



# DECENTRALIZED RURAL ELECTRIFICATION THROUGH SVOs POWERED MULTIFUNCTIONAL PLATFORMS (MFPs)

*Lessons and Experience from TaTEDO Pilot Project.*

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# About TaTEDO



- A sustainable Energy, Development, non-profit sharing organization established in 1990.
- **Vision:** Poverty free and self-reliant communities in Tanzania accessing sustainable modern energy services.
- **Mission:** To advance popular access to sustainable modern energy technologies in marginalized communities in Tanzania through technological adaptations, capacity building. Community mobilization and advocacy for increased access to sustainable energy.
- **Activities:** Capacity building, community mobilization, energy technologies transfer, networking, enterprise Development services, etc.

# ACCESS TO ENERGY (ELECTRICITY & FUELS) A TANZANIA PERSPECTIVE.



- More than 90 percent of Tanzanians lack access to commercial energy.
- Only 10 percent have access to electricity country wide, in rural areas only 2 percent have access.
- More than 90 percent of cooking fuels is from woodfuels (firewood and charcoal).
- Rural lighting is increasingly switching to wood-sticks rather than kerosene or electricity.
- More than 90 percent agricultural energy, for farming, transportation and processing is from human.
- Ongoing rural electrification programme will take several decades to reach at least 50 percent of Tanzanians.

## Electrification in Tanzania.



- Very low electrified country.
  - Total installed capacity of about 950MW (2005).
  - National access to electrification is at 10 per cent
  - Urban access at 39 per cent
  - Rural access at 2 percent

	Access to Electricity (%)	Consumption of electricity per Capita (KWH)	Total energy consumption per Capita (Kgoe)
Tanzania	10.5	55	465
Developing Countries	66.6	1,015	910
Developed Countries	100	7,702	6233
World	72.8	2,436	1,674

Source: World Resource Institute [www.wri.org](http://www.wri.org)

## The Energy Issues and Challenges in Tanzania.



- Energy is a basic requirement for sustainable development.
- It is a prerequisite to fight poverty.
- Energy contributes to achieving the MDGS.
- Most people without modern energy services are in rural areas.
- Lack of better energy services contribute to greater unemployment in rural areas which forces youth to migrate to cities leading to over crowding and crimes.
- More than 80 percent of the raw materials are exported, without value addition.
- More than 40 percent of agricultural products are wasted due to post harvest losses and lack of better energy services to process or preserve.

## RURAL ELECTRIFICATION EFFORTS IN TANZANIA.



- Have focused on grid extension or use of off-grid diesel power plants.
- Over the years has been the responsibility of TANESCO.
- Recently a rural electrification master plan has been prepared to increase access from present 2 percent to 25 percent by 2013.
- Other efforts include SIDA, UNDP and private companies solar PV market development.
- TaTEDO scaling up access programme using solar PV, Micro hydro and straight vegetable oil.
- REA initiatives to mobilize, coordinate and facilitate private public initiatives in rural energy development.



- Work with different stakeholders at different levels to promote access to electricity in rural areas.
- Promote use of solar PV, Wind, Micro Hydro, Biogas and straight vegetable oils for generating rural electricity.
- Combine generation and distribution of energy with complementary activities.
- At the same time address social, economic and institutional issues for success and sustainability.
- Support energy services that are reliable and low cost, requiring minimal maintenance and repair.
- Facilitate income and employment generating activities through value addition to crops.

# TaTEDO PROGRAMME STRATEGY ON RURAL ENERGY ACCESS.



- Ensure close cooperation with district authorities and strong participation of villagers.
- Ensure technical and business viability of the selected energy systems is based on locally available renewable energy sources and entrepreneurial capacity.
- Develop local capacities to plan, design, build/install, operate and maintain the energy systems in order to:-
  - Reduce investment costs.
  - Increase sustainability through better management, maintenance and operation..
  - Reduce opportunities for income and employment generation.



## Among Priority activities of TaTEDO.

- TaTEDO Develops and implements village electrification projects from decentralized generation and distribution systems: some include;
  - Micro hydro power (Kinko Project, 10kw – run –of the river).
  - Solar photovoltaic (solar home systems, mobile phone chargers, social Centers).
  - Wind electricity development support (studies undertaken).
- **Small farmers support to grow Jatropha.**
  - Awareness raising materials distribution.
  - Training farmers on Jatropha nurseries establishment/cooperatives formation and management.
  - With district staff provide extension services for growing, processing and local use of Jatropha oil
  - .
- **Institutional**
  - Facilitate community planning and capacity building.
  - Entrepreneurs support, technicians training and business development.
  - Market assessment and development.
  - Business plans preparation.
  - Facilitate financing.
  - Identify training needs, conduct training for planners and contractors.
  - Policy advocacy for rural electrification incentives.

# The SVO/MFP Pilot Project Implemented by TaTEDO. (2006 to 2007).



## Objectives.

- To install MFPs and associated machineries for oil seed extraction, grain milling, de-husking and battery charging.
- To bring knowledge and capacity to develop and implement MFPs projects in Tanzania.
- To develop capacity among beneficiaries on the use of MFPs, management and small business development, and
- To demonstrate to policy makers, investors and donors how innovative solutions can provide modern energy services and improve rural people's livelihoods.

# Major Project Activities



- MFPs systems design.
- Communities mobilization, demand, willingness and ability to pay assessment, village energy development plans prepared.
- Capacity building for ownership in operating and maintaining MFP power plants, tariff setting, bill collections etc.
- Formation of village energy team (VET) – for supervising the operation of the MFPs, tariff setting, bill collection etc.
- Selection of entrepreneurs and operators of the MFPs.
- Installation and commissioning of the MFPs components, diesel engine generators, oil expeller, filter, minigrid.
- Encouraging farmers to grow Jatropha for future increased supply of Jatropha seeds and oil to the MFPs.
- Participatory close monitoring and evaluation for continuous learning, adaptation, scaling up, replication and mainstreaming at different levels.

# BASICS OF MFPs



- A lister Engine coupled to alternator, grain mill, oil seed press, dehusking machines and battery charging facility, water pump etc.
- All in one frame.
- Allows using combination of machines.
- Lister engines are simple, have been used for a long time in Tanzania and are familiar to many people.
- Can interchangeably use (SVO) Vegoil, and diesel (Flex engine).
- Average cost for a 10KW system – ranges between 9m to 15m Tshs.
- One litre of SVOs cost about 1200Tshs.





## Pilot Project Sites Features.



	Engaruka	Leguruki	TaTEDO Centre *
<b><i>Number of households</i></b>	600	700	
<b><i>Population</i></b>	3000	3500	
<b><i>Location from grid electricity</i></b>	60km	10km	
<b><i>Major community</i></b>	Maasai	Meru	
<b><i>Jatropha growing status.</i></b>	15tones/year	4tones/year	
<b><i>Economics – Jatropha price/kg.</i></b>	150-250Tsh/kg.	150-200Tsh/kg.	
<b><i>Pressing cost.</i></b>	70Tsh/kg	70Tsh/kg.	
<b><i>Electricity unit cost – Diesel</i></b>	1000Tsh/kwh	1000sh/kwh	
<b><i>Electricity unit cost – Jatropha oil</i></b>	300-500Tsh/kwh.		
<b><i>Major occupation</i></b>	Agroforestry/pastoralist	Agroforestry zero grazing	

\* For Demonstration, testing and training purposes.

# Selected technical details.



Particulars	Technical Information		
	Engaruka	Leguruki	TaTEDO Centre
<b>Engine Size</b>	10HP	16HP	10HP
<b>Alternator</b>	7.5KVA	12KVA	7.5KVA
<b>Oil seeds Pressing</b>	70-100kg/hr	70-100kgs	70-100kg/hr
<b>Oil price</b>	1200Tsh/litre	1200Tsh/litre	
<b>Maize mill</b>	500kg/hr	725kg/hr	300kg/hr
<b>De husking</b>	-	600kg/hr	-
<b>Charge/milling dehusking</b>	25Tsh/kg	25Tsh/Kg	
<b>Battery charger</b>	80AMP 6batteries/hr	80AMP 6-battries/hr	-
<b>Hours of electricity supply</b>	5hrs	4hrs	
<b>Households connected</b>	15	60	-
<b>Number of mini-grid Poles</b>	17	50	4
<b>Businesses connected</b>	13	17	2
<b>Accessing electricity from battery charged by the MFPs.</b>	22	23	

# Achievements - Impacts



- High level support on SVOs electrification
  - Inauguration of MFP at Engaruka by the then Prime Minister. Edward Lowassa.
  - Presence of the member of parliament at Leguruki during the planning of the project implementation.
- Government policy support.
  - Members of parliament, District Commissioners, District Executive Directors, ward Leaders supports the projects and have been very helpful during implementation and management of MFPs.
  - Members of Parliament are aware and educated on the importance and need to promote Jatropha growing for energy supply and poverty reduction. (Demonstration during parliament session in Dodoma).
  - TaTEDO to scale up, replicate and mainstream MFPs and biofuels development in 11 districts in more than 100 villages in the next five years.



- Demonstration

- MFPs powered by SVO/ Vegoil are very promising option for rural electrification and motive power provision.
- Created increased demand for electricity, more than 100 customers are waiting to be connected at a cost.
- MFP concept has been appreciated by some entrepreneurs who are requesting for MFPs installation.

# Achievements – Impacts ctn...



- TaTEDO has some expertise in MFPs systems design and development in the country
  - Capacity has been developed.
    - Among TaTEDO staff.
    - Partners, technicians, entrepreneurs, communities.
  - Methodologies and tools developed.
    - Manuals, training and hands on documents prepared.
    - Contractual arrangements and agreements prepared.
  - Interest from other organization on MFPs
    - Training for Konserve Consult and Vedco (34 farmers) in Uganda.
    - Requests for training from organization in Kenya, Zambia.
    - Study tours, a number of visits to the project sites by different visitors form inside and outside the country.
    - TaTEDO personnel visited Brazil, India and Mali for sharing experiences and learning.
    - Student research projects, providing information.

# Achievements – Impacts ctn...



- **Improved business performance.**
  - Better lighting – reduced smoke.
  - Extended hours of work and business till 23hrs.
- **Introduction of new business with increased village security.**
  - Video show.
  - Barber and salon shops.
  - Mobile phone charging.
  - Sewing business.
- Increased market for Jatropha seeds, value addition at the village, seed cake remain as bio fertilizer at the village.
- **Improved livelihoods.**
  - Members of families able to read and study during the night.
  - Families earning more from business using electricity.
  - Increased earning from milling, dehusking and battery charging.
  - Reduced women walking distances and time to milling machines.
  - Gained time especially for women for productive activities.





- **Technical sustainability.**
  - Low down – time till date.
  - Village Energy Team, entrepreneurs/cooperative and operators successfully managing the MFPs systems.
  - Relatively simple technology.
- **Social Sustainability**
  - MFPs, easily mainstreamed in the village way of life, priorities and planning.
  - Interest and ownership increasing in the VET and community at large.
  - Appreciating the benefits of access to electricity and motive power at the village.
  - Local production, processing, use and management of modern energy.
- **Financial sustainability**
  - Tariff 7000Tsh/month for households, 9000Tsh/month for small business with one socket. And Tsh.15000/month for larger business with multiple use.
  - Since October 2006 more than 98% payments, salaries of operators and other running expenses met.
  - Other income generating activities – grain mill, battery charging, dehusking etc. very much appreciated by the community and entrepreneurs.



## • **Institutional Sustainability**

- High support from the District Authorities.
- VET comprises representatives from the village.
- Gender representation considered.
- Rules and regulations being adapted and enforced.
- Competent , disciplined and well coordinated institutions necessary for the success of MFPs.

## • **Environmental Sustainability**

- Jatropha growing contributing to carbon sequestration. (emerging scientific data).
- Low total environmental impact on using Jatropha compare with diesel use.
- Compare to the use of diesel, use of Jatropha has: - total GHG emissions of more than 14 times lower
  - **Savings of 2kg co<sub>2</sub> eq. per kwh.**

# Challenges



- **Limited and seasonal supply of Jatropha seeds.**
  - Limited production, Jatropha is grown traditionally for fencing by small farmers using wild and low yield jatropha varieties.
  - Competition from other buyers.
- **Initial high costs of MFPs equipment.**
  - Some equipment are imported.
  - Inflation and taxes.
- **Low management capacity**
  - Ownership could be private, villagers, cooperatives, CBOs or jointly.
  - VET regulations for services and payment enforcement.
- **High energy prices** – when diesel is used
  - Sometimes spares not accessible.
  - Investments repayment would take longer duration.

# Lessons Learnt



- Adequate and continuous supply of Jatropha seeds is key condition for the viability of MFPs rural electrification and motive power provision. Also for lowering user prices and, improving local economy and livelihoods.
- Traditionally/wild grown Jatropha varieties are not predictable in terms of yield.
- Need to connect optimal number of customers, other needed modules i.e. Grain milling, oil press, battery charging and water pumping during the first days of installation.
- Need for adequate training (technical, business management)
  - Mainstream at different levels; village, district and national.
  - Different stakeholders, policy makers, operators planners, entrepreneurs.

# Recommendations and Conclusions



- Provide adequate extension services, financial, inputs and market support for farmers to grow Jatropha for meeting local energy needs and to form strong associations.
- Establish market networks for processing and fair marketing of the seeds at village and outside cooperation.
- Strong involvement of local authorities for support in expertise, enforcement of regulations and laws.
- Support local entrepreneurs/villagers to access financing for Jatropha growing MFPs and biodiesel projects.
  - Fund, long term soft loans
  - Government to introduce appropriate incentive, initial capital subsidy, tax exemptions for MFPs.
  - High hopes on REA and Rural energy fund; these are promising initiatives.
- Need to standardize designs, procedures and code of practices initially.
- Develop those MFPs system enterprises that would demonstrate technical and financial viability.

## Recommendations and Conclusions



- Biofuels for transport and export is receiving a lot of attention. However, biofuels offer tremendous potential to improve access to modern energy services (electricity and fuels) in rural areas and contribute to poverty reduction and improved livelihoods.
- TaTEDO pilot project has offered a lot of lessons that can serve as a model for scaling up, replicating and mainstreaming rural electrification through Jatropha SVO in most villages in Tanzania.
- Strategy of the Government and related stakeholders should be to achieve for each unelectrified village at least one MFP, and for each district one biodiesel plant to meet local energy needs before exploring outside markets.

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Thank you for the Time and Attention.



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