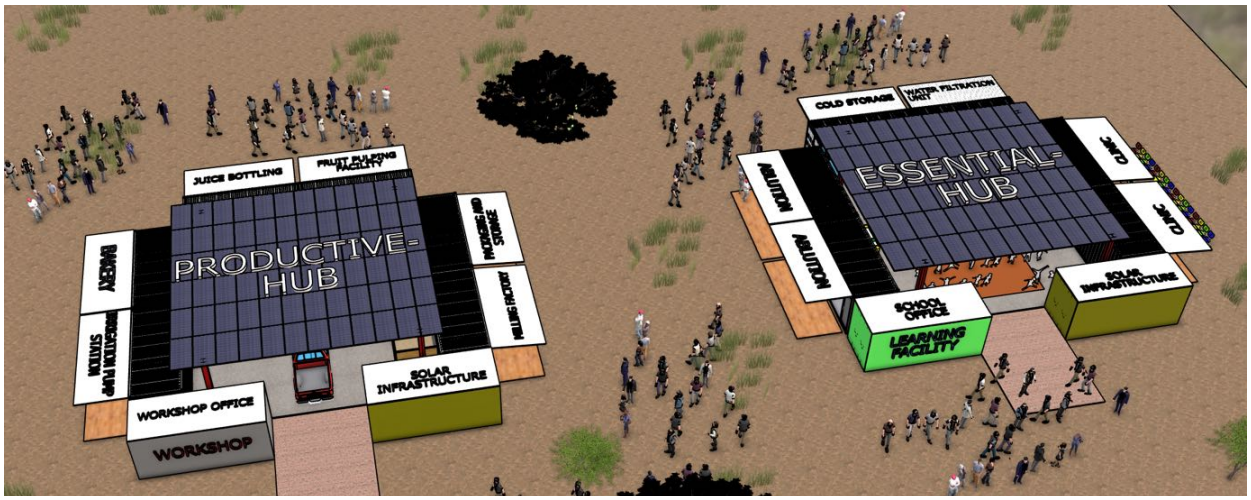
Credit: Afri.Can Micro Factories

Implementation Approach

Our solution is based on a **two-hub model**:

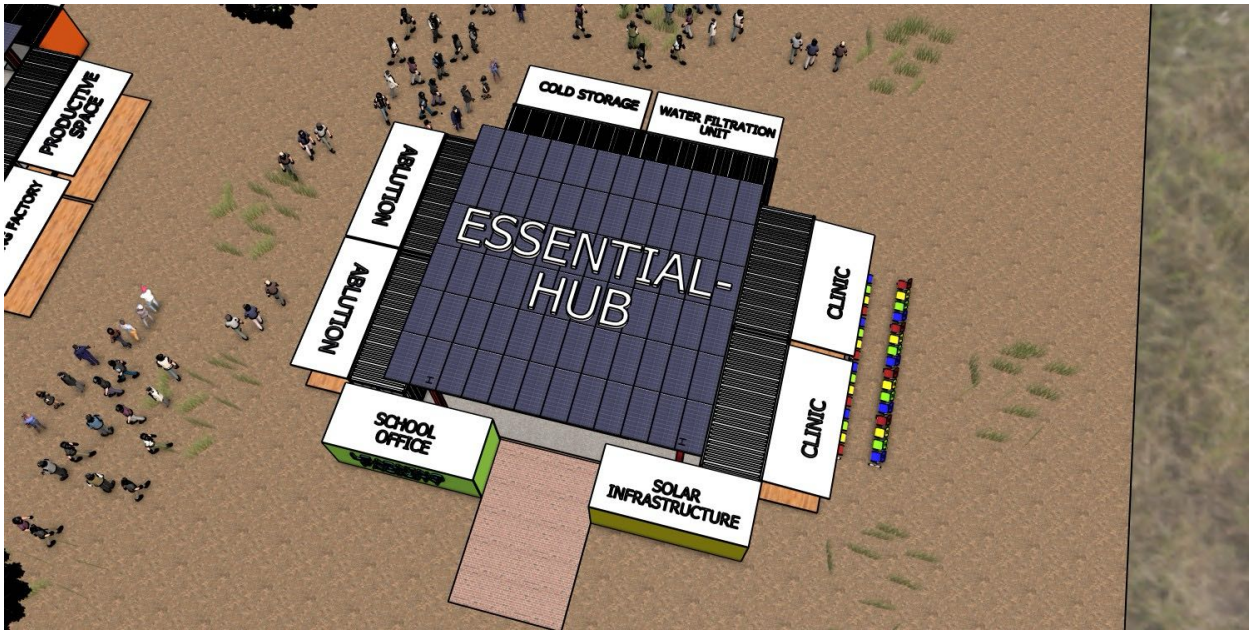
1. **Essential-Hub**: Delivers core services such as clean water, healthcare, food storage, sanitation, and basic education.
2. **Productive-Hub**: Drives local economic growth through agro-processing, workshops, manufacturing, and vocational training.

These hubs are deployed using a **tiered and modular approach**, scalable according to the population size and evolving community needs:



Communities may begin with multiple Tier 1 hubs and progressively grow into higher tiers, ensuring flexibility, affordability, and adaptability.

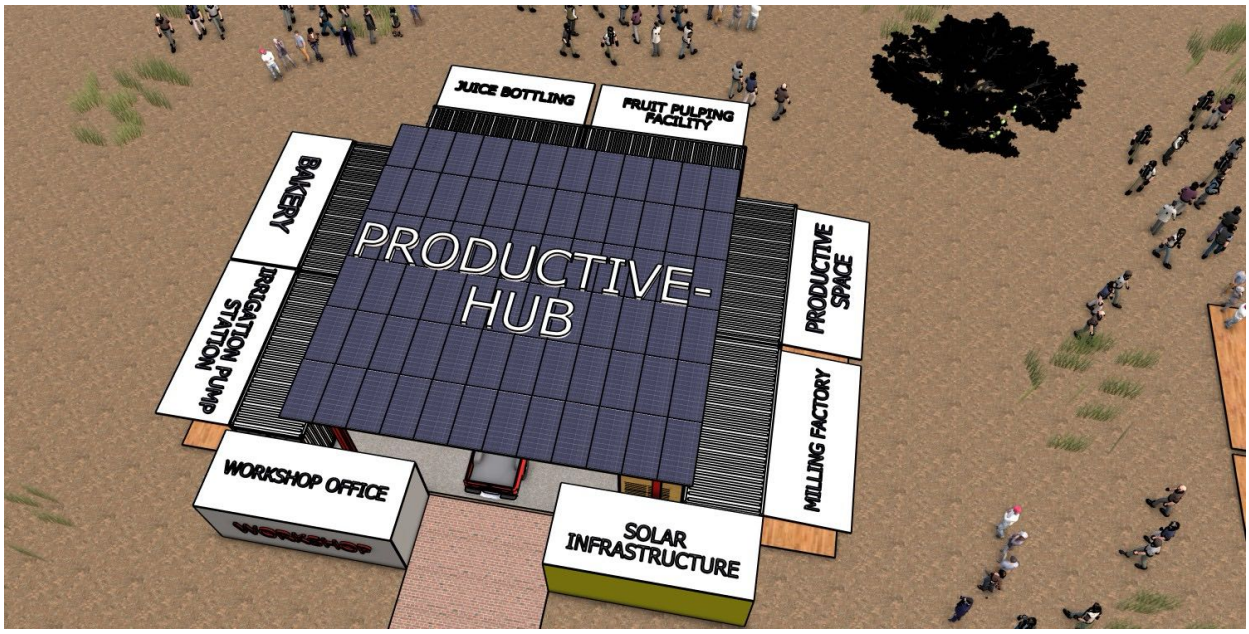
Essential-HUB



Microfactory	Base Unit (Tier 1)
Water Purification[1] *Prevent waterborne health outbreaks and limits the use of burning coal and wood to boil water*	Purifies 1,000lph[2] fresh and safe drinking water from local water source. The factory is fitted with an online monitoring system for condition based maintenance. Emphasis is placed on maintenance adherence and critical spares availability to ensure run time.
Clinic *Primary stabilization of a person and helping with chronic conditions*	*Health Outpost;* basic outpatient care, first aid and wound care, Malaria, TB, HIV testing, basic stabilization of patients, cold storage for medicine. All is fitted within two 6m containers. Remote support systems are incorporated in the clinics to access a network of health experts.
Cold Storage *Prevents the spoiling of food and preserves*	6m chiller container (0-5°C) capacity of 4-6 tons of fruit and vegetables. Racking system included to ensure multiple users can use the space. The container is lockable and secure.
Ablution Block *Replacing pit toilets and increasing sanitation practices preventing diseases*	Basic ablutions, total of 10 WC + 4 Urinals, 10 hand wash basins only cold water all effluent fed into a sewerage package plant. The package plant process the sewerage into grey water that can be used for irrigation.
School Facility *A school model that provides online learning for a variety of grades and could be expanded to occupational training with the Productive-HUB*	Space is created under the solar panels for a school environment. There is an office in one of the 6m containers that contains all the learning material for Primary and Secondary school learners. A relevant online schooling curriculum is linked to the facility which will incur an operational cost.

[1] Borehole with sufficient supply is required
[2] Liters per hour

Productive-HUB



Microfactory	Base Unit (Tier 1)
Milling Plant	Maize milling capacity of 500kg/hr. Roller mill and dehulling unit[3] manual pre-cleaning and bagging.
Pulping and solar dryer plant	Production capacity of 2 tons per hour of mangos or equivalent fruits for pulping. Includes pre-cleaning, pasteurizer, mixer and manual bottling line.
Bakery	Capacity of 100 breads per day, dough mixer, deck oven and prep equipment.
Irrigation pump station	Total water supply of 60 m^3/hr at 3 bar. The system includes sand and disc filters, pumps that feed into a main header. The main header has connections for local farmers to draw water from at pressure. The water can also be used with a local reservoir for raw water supply of toilets and washing. Drawn from a local water source. No irrigation equipment is supplied.
Productive Shop Space	Area where an entrepreneur can rent a space with water and electricity to operate their own business.

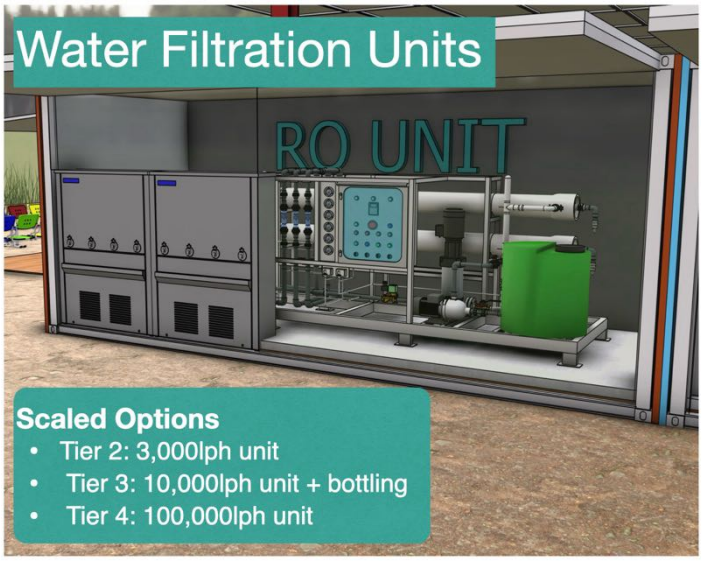
[3] The roller mill has a capacity of 750kg/hr thus it can easily scale by increasing the run times. A smaller hammer mill can be an option for a low-cost alternative.

Conclusion

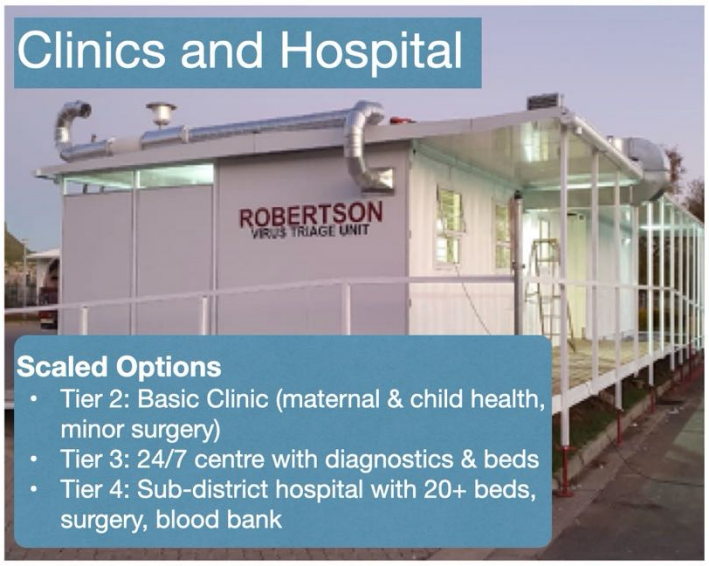
The concept note presents a scalable, modular approach to rural development that links energy access directly to productive infrastructure. By deploying context-specific microfactories—such as solar-powered mills, cold storage units, clinics, and workshops—this model ensures that electrification leads to immediate and tangible economic benefits. It responds to the critical need for affordability, technical support, and tailored deployment in underserved areas. Through this integrated strategy, rural communities are empowered to transition from energy access to sustainable livelihoods, supporting long-term socio-economic resilience and inclusive growth.

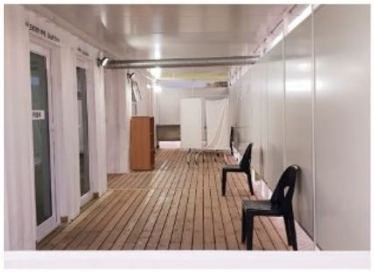
This solution is a catalyst for sustainable development—transforming underserved regions into self-sufficient, thriving hubs of innovation, health, education, and enterprise.

Credit: Afri.Can Micro Factories



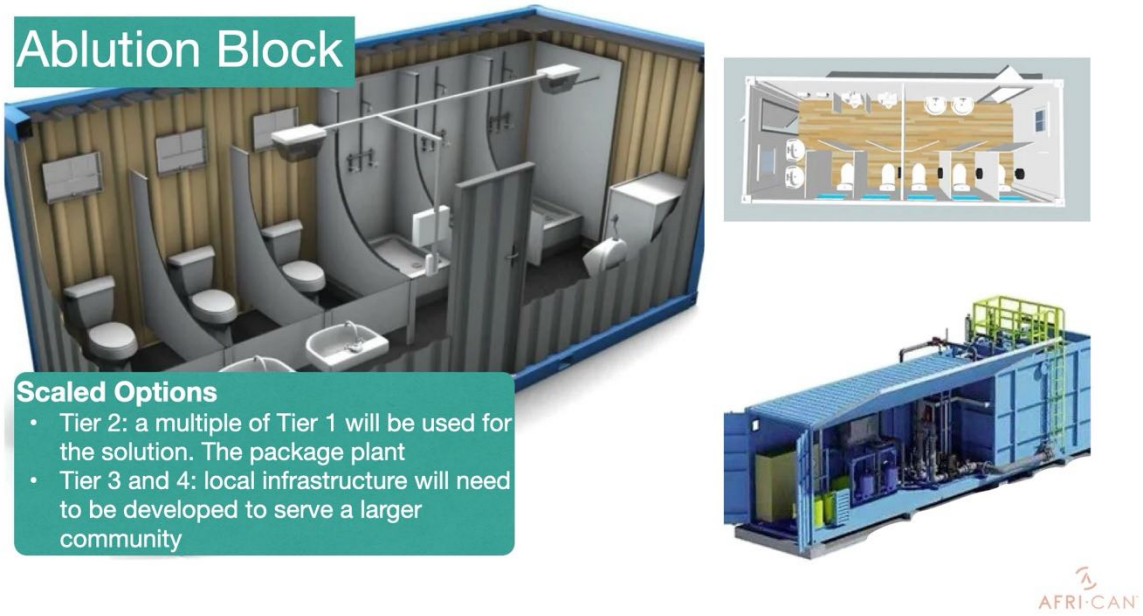
AFRI·CAN



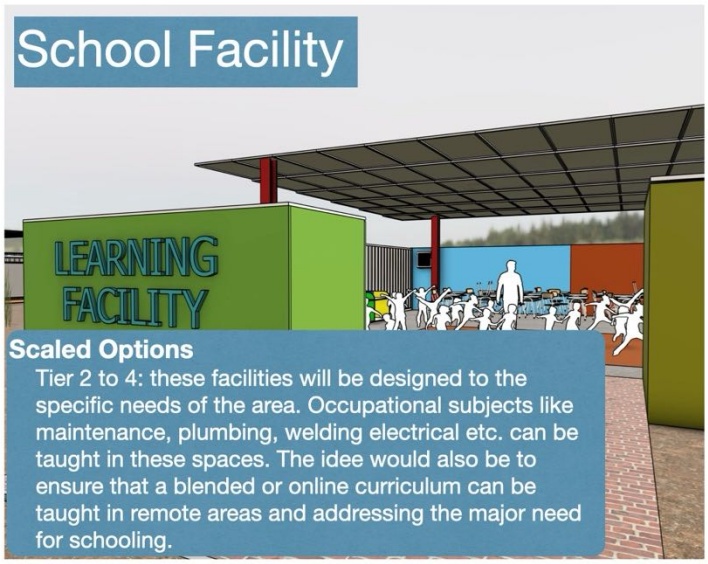


AFRI·CAN

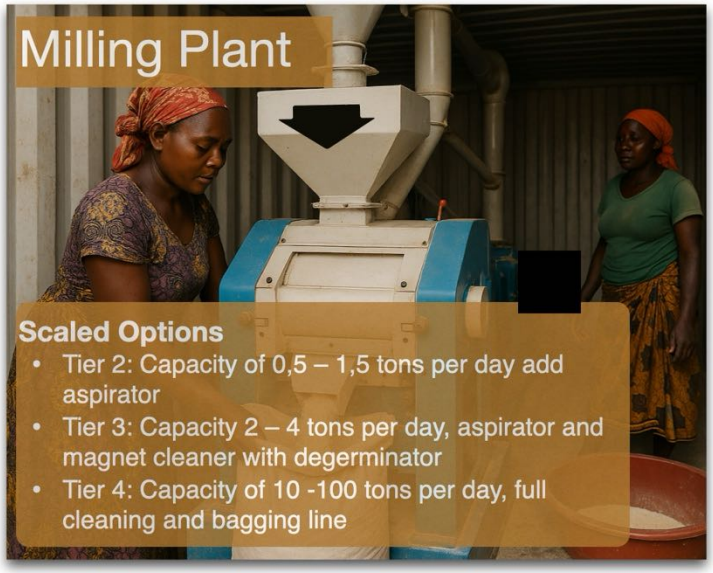
Credit: Afri.Can Micro Factories



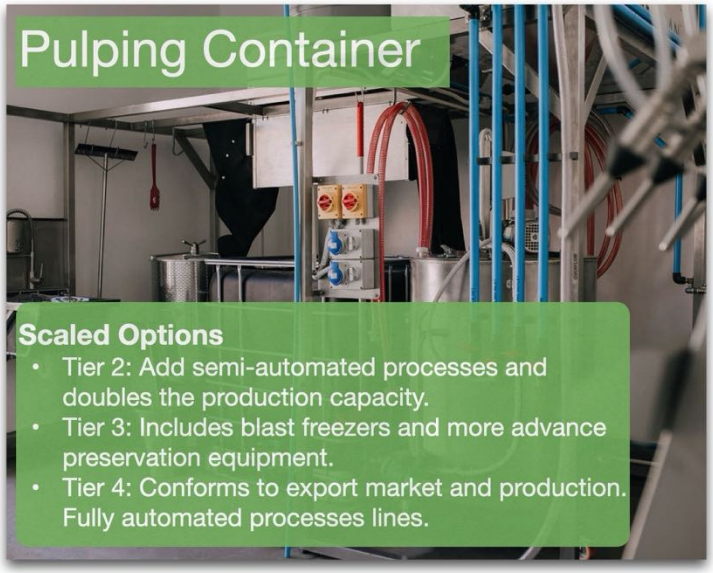
Credit: Afri.Can Micro Factories



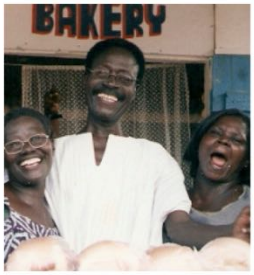
AFRI·CAN



AFRI·CAN



AFRI·CAN



AFRI·CAN

Credit: Afri.Can Micro Factories