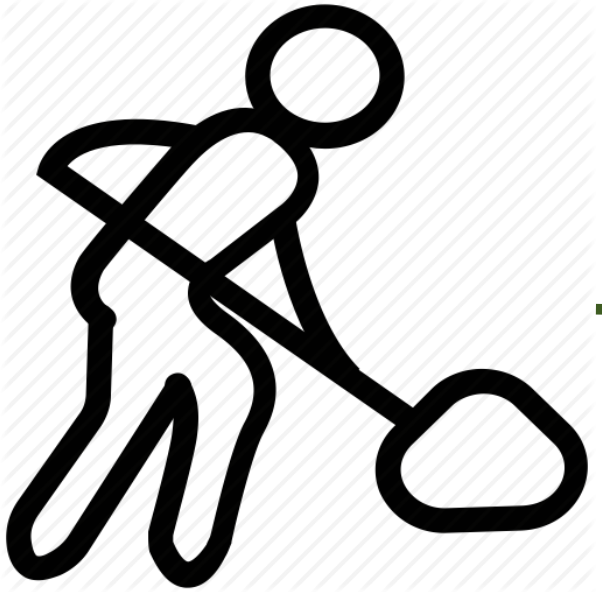
Thoughts on Clean Cooking Access for Rural Malawi:

... trying to create access by organizing with rural Women's Groups

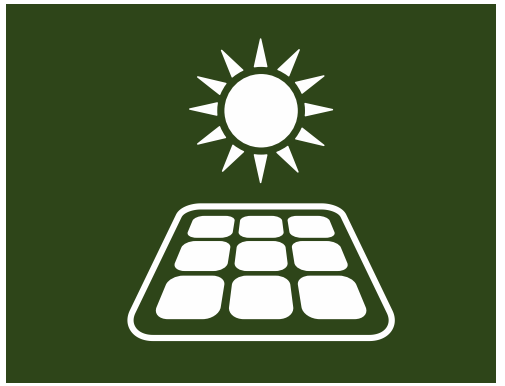
Robert Van Buskirk, Ph.D.: https://solar4africa.org

Electricity Access is Key to Increased Income in Rural Africa

Manual Labor has the power of a 100 watt light bulb



Solar power can increase labor productivity



And costs only $1 per watt!

If Manual Labor can produce $1000/year of value for 10 years, then this value is ~$10,000

This means that a $100, 100-watt solar-mechanical system might also produce ~$10,000 of value over 10 years

Which implies that a low-cost, long lasting solar systems might create ~$100 of Value for every $1 Invested!

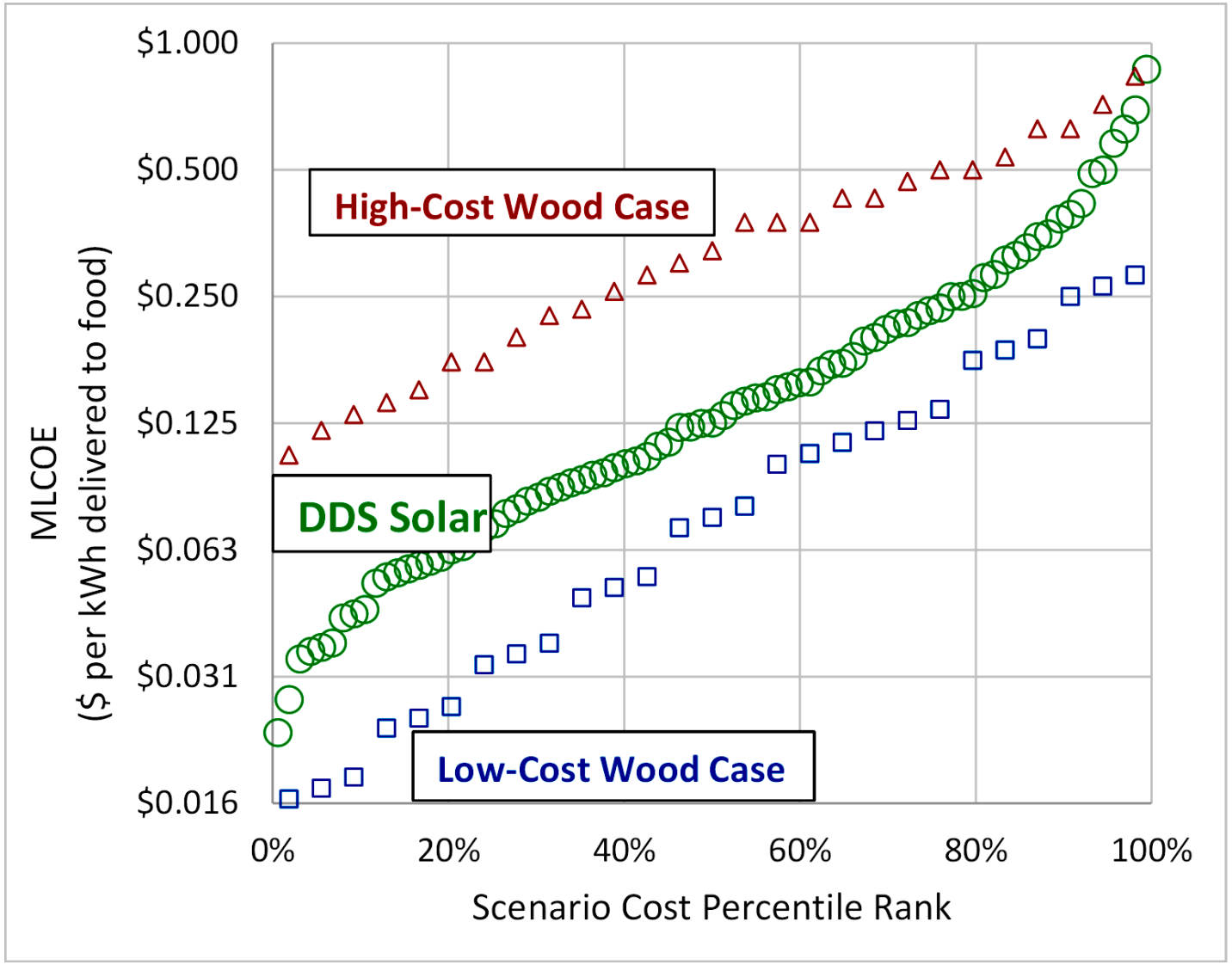
Rural Malawi operates in a Manual-labor-based Subsistence Economy

- Almost all labor is manual
- Even transportation (walking and bicycle taxis)
- Most income is spent on food
- Food is corn mush, beans, greens, eggs and only occasional meat
- 1/3 of consumption is self-produced with non-cash activities & resources
- Hundreds of millions of Africans living in very-cash-poor subsistence economies

A key to electric cooking access is cheap electricity

In rural Malawi, solar electric cooking need to beat wood.

This is possible with direct-use solar!



What does direct-use cooking look like?

EPCs are connected to a panel, either directly or through an MPPT controller to increase efficiency

A 200 watt panel can provide about 0.7 kWh/day of cooking on sunnier days.

But on about 1/3 of days it can be difficult or inconvenient to get any cooking done.

Direct-use cooking also provides daytime AC electricity with NO BATTERY

The same MPPT controller than can be used to control the voltage to the cooker, can also be used to control the input voltage to an AC inverter that costs only $10.

And the MPPT controller costs only about $35.

With no initial need for batteries, the key to off-grid solar electric cooking is empowering women to buy solar panels

We partner with village women's groups to open local solar shops.

We pay the rent, and they earn commission income on everything that passes through the shop

---

Roughly 10% of households can afford a $100 system now.

~90% of households need a higher income to make this affordable

How to generate income for solar cooking?: Solar pumps

Hundreds of thousands of women in Africa irrigate gardens by hand to generate income in the dry season

Income is proportional to Yield

Yield is proportional to Area Irrigated

Area Irrigated is proportional to Water Supply

Water Supply is limited by Labor Supply for Many Women's Gardens

Greater Water Supply Labor Productivity = Increased Income

Pump sharing decreases investment cost & improves impact

Gardens need to be irrigated only once per week

Five to Ten women can share one solar pumping system that costs $100 to $200

Investment Cost = $20/woman

Crop Rotation = 100 days

Value/Crop = 100 days x $2/day = $200

Doubled Production = $200 new income

Target Pump Life = 10 rotations

TOTAL VALUE = $2000/woman

Income Generation = $100:$1

Preliminary evidence of impact

Low-income women's groups are willing to pay >$100/system (50% of cost) and their investment payback time is months, not years

An NGO pilot-tested the pumps: their farmers increased farmed area by 4X

One farmer that rents the pumps full-time reports that income is $1000 to $2000 per rotation, he doubles his farmed area with the pump, and he does 2 to 3 rotations per dry season

And the solar pumps generate a lot of happiness:

The reception we get for solar pump distribution events is incredible!

Hybrid Pumping/Cooking Financing Model

A. Initial purchase of pumps by Philanthropy
B. Women by solar panels needed for pumps
C. When pumps aren't used panels are used for cookers
D. Both poverty credits and carbon credits are earned by women's use of pumps and cookers
E. Impact credits earned are used to help buy more solar panels that run more pumps and cookers

What are our planned “next steps”

A. We have set up about a dozen women’s shops
B. We are distributing pumps and panels over the next four months
C. Women will earn income between June through December
D. We will distribute discounted cookers and solar panels to the women’s groups that do the best at earning income with the pumps.
E. We will also try to set up an “impact credits” scheme for both the pumps and the cookers and engage with “Effective Altruism” philanthropy.

Last year we distributed >100 solar pumps. Next year we will to distribute >500 groups.
We plan to distribute ~1500 cookers to these >600 groups in the coming year & measure impacts.