A2E ACCESS TO ENERGY INSTITUTE I

Productive-Use Methodology for Evaluations

OCTOBER 13, 2020

A2EI Webinar

A2EI

Access to Energy Institute

Non-profit, collaborative R&D platform for the off-grid energy industry in Africa

Elliot Avila

Research Director at A2EI
Founder at Imara Tech

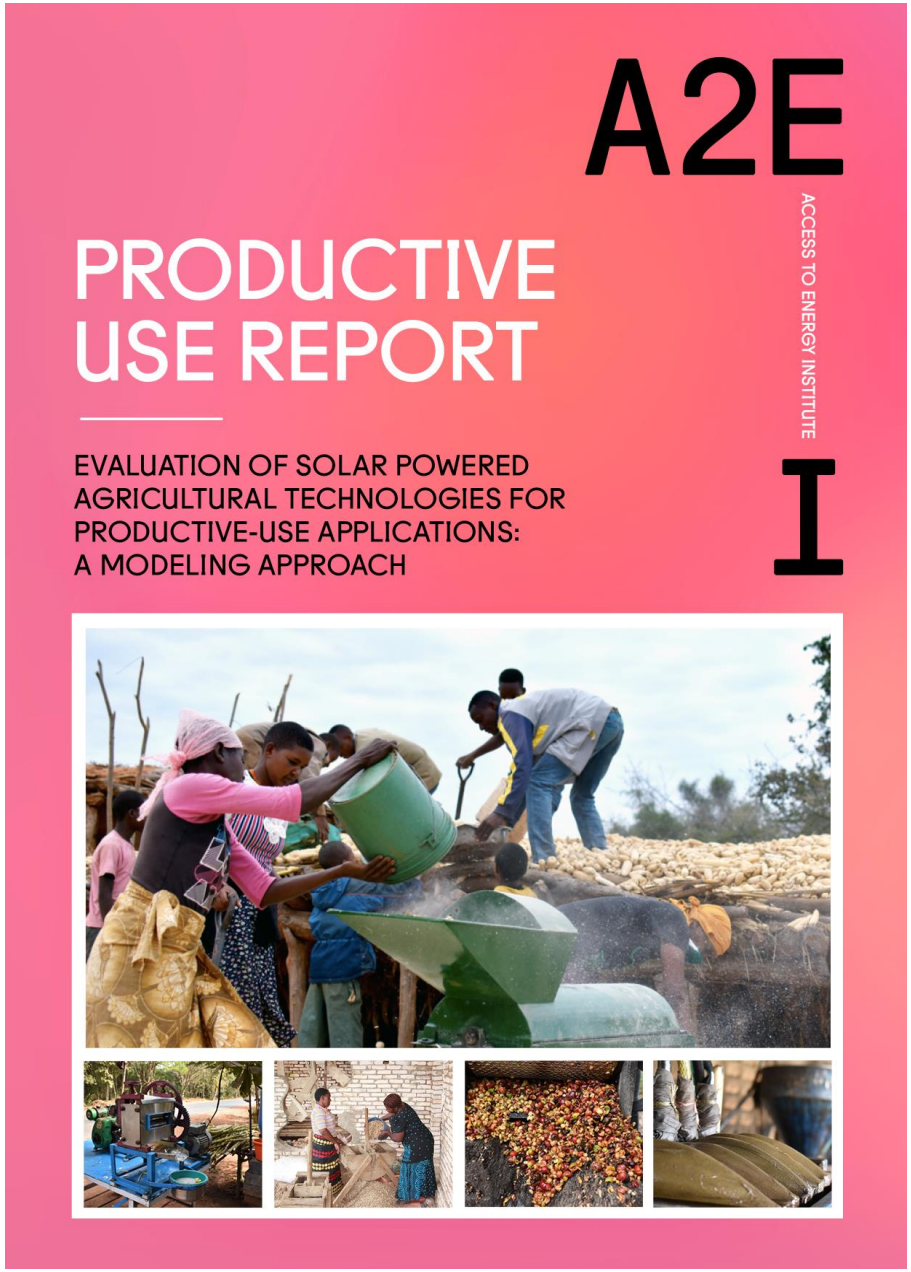
Supported by

IKEA Foundation

STICHTING DOEN NATIONALE POSTCODE LOTERIJ

Good Energies POWER FOR A BETTER WORLD

FMO Entrepreneurial Development Bank



Motivation

Which productive-use technologies will scale? Which ones will not?

Key Premises for Paper

1. The value proposition of a productive-use technology is the income that it generates.

2. We can estimate income generation of a productive-use technology with a business model.

3. We can estimate the market potential for productive-use products by evaluating their business models.



10 Products were selected for evaluation

Coffee Peeler

Peanut Sheller

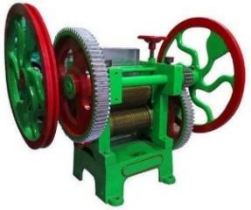
Oil Presses

Flour Mill

Rice Huller

Electric Dryer

Fruit Juice Blender



Sugarcane Juicer

Maize Sheller

Spice Mills

A business model was constructed for each technology

Original Scenario

What were things like before?

New Business Scenario

What are things like now?

Technology Assumptions

What product is used and what are the specifications?

TECHNOLOGY ASSUMPTIONS		
Specification	**Unit**	**Value**
CAPEX Costs	$	$2000
Power	kW	2.2
Throughput	kg/h	28

Business Assumptions

What is the day-to-day operation of the business?

BUSINESS ASSUMPTIONS		
Specification	**Unit**	**Value**
Price per Seed	$/kg	$0.065
Daily Usage	h/day	8
Seasonal Utilization	%	50%

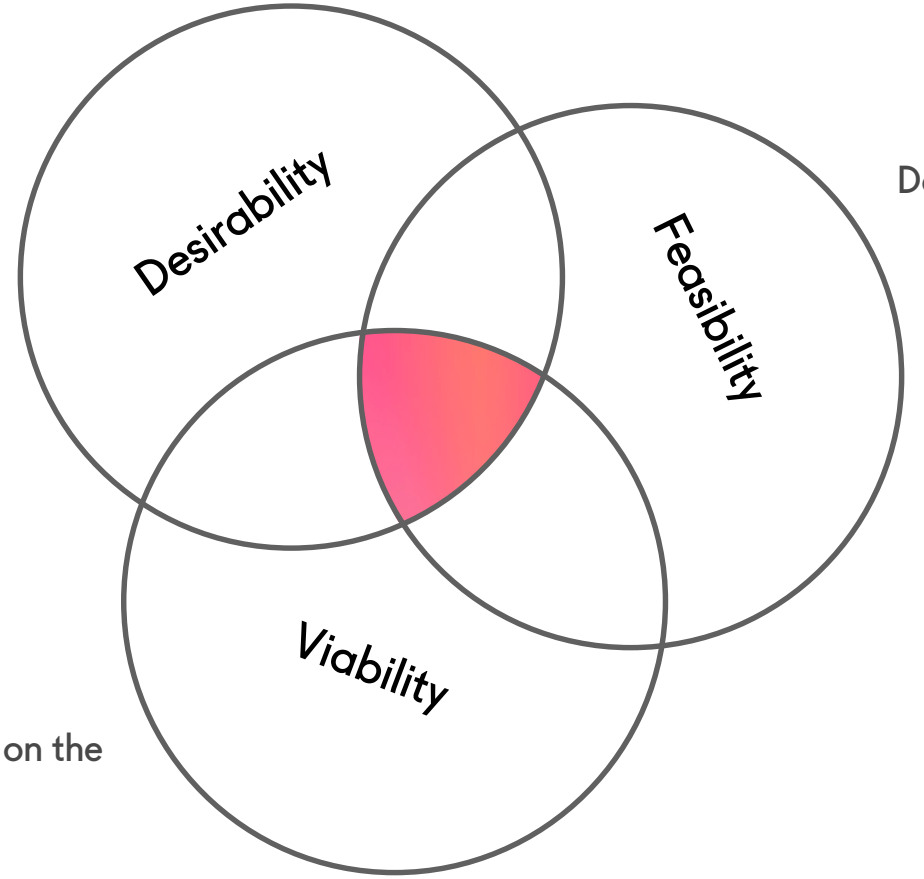
The business models were evaluated

Does it earn substantial profit?

Is the demand predictable?

How much gross profit goes toward the product?

Are the products/services better than alternatives?



Does the product work?

Is it easy to train users on the product?

Do users require business training?

Is the product desirable at half capacity?

Results were analyzed and conclusions were made

Too many transport challenges

Coffee Peeler

Very promising

Peanut Sheller

Works with the right technology

Oil Presses

Has potential, but not without challenge

Flour Mill

Has promise, but needs the right market

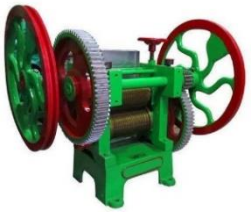
Rice Huller

Electric Dryer

Profitable, but requires market linkages and training

Fruit Juice Blender

Best as supplementary income



Sugarcane Juicer

Works if not a retrofit model

Maize Sheller

Stiff competition and big transport challenges

Spice Mills

Not appropriate for Tanzania

A Few Key Insights

#1 Efficiency and power are just pieces of the picture.

Manual Coffee Pulping

75W required

- Considerations such as transport and service charges can be more important than technical specifications
- Ultimately *cost-efficiency* is more important than *energy efficiency*

#2 Earnings per acre is a shortcut to understanding scalability.

Low-Value Services

Pulping Coffee

~$3/acre

Shelling Maize

~$4/acre

- Need to serve large area to be profitable
- Competition risks
- Transport is an issue

High-Value Services

Pressing Oil

~$23/acre

Shelling Peanuts

~$26/acre

- Can be successful serving small area with little supply
- Less susceptible to competition
- Incentives to overcome transport barriers

#3 For food businesses, the population size is key.

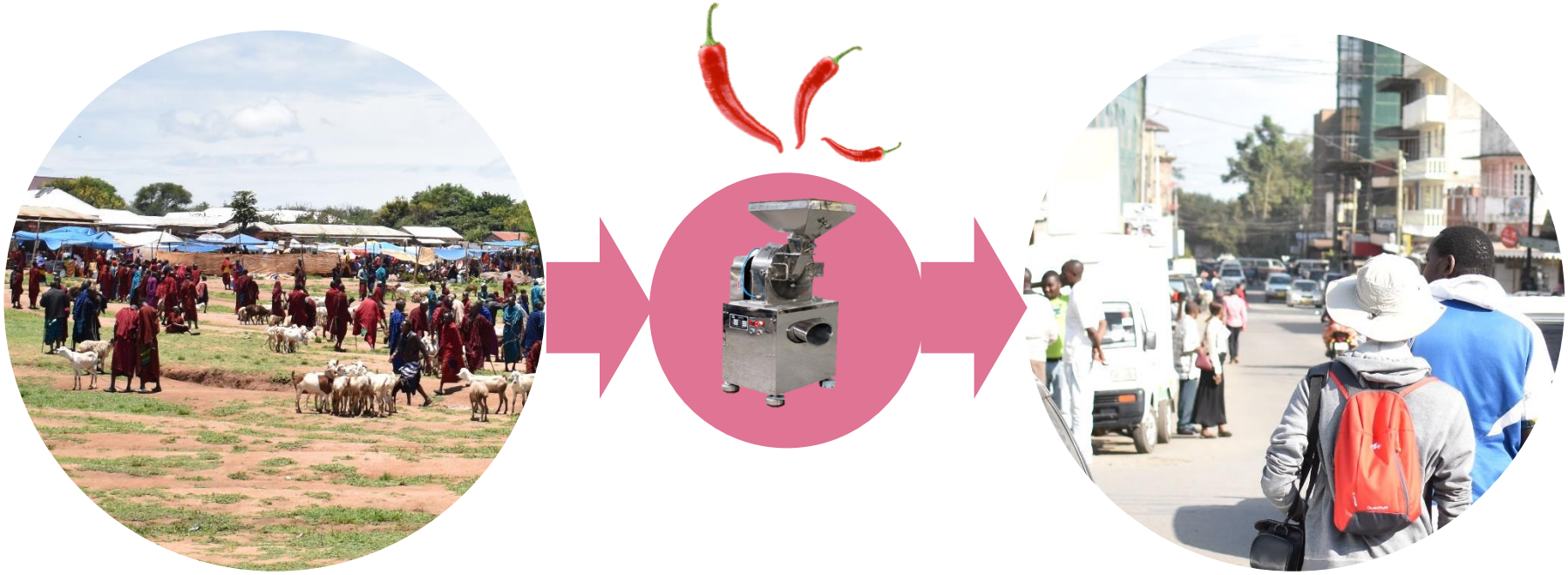
Maize Flour Milling

~~~$21/acre~~~

~$5/household

- Applicable when processing material only for consumption (e.g. milling, hulling, spice grinding)
- These businesses perform best in highly populated markets
- Pain point for these technologies is finding the right market
~~~

#4 Just because it can happen off-grid, doesn't mean that it should.



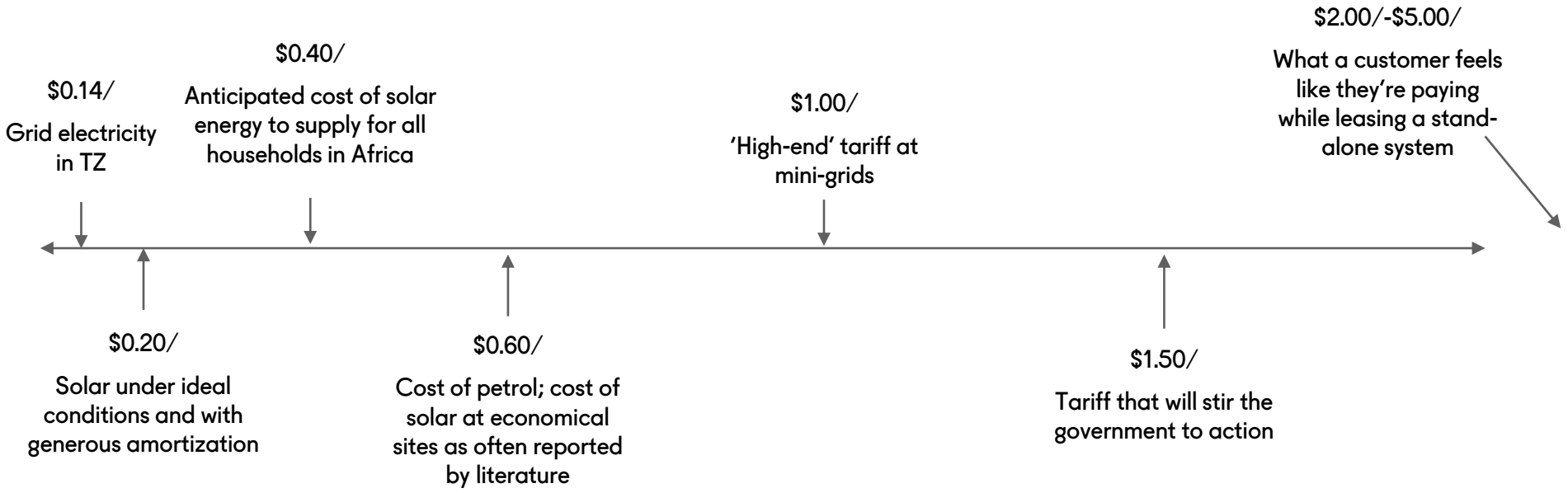
- If the market for an end-product (e.g. ground spices) is on-grid, it's often more efficient to simply process it on-grid
- Transport or quality could result in exceptions to the above statement
- Value addition: there needs to be a good reason why it should happen in rural areas or off-grid

Applying This Methodology: Why and How

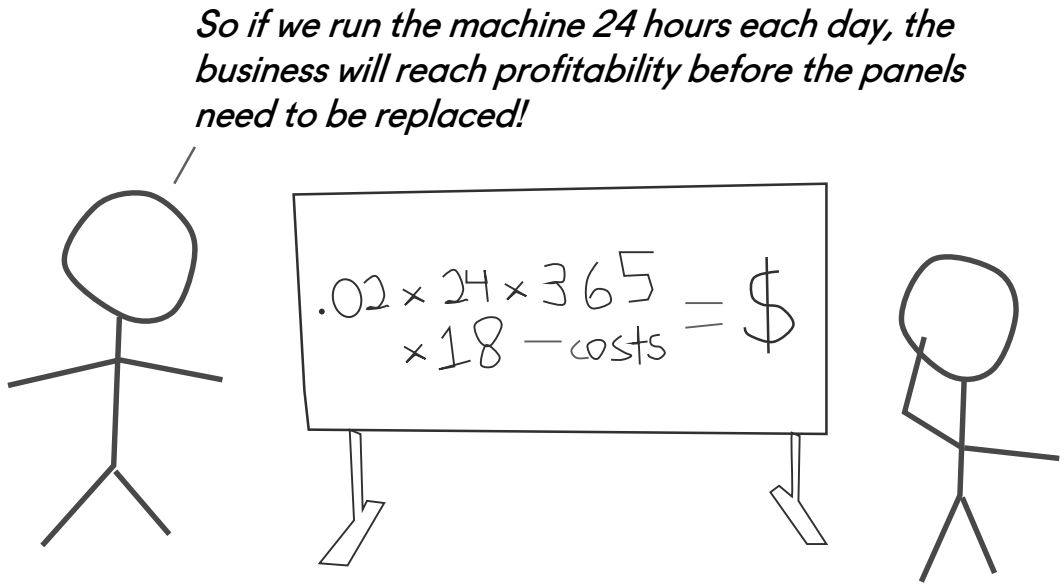
Why use a model?

- Forces transparency in discussion
- Can be made simple or complex as required
- Easy to modify: responsive

A contentious question: what is the cost of solar energy?



How Investors & Entrepreneurs Should Apply This Tool



- Bring a model to the table for discussion
- Talk through each point: these are the levers to work with
- Play with the model and change some numbers
- Focus on what seems unbelievable or what *isn't* working
- The entrepreneur's next move should address the weak points

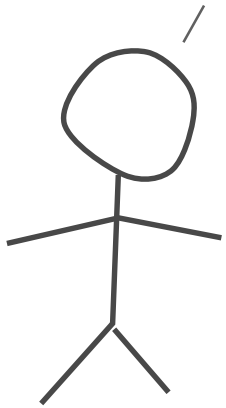
How Researchers Should Apply This Tool to Amplify Results

Lifetime cost Comparison of diesel mills and G2 mill

Description	Diesel Mill	G2 Mill
Production		
CAPEX (USD)	1,000	2,500
Life (yrs.)	10	10
Daily production (kg)	300	140
Throughput (kg/hr.)	150	32.7
Average operating hours per day (hrs.)	2	4.3
Annual production (kg p.a.)	109,500	51,100
Availability/seasonality factor (%)	85%	80%
Annual production (kg)	93,075	40,880
Power Requirement		
Size of motor (kW)	20	1.2
Loading factor (%) - 80% for diesel	16	1.2
Revenue		
Price charged for milling (USD/kg)	0.045	0.045
Annual revenue (USD)	4,188	1,840
Lifetime revenue (USD)	41,884	18,396
Expenses		
Capex	1,000	2,500
Cost of diesel (USD p.a.)	2,555	-
Repair and maintenance (USD p.a.)	300	98
Labour costs (USD p.a.)	780	780
Battery replacement (USD p.a.)	-	250
Rent (USD p.a.)	-	-
Total expenses (USD p.a.)	3,635	1,128
Summary		
Annual profit (USD)	553	712
Payback period (years)	1.8	3.5

VS

After months of rigorous testing behind closed doors, we got some nice bullet points to include in the annual report.



- Include a model that represents typical use cases(s) in publications
  - Ex: After a pilot, model one of the users in the pilot
  - Can be the model of an actual user, *or* can be a representation of a user
  - Does not need to be the main body

How All of us Can Apply This Tool to Innovate

Problem: throughput too low for energy consumption

Engineer solution: technical modifications and improvements

Problem: not profitable without large base of end-users

Donor solution: RBF subsidy for remote areas

Flour Mill

Problem: high upfront costs and high risks for customers

Entrepreneur Solution: business owns mills and offers services to end-users

Problem: costs for identifying customers drives up

Market Enabler Solution: Open-source tool to easily identify markets based on satellite imagery

- Focus on what isn't working and build a problem framing statement around that point
- Start the ideation and design process from the business model
  - *How might we… improve any input used in the business model?*

What's Next?

- Updates and Annexes
- One-on-ones with stakeholders to gain insights to how the sector is applying this kind of methodology
- Product development: Mill, Peanut Sheller, Oil Press