

Renewable Energy for African Agriculture

a LEAP-RE project

Business models and techno-economics
of electrification of smallholder
agriculture in sub-Saharan Africa

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Long-Term Joint EU-AU Research
and Innovation Partnership on Renewable Energy



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Designing business models for the agri-energy nexus



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Energy access is at its lowest in **rural areas**, and a significant portion of productive uses in these areas are **agriculture-based**.



Productive uses of energy are core to financial sustainability of energy access projects;



Designing energy access business models around **agricultural activities** and electrifying those activities **cost-effectively** are key in the overall success of rural energy access interventions.

TFE's techno-economic model to identify financially viable electrification opportunities in agri value chains



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Goal: Determine the financial viability of electrifying agro-processing and irrigation from the perspective of the smallholder farmer

Main value add: Methodological. The model's key aim is to calculate the payback period, net present value and internal rate of return. The less time it takes to “pay back” the upfront cost, the better.

Secondary value add: The model has been populated with indicative data to provide example insights of techno-economic viability of processing and irrigation activities across key value chains in Nigeria, **Zambia, Zimbabwe** and Rwanda.



All models are wrong, but some are useful

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George Box

Introduction to the methodology



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- **The central equation of the model: Marginal profit vs capital expenditure**
- In turn, **marginal profit** = Marginal revenue – marginal cost

	Marginal revenue	Marginal cost
Definition	The additional revenue enabled by the irrigation/processing activity	The ongoing costs of performing the irrigation or processing activity
Calculation	For irrigation activities: <ul style="list-style-type: none">• Price margin (\$/kg) x yield (kg/ha) Agro-processing activities: <ul style="list-style-type: none">• Throughput (kg) per hour x operating hours x price margin (\$/kg)	The following costs are considered: <ul style="list-style-type: none">• Transport of crops• Salaries for operators of the pumps/machines• Maintenance• Electricity (\$0 for standalone, variable for grid and mini-grid)

Part 2: Design considerations for business models targeted at smallholder agriculture



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- PAYGO (lease to own and service based PAYGO models)
- The Keymaker model
- Community centred business models

Implementation of business models are influenced by:



Regulations



Financing



Infrastructure (digital and physical)



Thank you for watching!



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For any more questions, contact:
André Troost at andre.troost@tfe.energy

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