KENYA BANKERS ASSOCIATION

Business Opportunity
Case Study

Innovation in Social Technology for Agriculture: New Opportunities for Finance

The Case of Solar Milling and Agsol

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ABSTRACT

This case study looks at the opportunity for banks to invest in solar milling; an emerging technology with the potential to make daily agricultural tasks both more equitable and climate friendly. In East Africa, milling is one of the most frequent tasks smallholder farmers undertake. When staple crops such as maize, millet, sorghum and cassava are converted to a staple flour, they require milling before they can be eaten or sold. This makes smallholders frequent customers of mill owners typically visiting a mill one to two times per week[1]. Most mills are off-grid and diesel powered, imposing economic and environmental costs on top of these staple yet low margin products. Conversely, as this case study will explain, solar mills, which cost less than a diesel mill and nothing to run, represent an equitable and environmentally friendly alternative with the potential to transform rural landscapes and futures. All that is missing for this innovative technology is financing, in order to take off and meet the widespread demand for affordable, accessible, climate-friendly milling in rural areas; a critical contribution in greening Kenyan agriculture that Kenyan banks are well positioned to make.

BACKGROUND

Not all crops are equal. Some crops are grown for export, require specialized care, command high prices and provide attractive returns to those who cultivate them. Then, there are crops grown for direct consumption and sale on the local market. Staple crops like maize, millet, sorghum, and cassava fall in the latter category. While they do not promise lucrative returns, these crops are critical to the livelihoods of Kenya and its rural communities.

Source: Agsol

The Problem with Conventional Milling

In East Africa, 24 million tonnes of maize are milled at the village level each year[2]. 74% of maize milled in Kenya is processed in small scale posho mills, usually powered by a diesel engine.[3] Posho mills are categorised into three groups: small, medium, and large, based on their different output capacities. Small mills are used in rural settings, medium-sized mills in towns or busy market centres, and large mills are recommended for commercial flour milling plants. But even small mills can be inefficient and expensive to operate. Given the cost of turning on diesel motors, mill customers often wait until a critical mass of produce has arrived before turning on the machine. This creates time costs and

[1] https://nextbillion.net/milling-on-mini-grids-africa-maize/
[2] Extrapolation from FAO production data of maize and Flour Fortification Study estimating % of maize milled by diesel mills in 9 East African countries.
[3] Agsol (personal communication, 2021 – based on internal research)

inconvenience to customers, wasting valuable productive time. Apart from emitting CO_2, diesel mills are costly to run, noisy, and the flour they produce can absorb a distinct unpleasant diesel flavour alienating customers. Families living in smaller or dispersed communities often struggle to access mills and must walk far and spend a lot of time getting their maize milled. This task and time burden is assumed primarily by women, who spend many hours each week walking to and from diesel mills and waiting for their produce to be milled. The dominance of diesel mills in the market – there are an estimated 500,000 small mills[4] in East Africa - not only creates negative environmental impacts through emissions – it undermines women's economic equality, too. The processing landscape for staple crops in Kenya and East Africa is therefore characterized by inequity, inefficiency, and environmentally unfriendly practice.

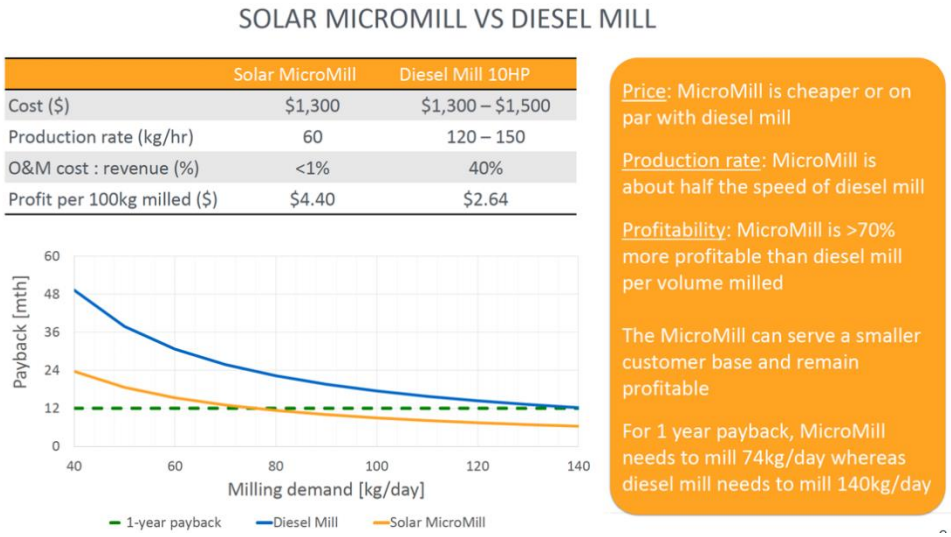
Source: Agsol

Innovating milling through solar power: The Case of Agsol

A lifetime of working in agriculture and renewable energy across three continents, coupled with frustration at inefficiencies in the solar processing sector, promoted Matt Carr and Greg Denn to create a solar-powered mill that could provide a more affordable, clean, efficient alternative to diesel generators. They set up Agsol, a company committed to providing agricultural and energy access solutions to off-grid farming communities across the world in 2016, as a vehicle to promote the use and sale of the solar mill they designed. After several iterations, the current version, the solar MicroMill was created. In terms of specifications, the MicroMill fares very well against the standard diesel mill in the market, as the figure below illustrates. While it is about 50% slower than a diesel mill, it is >60% more profitable because 40% of revenues from a diesel mill pay for fuel and maintenance costs to run it. Though a solar mill's only shortfall is that it is not able to process as much grain as a diesel mill, this in fact is a benefit to customers, who no longer have to wait for others to turn up for their grain to be milled – quantity is no longer a problem, and operating cost is nil. Additionally, research in Kenya has shown that small diesel mills in rural areas only mill an average of 110 kg/day, whereas the solar MicroMill can easily process 200 kg/day in standard format, or more than 300 kg/day with $200 of additional solar panels.

[4] Extrapolation from FAO production data of maize and Flour Fortification Study estimating % of maize milled by diesel mills in 9 East African countries.

As the solar mill costs nothing to run, it can reach breakeven with a smaller number of clients and therefore a smaller customer catchment area - less than 50 households suffice. As such, where one diesel mill may need to serve a 5km radius to be viable, a solar mill can serve 1km, leaving customers with a much shorter distance to walk to access their services. This difference results in dramatic improvements in gender equity outcomes, freeing up time for women who are primarily responsible for milling duties. And best of all, by emitting no fumes at all, the solar mill is 100% climate friendly, in complete contrast to the standard diesel mills.



Source: Agsol (personal communication, 2021 – based on internal research)

How Solar Mill changes Lives

Agsol has helped to improve the lives of mill owners like Wilfred Murithi in Mwea. Wilfred's wife used to walk 3km to the nearest diesel mill to process their home-grown grains. Wilfred realized he had an opportunity to not only save time for his wife, but to also generate business from milling for neighbours around him. Realizing that he would have a steady supply of milling customers available from neighbouring households as well as a farmers' group in the village who process chicken feed, Wilfred took a calculated risk in buying an Agsol mill from carefully amassed savings. Though it stretched him financially, he is glad he did as the mill has increased his daily income from additional milling business. Wilfred's customers, women like Rose Wambura, like his climate-friendly mill because it is close by, quiet, and doesn't leave the ugali flour tasting of diesel like the previous one she had to walk much further to, to use.

FINANCIALS

With solar mills targeting smallholder farmers living near or below the poverty line, the key customers for this product are extremely price sensitive. They are unlikely to purchase the machines if offered on loans with high interest or collateral terms. On the positive, since mills service a predictable, year-round grains market and grains processing service, they are never going to suffer from a drop in demand. With a predictable customer flow, and with no opex costs from operation, a micro mill could breakeven in one years' time, as calculated in this model below, with a presupposed interest rate of 12%:

Potential Solar Mill Payback Scheme					
KES	**Initial cost**	**Quarter 1**	**Quarter 2**	**Quarter 3**	**Quarter 4**
Investment					
Solar mill	130,000				
Total CAPEX	**130,000**	-	-	-	-
Interest 12%	**15,600**				
Opex	-	-	-	-	
Revenue					
Milling fees (350 per day x24 days)		25,200	25,200	25,200	25,200
Savings					
Diesel fees (180 per day x 24 days)		12,960	12,960	12,960	12,960
Total revenue	-	**38,160**	**38,160**	**38,160**	**38,160**
TOTAL COSTS	**145,600**	**107,440**	**69,280**	**31,120**	**- 7,040**

Source: Author of the case study; numbers based on example of a potential loan repayment model [5]

Beyond fixed term loans, other forms of innovative financing could be considered to support solar mill sales. M-Kopa pioneered selling solar devices through a digital finance model called pay-as-you-go (PAYG), which allows clients to pay for a product remotely via mpesa in manageable payment amounts, with the company able to remotely disable the solar panels in the case of non-payment. By incorporating a PAYG remote system, solar mills would become even more accessible and affordable to smallholder farmers. They would also be able to piggyback on existing customer channels already built by solar companies such as NCBA with M-Kopa solar products or Sidian with SunCulture's irrigation products. Agsol intends to incorporate PAYG capability in future versions.

OUTCOMES

While Agsol's solar mills do not offer huge returns at a unit loan level, the milling market is large, steady and untapped, representing an enormous opportunity for efficient solar technology companies with financing partners to tap into. Repayment of loans for solar mills can be considered low risk, as revenue from milling sales, as well as savings from avoided use of diesel or electric mains, are both constant. Additionally, with a regular customer base, an astute mill owner can capitalise by up-selling other goods and services to visiting customers.

From an impact perspective, benefits to women and girls and the environment are significant. Supporting social and environmental outcomes can build a bank's reputation and prospects for raising concessionary, impact-focused capital to invest in making the agricultural sector more climate friendly. Overall, transitioning from diesel to solar not only reduces the impact of climate change, it boosts village economies, increases labour efficiency and productivity, and keeps money within the community as well. Banks can achieve blended impact by releasing capital to finance the acquisition of solar mills.

[5] The savings calculation in this model presupposes that the solar mill has been purchased and is being used to replace a previous diesel mill. If this is not the case, and the mill has been purchased independent of a prior diesel mill, the savings calculation would need to be removed and the payback period extended by approximately 4.5 months.

TAKEAWAYS FOR BANKS

- Financing the purchase of new, climate-friendly products does not necessarily require dramatic innovation in standard due diligence approaches. Understanding who the clients are, what they will use the loan for and the cash flows for repayment remain the fundamental pieces of knowledge required. In the case of solar mills, the information is simple, and easily obtained.
- Banks may not always be the source of innovation in financial products. The market is often the first mover in the equation. Innovation in terms of the first product in the marketplace may indeed be driven by clients seeking a first-mover advantage. Banks need to develop internal systems and incentives to encourage employees to seek out, package and publicize new investment opportunities through the bank value chain, to enhance its green lending portfolio and reputation.
- Solar mills have the potential to be sold via a remote PAYG scheme similar to the one used by M-Kopa. As PAYG models provide steady cashflows, Agsol could partner with a local bank much as M-Kopa did with NCBA, and secure finance using projected cashflows from PAYG micropayments as collateral rather than traditional assets.
- To de-risk lending in the sector, banks may choose to finance the milling company over individual mill clients. Or the bank might choose to work with client aggregators (such as SACCOS), to reduce the risk that a large volume of transactions can represent.
- Opportunities to support the evolution of green technology in agriculture and the agricultural sector's transition to a climate friendly future may be more abundant and readily available than banks realize. Moreover, with expectations on banks to report on how their financing decisions are taking into account the impact of their capital on climate change (with regulations such as the Central Bank of Kenya's new Climate Related Risk Management Guidance on the horizon), it is an auspicious time for banks to be proactive in seeking out companies to finance the Kenyan agricultural sector's transition to a climate-friendly future.

For more information on solar milling, please consult Module 2: Solar Milling, and watch the video on Agsol in this module. More information on Agsol can be found at https://agsol.com/ and they can be contacted at matt@agsol.com.