AgriGrid

Opportunity Assessment Toolkit

The EnAccess Foundation

ANKA MADAGASCAR

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3 SITE DATA COLLECTION

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1 INTRODUCTION

About the AgriGrid Business Model

What is an AgriGrid?

"AgriGrid" is a business model concept that tightly integrates commercial-scale opportunities in energy access with opportunities in food & agriculture sectors throughout energy poor economies.

Why an AgriGrid project?

We believe that the tight integration of mini-grids with commercial agribusiness operations can dramatically improve the economics and social impact of modern mini-grid investments. Because an AgriGrid operator provides access to market for a community's food & agricultural products, rural household and micro-enterprise incomes increase. Over time, as community export revenue increases, the purchasing power of customers connected to the mini-grid also increases. Customers have the ability to purchase increasingly more electricity from the AgriGrid operator. This increased demand for electricity results in healthier and increasing revenue generation for the mini-grid operator (as compared to a *Business as Usual* scenario). Coupled with agribusiness margins, the performance and sustainability of the investment is improved*.

*See our corresponding ***Concept Note*** for more information on the AgriGrid business model.


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About this toolkit

Who is this toolkit for?
This toolkit is meant for mini-grid developers who are interested in assessing AgriGrid opportunities.

What's in the toolkit?
The toolkit includes a research methodology with suggested research activities, data sources, and developer insights to guide users through the identification, design, and pre-feasibility assessment of potential AgriGrid opportunities.

Examples from incubation work in Madagascar are included to provide users with an illustration of the activities outlined in the toolkit.

Why share this toolkit?
Increasing access to electricity in underserved, rural areas is important. But so is enhancing socio-economic inclusion and delivering long-term and positive impact. We believe that modern mini-grid companies bring valuable resources and capabilities to rural communities and are well positioned to deliver lasting economic impact beyond that derived from electricity access alone. We'd like to see more mini-grid business models move away from ***"selling rural electrons"*** and towards ***"creating rural wealth"***.

1 **Structure:** The toolkit is broken into five major sections: **Market and Pipeline Scan, Site Data Collection, Business Case Development, Modeling, and Evaluation.** The clickable table of contents allows you to choose which section you want to look at.

2 **Content:** Each section contains research and analysis activities which are described by **objectives**, **processes**, and **milestones**. Suggested **data sources** and **developer insights** are included where possible.

3 **How we did it:** Examples from our experience in incubating an AgriGrid investment opportunity in Madagascar, in a community referred to as "MadaSite", are included in the "How we did it" parts.

4 To make this toolkit more practical, **tools and tips** are integrated in section where possible. They can be used as action templates that will help you design your own project. Feel free to us it!

Using this toolkit

Starting point: This toolkit assumes that a mini-grid developer has a site pipeline with detailed site planning information available. If this is not the case, additional research and analysis will be required.

Scope: This analysis focuses on unit economics and the initial assessment of an AgriGrid opportunity. We excluded analysis related to the broader market and investment climate – e.g. assessment of regulations and licensing in electrification and agribusiness sectors – from the scope of our work.

End point: The toolkit produces a pre-feasibility level of assessment. The approach brings developer teams to a decision about whether to further invest in analyzing/developing an AgriGrid opportunity.

Data confidentiality: In certain instances, data is anonymized or coded to protect sensitive or proprietary business information.

Use, Iterate, Adapt: This toolkit is a suggestion. We expect the approach to be refined and adapted to different contexts as required. For example, we adopted the perspective of developing a pilot at one site. Other developers might consider identifying and developing one business model, that can then be immediately scaled across several sites. This would require changes to the methodology presented here.

2 MARKET AND SITE PIPELINE SCAN

Exploring Food and Agriculture Market Opportunities

Objective
- To identify food & ag market opportunities that can be served, and food & ag commodities that can be sourced within communities.

Data Sources
- Literature
- National Economic Development Office or Investment Authority
- Employees, partners, business network
- The Observatory of Economic Complexity

Processes
- Define criteria for selecting markets
- Identify and size potential market opportunities
- Qualitatively assess market opportunities
- Identify supply of food & ag commodities

Milestone
- Shortlist of food & ag market opportunities

DEVELOPER INSIGHT

We limited our analysis to domestic demand for food & ag products in Madagascar. This was to bound our market exploration during the R&D project. While attractive international export opportunities likely exist, we considered these too complicated for a short R&D project.

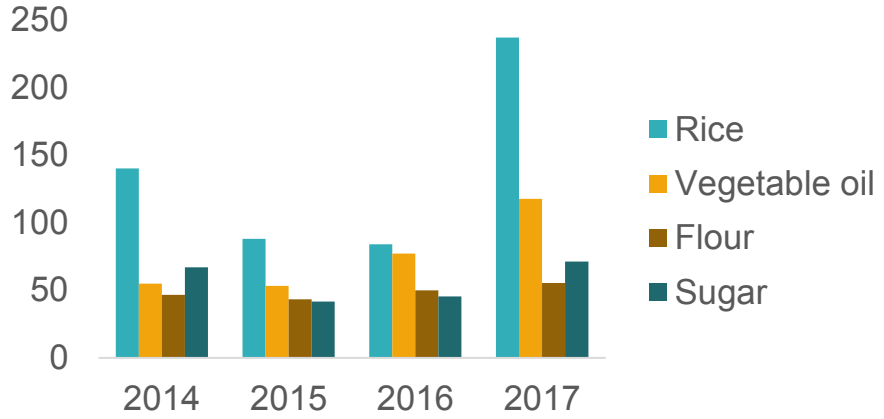
As a shortcut for market identification, we identified imported food products which could potentially be produced domestically. If products are being imported into the country, then demand is exceeding domestic production and net food import values could be used as proxy market sizes.

We also identified staple crops found at scale throughout the country. This was to get a sense of what raw commodities might be available in excess supply. Excess supply may currently be overlooked or considered as waste by existing agribusinesses. We wanted to identify whether commodity supplies may be available at a national scale which could be developed into commercial opportunities through optimized processes or new product development.

how we did it

Exploring Food and Agriculture Market Opportunities

National imported bill in Million (USD)



Average consumption of Vegetable oil of Malagasy household

Major staple crops produced in Madagascar (Production, million tonnes)

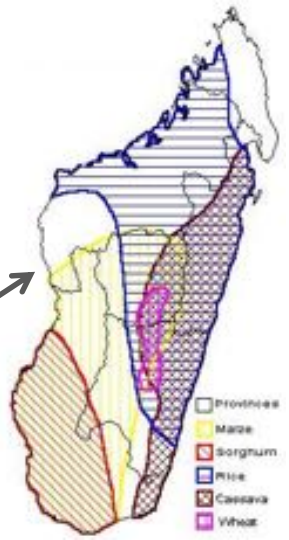
Rice: 4,03

Sweet potatoes:1,088

Cassava: 2,500

Maize: 0,250

Map of main crops in Madagascar



Key data to collect

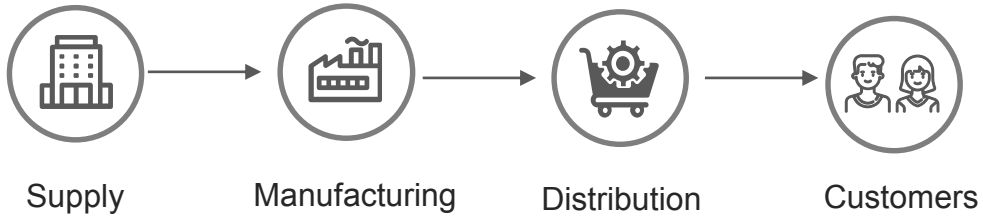
Domestic food production

- [ ] What are the top four major food crops that are produced in the country, by amount (tonnes or litres)?
- [ ] What domestic processing or value addition is done per commodity?
- [ ] What are the total domestic sales (in USD) per product?
- [ ] Where are these products being produced?
- [ ] Map the major value chains for each product. Identify the major steps of the chain, the major actors, and the estimated prices along the chain.

Food imports

- [ ] What are the top four food products that are imported in the country (by amount)?
- [ ] Which of these top four could potentially be produced locally?
- [ ] What amount (in terms of tonnes or litres) of these products are imported?
- [ ] What is the cost of these imports (in USD) per year?

Components of value chain



Assessment of Site Pipeline

Objective
- To identify specific sites and/or site clusters that may become viable AgriGrid investment locations.

Data Sources
- Literature
- Proprietary site data
- GIS and Google Maps data

Processes
- Define criteria to be assessed per site
- Collect agricultural data for each site
- Score sites (e.g. Multi-Criteria Assessment)
- Qualitatively assess each site (e.g. SWOT)
- Create “medium-list” of sites

Milestone
- Shortlist of top three sites

DEVELOPER INSIGHT

While creating a medium-list of sites, we took network effects of site locations into consideration. This means not assessing sites on a per site basis only, but also assessing clusters or zones consisting of several sites. An AgriGrid model implemented in one site alone may fail; however that same model may be viable if implemented with a Hub and Spoke sourcing model that spans several sites.

We tried to remain as systematic as possible throughout the market and pipeline scanning process. In reality, certain practical or groundgame factors can play a huge part in early stage decision making. The existence of a particularly engaged partner, enthusiastic community leader, or the specific interests of a committed investor are all factors that can outweigh the results of a considered analysis.

how we did it

Assessment of Site Pipeline

Example: Multi-Criteria Assessment of Sites

	Agricultural profile	Connectivity	Ecosystem
Site 1	• •	•	•
Site 2	•	•	•
Site 3	• •	• •	• •
Site 4	• •	• • •	• • •
Site 5	• •	• •	• • •
Site 6	• •	•	•
Site 7	•	•	•
Site 8	•	• •	•

Note: the dots range from 1 to 3

In this example we summarized the results in one table to have a clear overview.
We put dots to rank the villages:

- • Score under average
- • • Average score
- • • • Above-average

Example: SWOT Analysis for one site

S

- Large population
- Several micro-enterprises
- Short lean season
- Diversity of crops and products (high value crops, vegetables and fruits, staples)

W

- Limited accessibility during rainy season
- High amount of existing agribusiness activity (i.e. competition with traders)
- Close to national grid

O

- Proximity to regional capital
- Potential for new product development and value addition
- Existing agricultural NGO organizing farmer groups

T

- Negative reactions from existing businesses, traders, officials
- National grid connection
- Large and established agribusiness factory nearby

Score sites using multi-Criteria Assessment

Criteria	Description	Score
ACCESSIBILITY / CONNECTIVITY		Sub-total: …/5
Distance from the nearest town (km)	□ Less than 25km: 1, □ 25 to 50 km: 0,5 □ Up to 50km : 0	
Accessibility during rainy season	□ Easy : 1 □ Difficult : 0	
Frequency of transport (weekly basis)	□ Every day: 1 □ 3 to 6 days a week: 0,5 □ Less than 3 days: 0	
Number of villages in the surrounding area	□ At least 3 villages □ 2 villages □ 1 villages	
Telecom coverage	Good: 1 Medium: 0,5 Bad: 0	
AGRICULTURE PROFILE		Sub-total: …/5
First main crop in the village (in term of volume)	□ High value crop and could be processed : 1 □ Ordinary crop and could be processed: 0,75 □ High value crop but could not be processed : 0,5 □ Ordinary crop and could not be processed: 0	
Second main crop in the village (in term of volume)		
Third main crop in the village (in term of volume)		
Agriculture companies working in the area	□ Yes : 2 □ No: 0	
Existing cooperatives	□ Yes : 2 □ No: 0	

Score sites using multi-Criteria Assessment

Criteria	Description	Score
ECOSYSTEM		Sub-total: …/3
Presence of NGO or association in the village	□ Yes : 1 □ No: 0	
Presence of MFI	□ Yes : 1 □ No: 0	
Presence of productive use of energy	□ Yes : 1 □ No: 0	
		Total: .../15

SWOT Analysis for one site

S • …… • …… • …… • ……	**W** • …… • …… • …… • ……
O • …… • …… • ……	**T** • …… • …… • ……

After selecting the top **three** sites you can proceed to a SWOT analysis for each site.

Notice that SWOT analysis will help you to make your decision especially when you have villages with the same score.

Assessment of Existing Value Chains

Objective
- To identify existing food and agriculture value chains and value creation opportunities within the site pipeline

Data Sources
- Literature
- Proprietary site data
- Employees, partners, business network

Processes
- Identify value chains existing at pipeline sites
- Identify opportunities in food & ag value creation
- Define criteria for value chain scoring
- Score value chains at a site and cluster levels
- Identify the top three value chains per site

Milestone
- Description of the top three food & ag opportunities

DEVELOPER INSIGHT

When we pre-selected our three study sites, we decided to focus on three sites in the same area. This allows us to limit the impact on the study budget, to pool data collection and to consider the creation of a group of villages. Farmers in the targeted rural villages may grow several crops, but assessing all the different crops in the village can be difficult (in terms of budget and time management).

It is therefore important to reduce the list to the three main crops/value chains. Note that the identification of the same crops in the three pre-selected villages is not problematic: this allows for a comparison of the different situations in each village.

how we did it

Assessment of Existing Value Chains

Example: Assessment of Value Chains at a Single Site

- 90% of the community grow rice (i.e. inclusion)
- Two rice harvesting seasons per year (i.e. income)
- Rice is a national staple crop (i.e. scalability)
- Rice millers are diesel-based (i.e. value creation)

- Bananas are cultivated in several sites (i.e. scalability)
- Several processing options (i.e. value creation)
- Near year-round production (i.e. income)

- 50% of the community grow sugarcane (i.e. inclusion)
- Farmers sell to an off-taker (i.e. skills)
- Few sites in the country are producers (i.e. pricing)

Example: Overview of value chain assessment

	Market potential	Social impact	Scale and replicability	Seasonality
Rice	● ● ●	● ● ●	● ● ●	● ●
Banana	● ●	● ● ●	● ● ●	● ●
Sugarcane	● ●	● ●	● ●	●
Tomato	● ●	●	● ●	●
Mango	● ●	● ●	●	●

Example: Rice market opportunity's assessment

Processing opportunities

- ☑ Milling
- ○ Drying
- ○ Storing
- ☑ Pressing
- ☑ Threshing

Products opportunities

- ☑ Flour
- ☑ Oil
- ○ Juice
- ☑ Animal food

Main criteria for the assessment

Seasonality

- ☐ How is the seasonality impacting the value chain / crops?
- ☐ Are there opportunities for income smoothing?

Social Impact

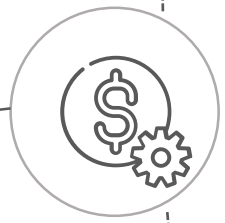
- ☐ What proportion of farmers will be impacted by the project?
- ☐ What is the potential for increased household income?

Scale and Replicability

- ☐ How widespread is the opportunity?
- ☐ Can the model be replicated to other sites?

Market Potential

- ☐ What opportunity for value creation does exist?



Processing opportunities

- ☐ Milling
- ☐ Drying
- ☐ Storing
- ☐ Pressing
- ☐ ……..

Product opportunities

- ☐ Flour
- ☐ Oil
- ☐ Juice
- ☐ ……..

Overview table

	Market potential	Social impact	Scale and replicability	Seasonality
Crop 1				
Crop 2				
Crop 3				

You can summarize the result in one table to have a clear overview:

- • Low potential
- •• Medium potential
- ••• High potential

3 SITE DATA COLLECTION

Rapid Scan of Shortlisted Sites

Objective
- To collect site-specific data in order to have an overview of the shortlisted sites

Data Sources
- Field data
- Literature
- Employees, partners, business networks

Processes
- Interviews and surveying
- Focus group discussions
- Observation

Milestone
- Database of food & ag value chain data collected from the top three value chains in the three shortlisted sites

DEVELOPER INSIGHT

After the pre-selection of sites, we strongly recommend that field surveys be conducted to collect key data that can help select the final pilot project. In this section, we present the primary data to be collected during the field surveys.

Always try to get as much data as possible from different sources (farmers' association, local authorities, contractors, national statistics, etc.).

how we did it

Rapid Scan of Shortlisted Sites

General information

- 1,262 Households
- 05 Schools
- 06 Churches
- 02 Clinics
- 15 Rice huskers
- 12 km from paved road
- Distance to:
  - Head of region: 145km
  - Closest main town: 13km
- Poor network coverage
- Daily bus
  Daily rickshaw to the main town
- Nearest grid: 13 km

Existing crops



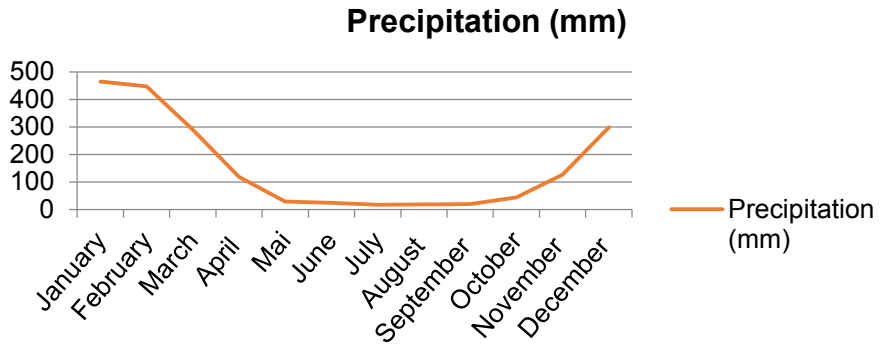

Emerging activities

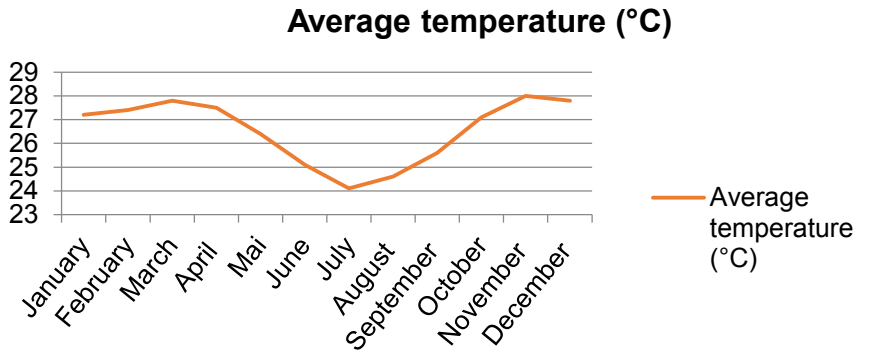
- Poultry businesses
- Rice husking

New opportunities

- Rice bran oil
- Rice bran for animal feed
- Dried banana and mangoes
- Irrigation

Climate





Community development

- There are five rice farmers' associations in the village. Their main objective is to share best practices in rice farming within the community.
- A new chicken farmers' association is present on site. This association was created by a local NGO to help young entrepreneurs to start poultry farming. There are currently ten young beneficiaries.

Key data points for the shortlisted site

Background information
- Physical
- Climate
- Seasonality data points

Potential for new activities
Qualitative assessment of community interest in new agricultural operations

Community development
- How are community decisions made
- Farmer's association
- Cooperative

Emerging activities
New and emerging economic activities and key entrepreneurs

Scan of the Shortlisted Value Chains

Objective
- Select a pilot value chain from the shortlisted crops

Data Sources
- Proprietary data

Processes
- Field data
- Literature
- Employees, partners, business networks

Milestone
- Pilot value chain selected for further assessment

DEVELOPER INSIGHT

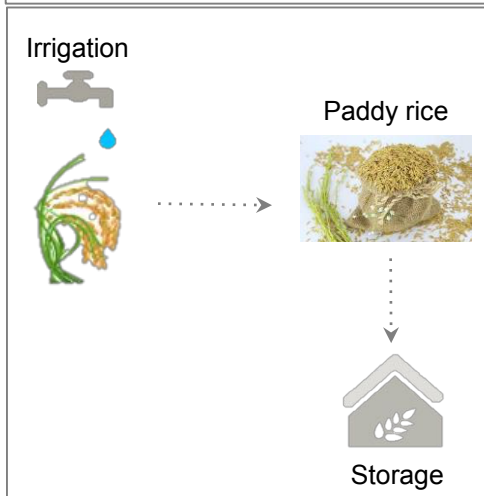
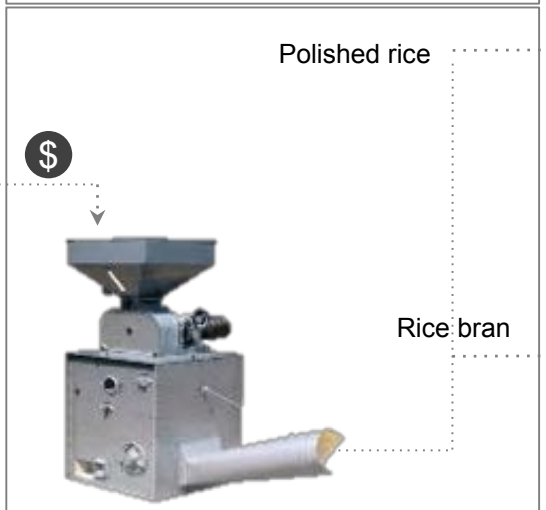
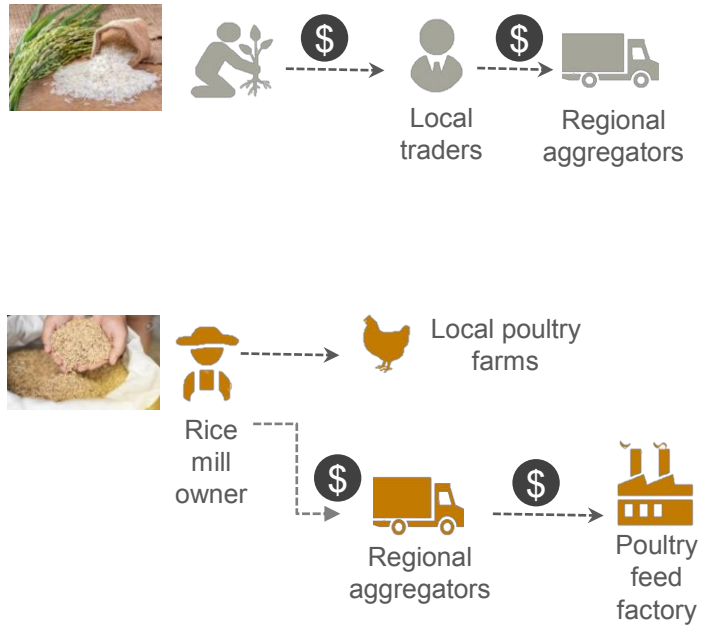
In order to select the value chain or pilot crops, it is essential to have a good understanding of the situation on the ground.

You need to describe the current value chain process from production to market.

Note that some data are difficult to obtain; in some cases you will have to use informal data. At this stage, you will need to have an agronomist on your team to gain a better understanding of activities along the value chain.

how we did it

Scan of the Shortlisted Value Chains

	Production	Processing	Market
KEY ACTORS	▪ Farmers	▪ Farmers ▪ Rice mill business owner ▪ Local traders ▪ Regional aggregators	▪ Farmers ▪ Local traders ▪ Regional aggregators (i.e. from other villages/cities)
VALUE CHAIN ACTIVITIES			

Key data points for crops value chains evaluation

Production

- ❑ Production steps + Expenses + Duration of the steps + Tools
- ❑ Current yield
- ❑ Crop calendar & seasonality
- ❑ Estimation of production volumes
- ❑ Estimation of water consumption
- ❑ Specificities of product storage (to avoid peak production)
- ❑ “Pain points”

Local processing

- ❑ Number of processing units
- ❑ Equipment used and maintenance
- ❑ Energy consumption
- ❑ Price of processing, in high and low seasons
- ❑ Yields and transformations
- ❑ Amount of crops processed per unit of time, in high and low seasons
- ❑ Specificities of product storage (to avoid peak production)

Market

- ❑ List of buyers
- ❑ Product transport means + costs
- ❑ Purchasing price (according to season)
- ❑ Sales price, high and low seasons
- ❑ “Pain points”

Key people

- ❑ Local authorities
- ❑ Farmers + associations
- ❑ Local traders
- ❑ Buyers from other localities
- ❑ Processing unit owners

Value Chain Selection

Objective
- Selecting the best value chain to be studied in depth

Data Sources
- Field data
- Literature
- Employees, partners, business networks

Processes
- Interviews and surveying
- Focus group discussions
- Observation

Milestone
- Database of food & ag value chain data collected from the top three value chains in the three shortlisted sites

DEVELOPER INSIGHT

Once you have a better understanding of the value chain, you will be able to identify the culture(s) to be studied in detail. In this section, we've put together some possible criteria that will help you prioritize them.

We have selected five criteria:
- Commercial
- Potential Impact
- Implementation
- Reproducibility and
- Technology

These are only suggestions, but you can use other criteria that can be adapted to your own strategy.

how we did it

Value Chain Selection

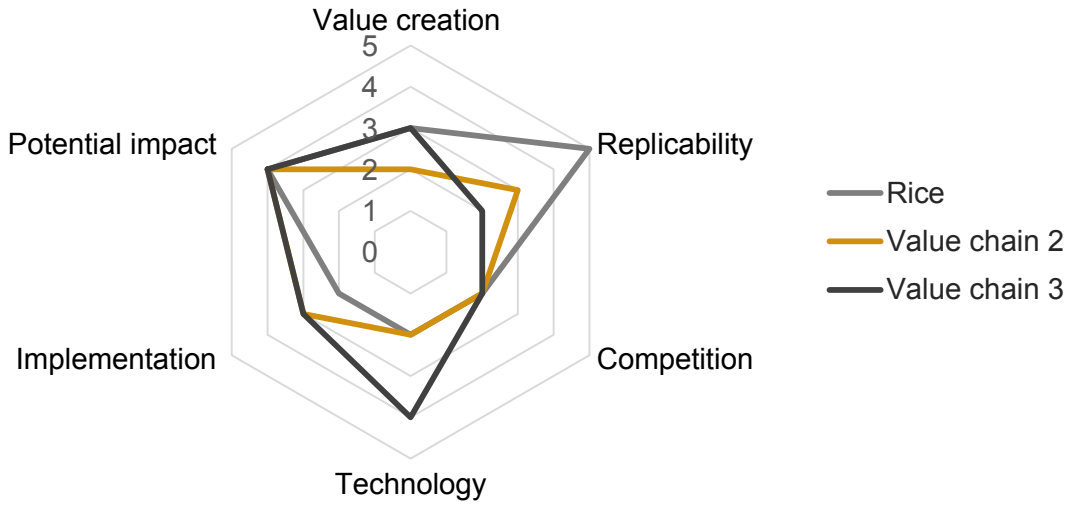
Description

90% of the farmers grow rice in the village. Usually, rice bran has no value to the farmers; they give it to the rice growers for free. Most of the time, farmers sell the bran at low prices to collectors to feed livestock and farm animals. Our literature review showed that rice bran can be processed into edible oil.

Assessment Summary of rice value chain

- Most farmers are growing rice
- The country imports a huge quantity of edible oil
- Rice-bran is cheap in the village
- Rice-bran oil is innovative
- The surrounding villages are growing rice as well
- Mini-grid can power a rice-bran factory
- There is limited information about the technology used for rice-bran processing

Quick value chain evaluation



Main criteria for value chain assessment

Commercial
- ❑ Potential for value creation
- ❑ Potential market size
- ❑ Competitive environment

Implementation
- ❑ Inclusivity
- ❑ Training requirements
- ❑ Cash management
- ❑ Potential for partnerships

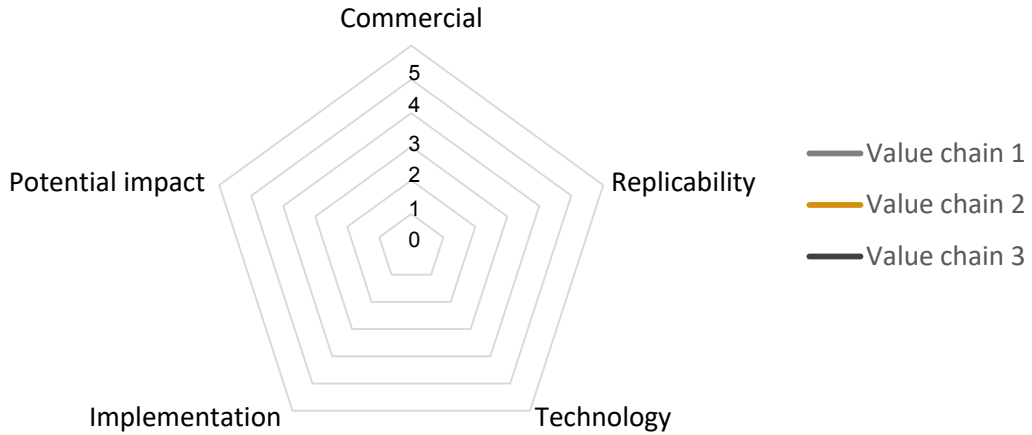
Replicability
- ❑ Replicability in other sites
- ❑ Scalability

Potential Impact
- ❑ Sustainable and substantial increases in income
- ❑ Economic benefits for a majority of the community
- ❑ Environmentally and socially sustainable

Technology
- ❑ Modularity
- ❑ Standardization

After analyzing these main criteria for every value chain / crops you can proceed with the value chain evaluation. You can use a radar graphic for visualization.

Quick value chain assessment



Deep Dive of the Selected Value Chain

Objective
- Collect detailed value chain data to inform a business model prototype and financial model

Data Sources
- Field data
- Literature
- Employees, partners, business networks

Processes
- Interviews and surveying
- Focus group discussions
- Observation

Milestone
- Detailed value chain data collected from the proposed pilot site

DEVELOPER INSIGHT

At this stage, it is important to collect in-depth data on the selected value chain. This key data will be used to prototype the business model.

In the following section, we propose the key data points (production, processing, storage, logistics and sales) that are essential to establish the business model.

Overview tab of the selected value chain

Production		❑ Total area in ha ❑ Crop yield per ha ❑ Farm gate price ❑ Volume sales ❑ Seasonal effects
Processing		❑ Required production capacity ❑ Machinery and equipment requirements ❑ Operation and maintenance specifics ❑ Training and labor requirements ❑ Investment requirements ❑ Seasonal effects
Storage		❑ Peak storage volumes ❑ Availability of buildings ❑ Humidity, temperature, other requirements ❑ Machinery and equipment requirements ❑ Operation and maintenance specifics ❑ Training and labor requirements ❑ Investment requirements
Logistics /Transportation		❑ Sizing of loads ❑ Frequency ❑ Costs ❑ Reliability and quality of service ❑ Build or buy ❑ Seasonal effects
Sales		❑ Mapping buyers ❑ Volumes, pricing, and other specifications ❑ Pain points ❑ Seasonal effects

4 BUSINESS CASE DEVELOPMENT

Identifying the Commercial Opportunity

Objective
- Identify the commercial opportunity

Data Sources
- Literature
- Employees, partners, business networks
- Proprietary data

Processes
- Commercial and technical research

Milestone
- Key commercial opportunity selected and researched

DEVELOPER INSIGHT

We began the study with a review of domestic demand for food and agricultural products in the country. We developed a shortlist of products such as flour and oil (see section "Marketing and Demand Analysis").

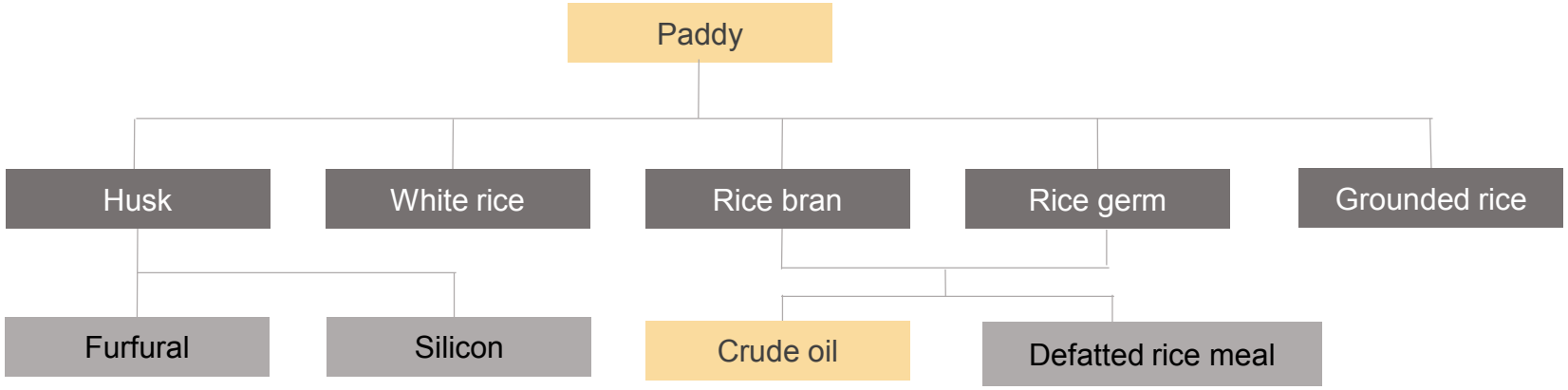
At the same time, we did a quick analysis of crops that could be processed into these products (for example, rice bran processed into edible oil).

During the field survey, we found that rice bran is mostly considered a waste product by farmers. We decided to take a closer look at this value chain.

how we did it

Identifying the Commercial Opportunity

Value added product from paddy

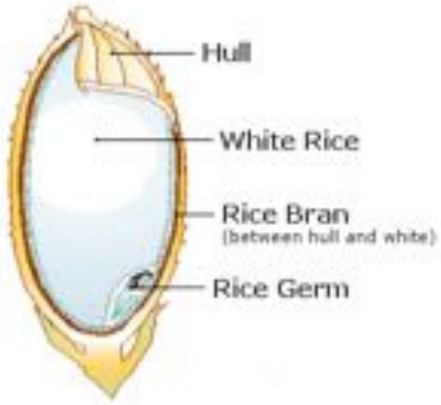


Facts

90% of farmers in sites grow rice

Rice by-products (such as rice bran) is undervalued by farmers. Usually they sell it for free to rice huskers.

The large majority of the edible oil sold in Madagascar is coming from abroad.



Opportunity

Rice bran is processed to edible oil in other countries such as India, Bangladesh and Thailand.

Rice bran oil is light and healthy (immunity boos, contain good cholesterol).

Business Model Prototyping

Objective
- Design a pre-feasibility business model prototype that can be modeled and further assessed

Data Sources
- Literature
- Proprietary data
- Employees, partners, business networks

Processes
- Identify value creation opportunities
- Assess actors and transactions
- Assess unit economics
- Assess scalability

Milestone
- Pre-feasibility business model prototype to be used for financial and impact modeling

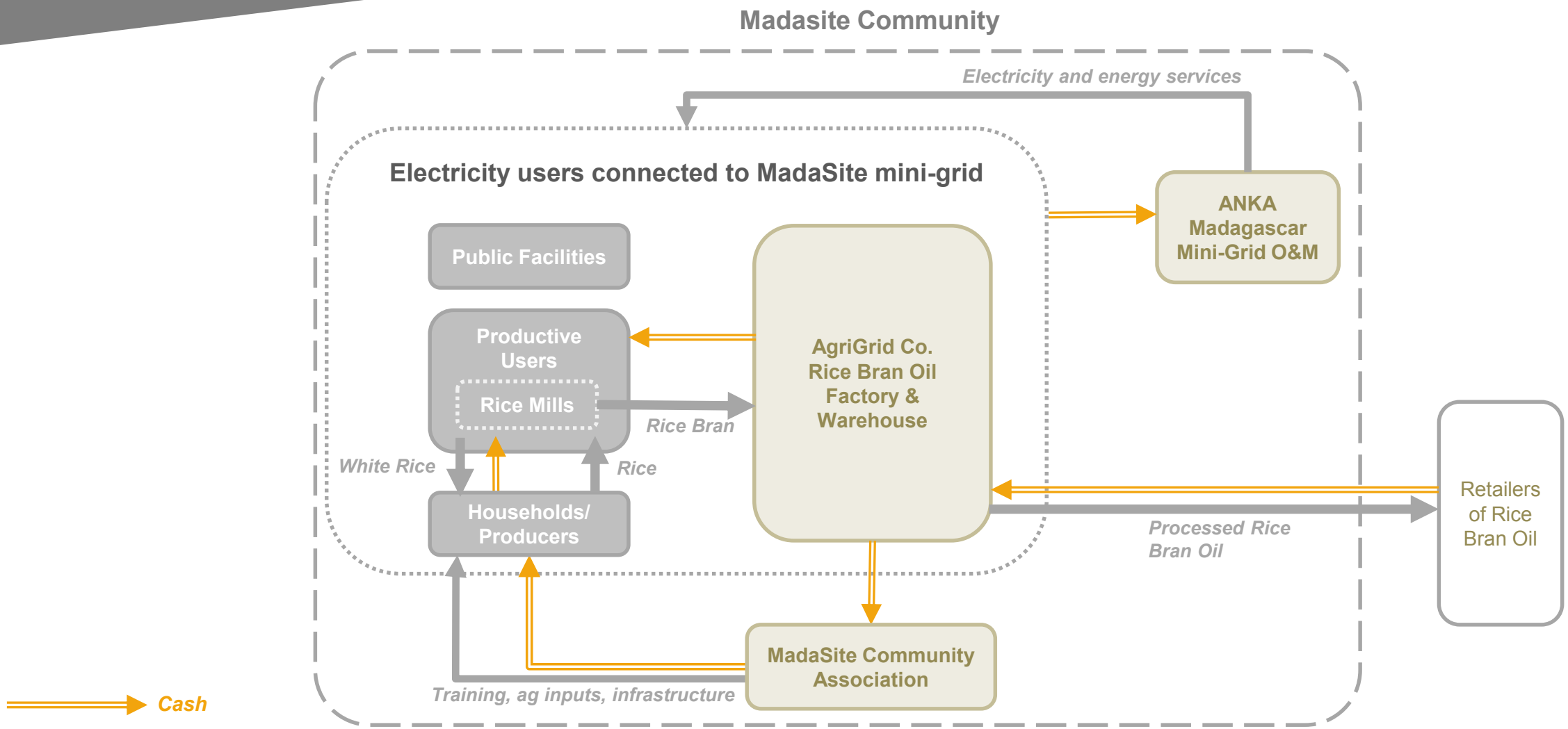
DEVELOPER INSIGHT

There are different ways of prototyping a business model, the most common being the business model Canvas. However, for your case study, we decided to make a simple model that describes the product, the customers and the flows between the different stakeholders.

This prototype model will allow you to better understand the creation of the value chain and at the same time help you to develop the financial model.

how we did it

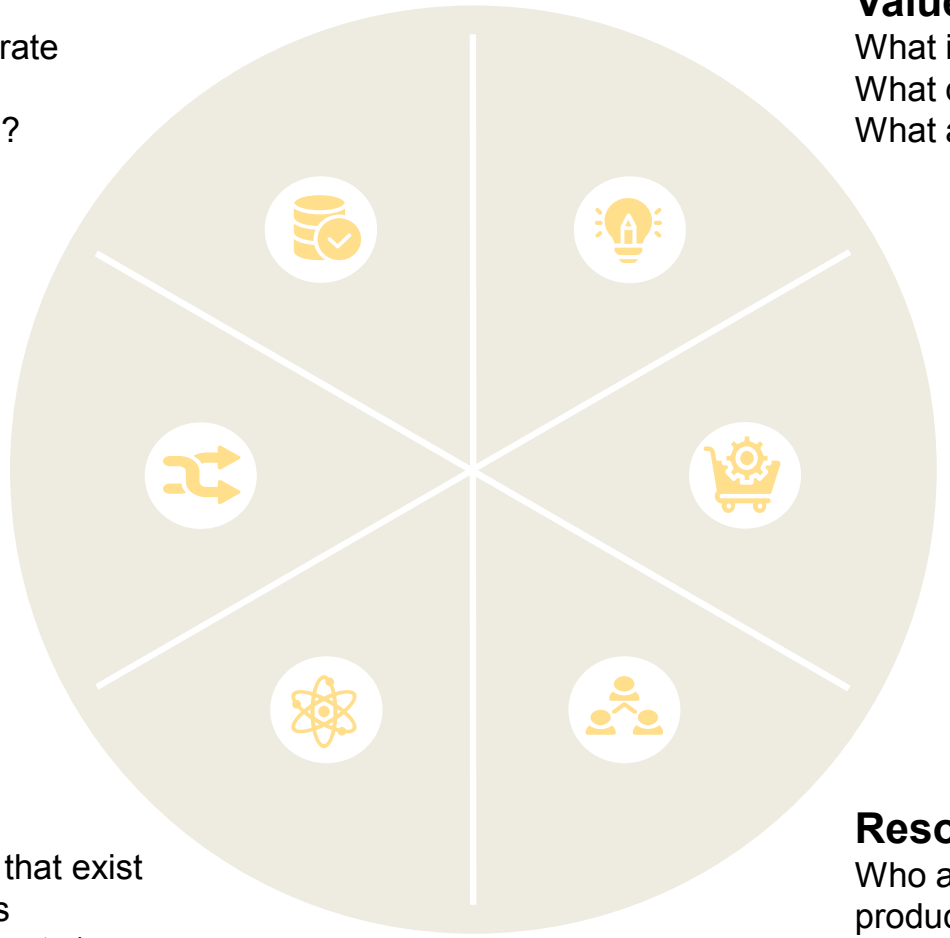
Business Model Prototyping



Business model prototype main components

Revenues
How can the value chain generate revenues?
What are the revenue streams?

Value creation
What is the added value of the value chain?
What distinguishes it from other value chains?
What are its strengths?



Channels
What are the distribution channels that can reinforce the added value of the value chain?

Customer segmentation
Who will be the direct beneficiaries?
Who will be the indirect beneficiaries?
Who may be negatively impacted?

Flow
What are the different relationships that exist between the stakeholders (business transactions, transfer of information, etc.)

Resources
Who are the stakeholders involved (raw material producers, collectors, buyers, resellers, traders, etc.)?

5 FINANCIAL MODELING

Preparing the Modeling

Objective
- Model and assess the operational and financial viability of the basic concept proposed for AgriGrid

Data Sources
- Crop research
- Literature
- Proprietary data
- Employees, partners, business networks

Processes
- Agronomic input
- Supply chain and operations modeling
- CAPEX, revenues and OPEX estimations
- Comparison of mini-grid (stand-alone) vs. integrated AgriGrid model - small and large size

Milestone
- 25-year financial model for the proposed AgriGrid concept
- **Improved financial indicators from AgriGrid**

DEVELOPER INSIGHT

Agronomic input
- Crop yield high-season/off-season to determine peak production & power capacity required
- End product content
- Chemical & physical processes
- By-side products

Supply chain & operations
- Collection and purchase of rough commodities
- Transport to processing facility
- Storage
- Processing activities
- Packaging activities
- Marketing activities
- Both direct and indirect sales
- Electricity flows

Financial modeling
- CAPEX
- Gross margin from main end product
- Gross margin from extra sold electricity
- Adjusted overhead
- Model simulation
- Funding simulation

Results
- Improved equity IRR, NPV and payback period compared to pure mini-grid
- Improved project IRR & NPV
- Profit sharing between AgriGrid and community

Main key attention points

Need for technical input from specialized agronomists:

- Chemical composition and characteristics of both interim and end products;
- Special treatment and processing steps to get the final product determine the production function and related costs;
- Required technologies and engineering knowledge;
- Required additional inputs and input-output ratios.

Good understanding of realities on the ground, with regard to harvesting seasons and yields, logistics and distances, or shipment channels are required.

Validate the final product in terms of competitiveness compared to existing (imported) products in the market.

Determine local or international providers of other supplies along the value chain, for instance for packaging.

Specific mini-grid engineering expertise is required to determine additional loads as well as production or distribution capacity expansion. Consumption needs to be carefully broken down into sales to third party productive users along the supply chain and consolidated consumption on own account.

Be careful with assumptions: they might require additional research and validation before implementation.

Based on the increased mini-grid capacity, additional CAPEX for production and maybe also distribution mini-grid equipment need to be added to the financial model.

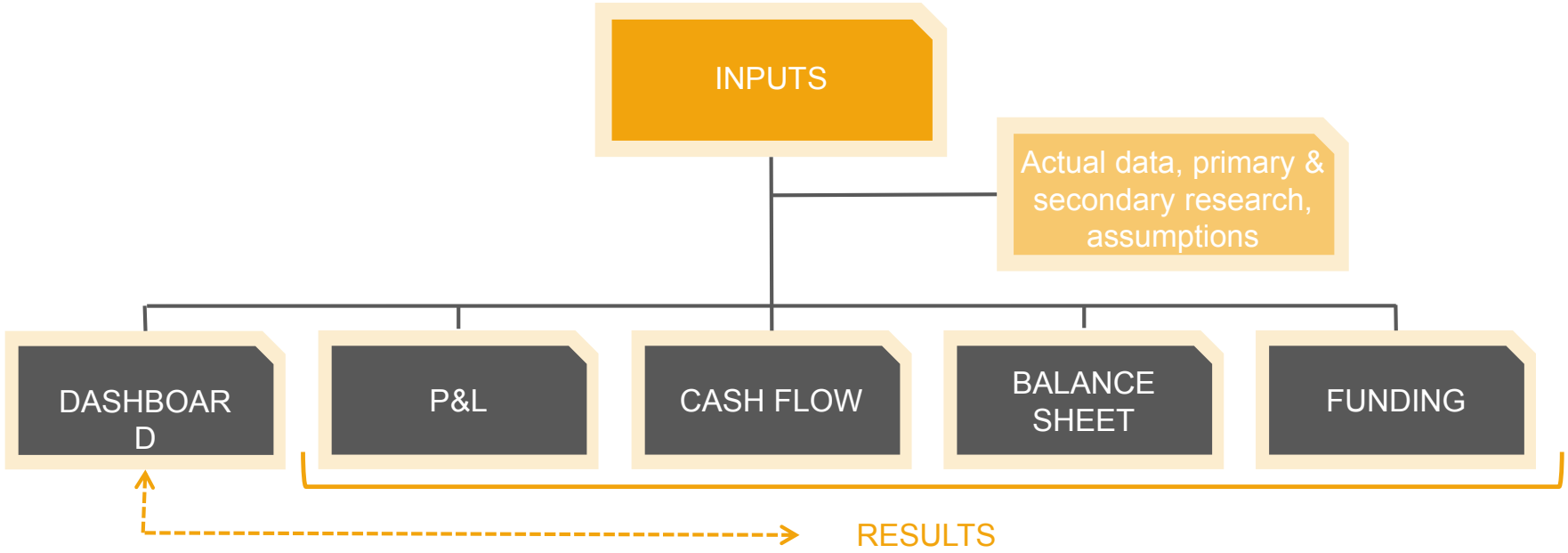
On a consolidated level it is important to avoid counting for revenue on the side of the mini-grid which is OPEX on the agri-processing side since this will be reflected incorrectly in cash flows and profitability figures.

Modeling Inputs and Outputs

DEVELOPER INSIGHT

A state-of-the-art integrated financial model should be used, as follows:

- An input section for factors, drivers and assumptions determining CAPEX, sales, OPEX and cash flows;
- A P&L section;
- A balance sheet section;
- A funding section considering grants (incl. first loss tranches), equity and debt;
- A cash flow statement;
- A Dashboard, highlighting the major results and assumptions (e.g. for funding).



how we did it

Modeling Input and Output

Supply Chain and Operation

DEVELOPER INSIGHT

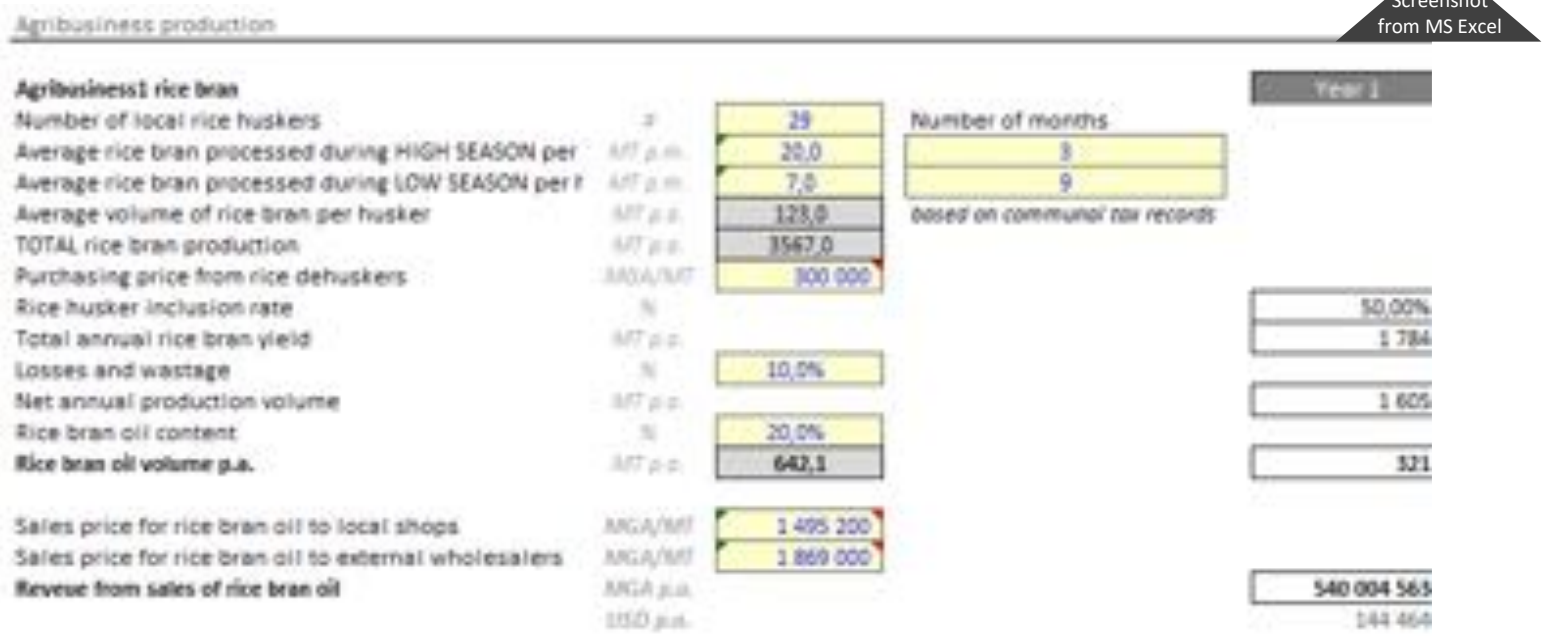
Financial modeling of the agricultural supply chain will try to translate on-the-ground activities into (simplified) data points both for volumes and financial figures. Some financial figures may still be based on estimations or assumptions and may require additional research and validation. Scalability of the financial model may also be limited if the economies of scale are not fully known. For instance, logistics with local means may be an appropriate means for a small-scale approach but not feasible for a large-scale model with trucks and heavy-duty machinery.

Translate supply chain data points into financial model

Yields

Sales

Screenshot from MS Excel



Agribusiness production

Agribusiness1 rice bran				Year 1
Number of local rice huskers	#	29	Number of months	
Average rice bran processed during HIGH SEASON per	MT p.m.	20,0	3	
Average rice bran processed during LOW SEASON per h	MT p.m.	7,0	9	
Average volume of rice bran per husker	MT p.a.	123,0	based on communal raw records	
TOTAL rice bran production	MT p.a.	3567,0		
Purchasing price from rice dehuskers	MGA/MT	300 000		
Rice husker inclusion rate	%			50,00%
Total annual rice bran yield	MT p.a.			1 784
Losses and wastage	%	10,0%		
Net annual production volume	MT p.a.			1 605
Rice bran oil content	%	20,0%		
Rice bran oil volume p.a.	MT p.a.	642,1		321
Sales price for rice bran oil to local shops	MGA/MT	1 495 200		
Sales price for rice bran oil to external wholesalers	MGA/MT	1 869 000		
Revenue from sales of rice bran oil	MGA p.a.			540 004 563
	USD p.a.			144 464

AgriGrid file - Inputs tab

Step 1

Create a copy of your mini-grid financial model and add a tab for AgriGrid inputs to it.

Step 2

Build your ag yield projection e.g. based on number of farmers involved, average farming area per farmer, farming yield per farmed acre or hectare, other inputs required, input-output-ratio for final processed product, differentiate between high season and off-season, and other…

Step 3

Sales prices may also vary between high season and low season, or for different sales channels (wholesale vs. direct retail sales) or for different target groups (B2B vs. B2C)

		Year1
YIELD / VOLUME PROJECTION		
Number of producers / supplier involved		
Average production during HIGH SEASON per		
Average production during LOW SEASON per		
Average volume of the products per producers		
Total of production		
Purchasing price from the producers		
Producers inclusion rate		
Total annual production		
Losses and wastage		
Net annual production volume		
SALES		
Sales price to wholesalers		
Sales price to retailers		
Revenue from sales of the products		

how we did it

Modeling Input and Output

Supply Chain and Operation

DEVELOPER INSIGHT

The AgriGrid model is supposed to stir both – the sales of value-added agricultural products processed with electric power and the sales of electricity from that additional agri-business income. Specific mini-grid engineering expertise is required to determine additional loads as well as production or distribution capacity expansion. Consumption needs to be carefully broken down into sales to third party productive users along the supply chain and consolidated consumption on own account for agri-grid processing. Also, seasonal peaks are very likely to be powered during the harvesting season if a product like rice bran cannot be stored for several weeks*. We have opted for surplus PV production capacity during off-season for other productive uses instead of installing peak diesel capacity.

Screenshot from MS Excel

Adjust mini-grid consumption to agri-grid requirements

*If rice bran is not stabilized, e.g. by enzymatic degumming, within four days after husking it will not be able to be processed into edible oil anymore

Productive users #

Portfolio Inputs

Phase 3 portfolio

		Growth rate	Total/site	Flat consumption				
				GSM Tower	Cold chain	Gas station	Agri-grid Farming	Agri-grid Transportation
Mini-grid	#		14	–	–	–	–	–
Rice bran oil	#		13					
Total			27	–	–	–	–	

Productive users tariffs

Fees, Tariffs and Charges

Connection & Installation Fees

		Phase 1	Phase 3
Connection fee	MGA/Connection	30.000	50.000
Upfront contribution indoor installation	MGA/Connection	50.000	50.000
Reimbursement of indoor installation	MGA/Connection	100.000	350.000

Tariffs & Charges

Phase 3 tariffs and annual charges

		Phase 3	Growth Rate	Year 1	Year 2	Year 3	Year 4	Year 5
Day Tariff	MGA/kWh	1.500	7,0%	1.500	1.717	1.717	1.966	1.966

Productive use penetration

Additional penetration rates

Phase 3 customers

Penetration Rate (by year of operations)

		Year 1	Year 2	Year 3	Year 4	Year 5
Mini-grid	hase 3 population	18,7%	37,4%	68,8%	75,0%	87,5%
Rice bran oil	hase 3 population	60,0%	80,0%	100,0%	100,0%	100,0%

Productive use consumption

Electricity consumption

Phase 3 day customers - overall consumption

		Year 1	Year 2	Year 3	Year 4	Year 5
Mini-grid	kWh/year	22.857	36.961	52.258	63.332	78.930
Rice bran oil	kWh/year	22.857	36.961	52.258	63.332	78.930
Agri-pyramid	kWh/year					
not determined	kWh/year					

AgriGrid file - Inputs tab

Step 4

Continue with modeling additional sales from electricity

Per mini-grid	Number of additional productive users, e.g. small-holder huskers	Estimated additional average new productive user (ACPU) in kWh	Applied tariff (most likely day tariffs only) in local currency/kWh	Additional revenues from sales of electricity in local currency
Site/village 1				
Site/village 2				
Etc.				
Totals				

Consider penetration rate over time!

Electricity consumption on own account for agri-processing shall not be considered as sales!

how we did it

Modeling Input and Output

Supply Chain and Operation

Screenshot from MS Excel

Logistics

Storage

Processing

Costs of 'internal' transport on own account				
Non-personnel-costs	MGA			
Trip capacity per zebu cart	MT	1,0		
Number of trips per day during high season	# per day	20,0		
Number of trips per day during low high season	# per day	7,0		
Total number of trips during high season	# p.a	1440		
Total number of trips during low season	# p.a	1512		
Service fee per trip during high season	MGA	15 000		
Service fee per trip during low season	MGA	40 000		
Total zebu transport service expenses	MGA			41 040 000
Personnell costs	MGA	n.a.		-
Total additional transport costs	MGA			**41 040 000**
Costs of warehousing				
Non-personnel-costs	MGA	*special equipment for rice bran required?*		
Personnell costs	MGA			
Number of warehouse administrators	#	1,0		
Salary	MGA/year	2 400 000		
Total annual pay				1 200 000
Total complementary warehousing and storage costs	MGA			**1 200 000**
Costs of processing				
Non-personnel-costs	MGA	*needs to be broken down further*		
Rice bran stabilization / degumming inputs				
Physical pressing inputs				
Other?				
Personnell costs	MGA	*needs to be broken down further*		
Total processing costs	MGA/MT	897 120		**288 002 434**

how we did it

Modeling Input and Output

Supply Chain and Operation

Screenshot from MS Excel

Packaging

Shipping

Costs of packaging				
Non-personnel-costs				
Large drum capacity	kg	160,0		
Share of local sales	%	50,00%		
Shelf life	days	14		
Drums per cycle	#	2		
Total number of drums	#	1813		
Cost per drum	MGA	16	added to CAPEX	
End consumer bottles/tins		needs to be broken down further		
Personnell costs	MGA			
Number of filling line operators	#	2,0		
Salary	MGA/year	2 400 000		
Total annual pay	MGA p.a.			2 400 000
Total packaging costs	MGA			**2 400 000**
Shipment costs				
Non-personnel-costs				
Transport service provider fee per trip	MGA	600 000		
Capacity per truck/trip	MT	7,5		
Number of trips per year	#			214
Total non-personell costs	MGA p.a.			128 412 000
Personnell costs	MGA	needs to be broken down further		
Number of filling line operators	#	1,0		
Salary	MGA/year	2 400 000		
Total annual pay	MGA p.a.			2 400 000
Total shipping costs	MGA			**130 812 000**

AgriGrid file - Inputs tab

Step 5 Continue with direct AgriGrid OPEX modeling

		Year1
Logistics		
Cost of one trip		
Number of trip		
Storage		
Cost of treatment during the storage		
Required capacity storage		
Processing		
Cost of pressing or cooling or milling etc…		
Personnel cost (number of employees * salary)		
Packaging		
Cost of drum / bottle / package		
Personnel cost (number of employees * salary)		
Shipping		
Non personal cost (cost of transport)		

Logistics in this regard refer in our model to farm and factory logistics which can vary depending on existing infrastructure and means of transportation

During storage, semi finished or end products may need additional treatment, like cleaning or cooling

Additional direct processing costs may not have been considered before

Packaging will also have to be determined based on local options since imports might be too expensive but eventually required for safety regulations and for shipping purposes

Shipping cost is related to the cost of transportation of the goods from the processing factory to the market

- Electricity consumption on own account shall not be considered as OPEX!
- Labour related expenses may apply along the entire supply chain

how we did it

Modeling Input and Output

P&L

DEVELOPER INSIGHT

The combined AgriGrid model needs to consider revenues and direct OPEX on both sides: for the mini-grid and for the AgriGrid. However, even overhead OPEX may have to be adjusted to the expended nature of the business. On a consolidated level it is important to avoid counting for revenue on the side of the mini-grid which is OPEX on the agri-processing side.

Screenshot from MS Excel

Mini-grid revenues

AgriGrid revenues

Mini-grid OPEX

AgriGrid OPEX

Overhead costs

Depreciation

Interest

Income Statement

Revenue							
Phase 1 Tariff	MGA				76.898.896	116.175.133	146.202.933	195.132.980
Phase 1 Connection & Installation Fees	MGA				55.586.910	28.507.564	26.917.856	18.820.576
Phase 1 Charges	MGA				12.352.647	21.017.387	27.170.439	35.776.159
Phase 3 Tariff	MGA				33.516.493	62.050.162	92.276.591	126.984.648
Phase 3 Connection & Installation Fees	MGA				4.687.313	2.476.415	3.502.272	462.358
Phase 3 Charges	MGA				2.083.250	3.579.530	5.180.673	6.160.741
Solar kits sales	MGA				17.036.800	4.259.200	9.583.200	2.129.600
Agribusiness1 rice bran	MGA				540.004.563	1.080.009.126	1.080.009.126	1.080.009.126
Total revenue	MGA				742.166.871	1.318.074.516	1.390.843.090	1.465.476.188
Operating costs							
Mini-grid operational site costs		Probability		Active flag:	1	1	1	1
Total	MGA				**97.273.520**	**113.472.488**	**138.144.140**	**166.672.902**
Agri 1 rice bran		Probability		Active flag:	1	1	1	1
Total Agri 1 costs	MGA				**463.454.434**	**924.508.867**	**924.508.867**	**924.508.867**
Overhead Costs							
Total	MGA				**76.000.000**	**57.980.000**	**60.068.900**	**62.272.690**
EBITDA	MGA				**92.927.517**	**219.451.160**	**261.199.982**	**310.690.729**
Depreciation	MGA				279.966.470	279.966.470	279.966.470	279.966.470
EBIT	MGA			**7.389.197.711**	**(187.038.953)**	**(60.515.310)**	**(18.766.487)**	**30.724.259**
Interest Expense	MGA				103.247.982	108.129.824	97.089.876	84.161.889
FX (profit)/loss	MGA				58.998.847	61.788.471	55.479.929	48.092.508
EBT	MGA				(349.285.782)	(230.433.604)	(171.336.292)	(101.530.138)

AgriGrid file - Inputs tab

Step 6 Create new integrated P&L including mini-grid and AgriGrid

	Unit	Year 1
Revenues		
Revenue from mini-grid		
Revenue from AgriGrid activity		
Mini-grid Operating cost		
Local human resources		
Operation and Maintenance		
Communication and Marketing		
…		
Agri-Grid Operating cost		
Logistics		
Storing		
Processing		
Packaging		
Shipping		
…		
Overhead Cost		
Human resources		
Office costs		
…		
EBITDA		
Depreciation and Interest Paid		
Depreciation		
Interest expenses		
FX (profit)/loss		
EBT		

how we did it

Modeling Input and Output
CAPEX

DEVELOPER INSIGHT

CAPEX will largely depend on the volumes that you expect to have along the supply chain but there might also be fixed CAPEX, like project development costs. AgriGrid CAPEX might also be related to power consumption and energy efficiency of the installed AgriGrid equipment and machinery. There will usually be economies of scale which can make larger investments more feasible and profitable in the long run. And depending on the life cycle of machinery and equipment you might have to repeat investments for instance after ten years.

Screenshot from MS Excel

Agri Capex Investment Assumptions

Cost Assumptions

	Farming equipment	Transport equipment	Storage&processing facilities	Processing equipment	Packaging equipment
	MGA/ha	*MGA/MT*	*MGA/MT*	*MGA/MT*	*MGA/kVA*
Mini-grid					
Rice bran oil			2.000.000	37.380.000	

Sizing Assumptions

	Farming equipment	Transport equipment	Storage&processing facilities	Processing equipment	Packaging equipment
	ha	*max MT/day*	*max MT*	*max MT/day*	*kWp*
Mini-grid					
Rice bran oil		21	166	21	

AgriGrid file - Inputs tab

Step 7

Go back to your Inputs tab to model CAPEX. You may have to look for specific offers and ask for pro-forma invoices to collect the required data points based on your forecasted volumes. You might also need to break the table below down into more specific items.

Per mini-grid	Farming equipment	Transport equipment	Storage & facilities	Processing equipment	Packaging equipment
	e.g. per ha	*e.g. per MT*	*e.g. per m³*	*e.g. per MT/day*	*e.g. per MT/day*
Site/village 1					
Site/village 2					
...					
Total					

- As you will face seasonal fluctuations in volumes you may have to determine agri-grid CAPEX based on peak production volumes
- Depending on the life-cycle of each item you may have to consider follow-up CAPEX in your financial model after life-time expiration

Modeling Input and Output
CAPEX

how we did it

DEVELOPER INSIGHT

Based on the increased mini-grid capacity for AgriGrid operations, additional CAPEX for production and maybe also distribution mini-grid equipment need to be added to the financial model.

Screenshot from MS Excel

Adjust CAPEX to AgriGrid model also on the mini-grid side

Production CAPEX assumptions

Elt. Production CAPEX Assumptions

Cost Assumptions

	Solar PV	Battery	Inverters	Diesel Genset	Solar Equip	Instal costs	Supply costs
	MGA/kWp	*MGA/kWh*	*MGA/kWp*	*MGA/kVA*	*MGA/kWp*	*MGA*	*MGA*
Mini-grid	1.608.440	1.922.138	530.135	573.600	47.646	166.008.000	288.065.844
Rice bran oil	1.608.440	1.922.138	530.135	573.600	0		

Sizing Assumptions

		Solar PV	Battery	Inverters	Diesel Genset	Solar Equip
		kWp	*kWh*	*kW*	*kVA*	*kWp*
Mini-grid	#	192	252	170	140	192
Rice bran oil	#	88	88	80	90	88
Total		280	340	250	230	280

Distribution CAPEX assumptions

Elt. Distribution CAPEX Assumptions

Cost Assumptions

	LV grid	MV grid	Civil work	Smart+connection	Public lighting	Transport/install	Spares & tools
	MGA/km	*MGA/km*	*MGA*	*MGA*	*MGA*	*MGA*	*MGA*
Mini-grid	47.148.600	0	205.305.616	512.857.480	5.516.000	109.100.000	25.474.000
Rice bran oil							

Phase 1 smart meter cost	*MGA/meter*	225.000
Phase 3 smart meter cost	*MGA/meter*	565.000

Initial Capex

Actual production CAPEX

Elt. Production & Agri Capex Investments

		Solar PV	Battery	Inverters	Diesel Genset	Solar Equip	Installation	Supply
Mini-grid	*MGA/site*	308.820.480	484.378.776	90.122.950	80.304.000	9.148.032	166.008.000	288.065.844
Rice bran oil	*MGA/site*	141.542.720	169.148.144	42.410.800	51.624.000	–	–	–

Actual distribution CAPEX

Distribution Capex Investments

		LV grid	MV grid	Civilwork/Power house	Smart+connection	Public Lighting	Transport/install	Spares & tools
Mini-grid	*MGA/site*	669.510.120	–	205.305.616	512.857.480	5.516.000	109.100.000	25.474.000
Rice bran oil	*MGA/site*	–	–	–	–	–	–	–

AgriGrid file - Inputs tab

Step 8

Go back to your Inputs tab to model CAPEX. You will have to reconsider mini-grid capacity for each mini-grid component based on kVA specifications of the entire AgriGrid equipment

Per mini-grid	Solar PV	Inverters	Battery storage	Diesel backup	Solar & installation cost
Additional capacity required	*kWp*	*kWp*	*kWh*	*kVA*	*kWp*
Specific cost per unit	USD/kWp	USD/kWp	USD/kWh	USD/kVA	USD/kWp
Mini-grid 1					
...					
Total					

- Ideally, your distribution CAPEX will not have to change if the grid which you have installed has the capacity to deal with peak demand during high season.
- You may also need to decide how you want to meet peak electricity demand; we have decided to go for renewable energy only to have surplus PV capacity for additional AgriGrid opportunities in the future instead of adding more flexible diesel generator capacity.

how we did it

Modeling Input and Output

Cash Flow Statement

DEVELOPER INSIGHT

The integrated agri-grid cash flow model will give you the total CAPEX compared to the mini-grid only model, and determine the funding required which you can split between grants, debt and equity in order to meet equity investors' return expectations.

Screenshot from MS Excel

Cash flow statement

		2020	2021	2022	2023	2024
Operating cash flows (before tax)	MGA	92.927.517	219.451.160	261.199.982	310.690.729	326.598.067
Initial funding						
Grants & village contribution	MGA	2.783.770.538	138.376.851	94.855.053	43.772.434	16.400.960
Senior debt	MGA	1.474.971.175	10.741.745	9.998.024	–	–
Equity	MGA	794.215.248	5.784.017	5.383.551	–	–
Total initial funding	MGA	5.052.956.962	154.902.613	110.236.629	43.772.434	16.400.960
Cashflow available for investments	MGA	5.145.884.479	374.353.773	371.436.611	354.463.163	342.999.026
Investments						
Initial generation capex	MGA	(3.045.704.462)	–	–	–	–
Initial distribution capex	MGA	(1.527.763.216)	–	–	–	–
Project development costs	MGA	(393.800.000)	–	–	–	–
Ongoing generation capex	MGA	–	–	–	–	–
Ongoing distribution capex	MGA	–	–	–	–	–
Customer connection capex	MGA	(75.368.818)	(36.723.916)	(34.181.279)	(20.529.200)	(13.191.750)
Total investments	MGA	(5.042.636.497)	(36.723.916)	(34.181.279)	(20.529.200)	(13.191.750)
Use of MMRA	MGA	–	–	–	–	–
Cash flow available for debt service (CFADS)	MGA	103.247.982	337.629.858	337.255.332	333.933.964	329.807.277
		-	-	-	-	-
Debt service						
Interest	MGA	(103.247.982)	(108.129.824)	(97.089.876)	(84.161.889)	(70.044.319)
Principal	MGA	–	(229.500.034)	(240.165.456)	(249.772.074)	(259.762.957)
Total debt service	MGA	(103.247.982)	(337.629.858)	(337.255.332)	(333.933.963)	(329.807.277)

Origin of funds (grants, equity, debt)

Utilisation of funds (CAPEX)

Payback of loans

AgriGrid file - Inputs tab

Step 9

Adjust your cash flow projections to the integrated AgriGrid model.

	Year 1	Year 2	Year 3	Year 4	Year 5
Origin of funds (grants, equity, debt)					
Utilisation of funds (CAPEX)					
Payback of loans					

Key output

Comparison with pure mini-grid case

DEVELOPER INSIGHT

On the small scale, the combined processing and sales of rice bran oil does NOT add value to mini-grid operations. More specifically :

- The internal rate of return (IRR) is lower than for the mini-grid alone;
- The payback period does not change, but it is also not reduced;
- The net present value (NPV) in local currency is almost the same.

The question to ask is **"why the addition of agri-processing activities does not add value to equity investors who take the highest risk together with the developer?"**

The major explanation is that 1) the CAPEX for the combined AgriGrid case are higher than for the mini-grid only while 2) the operational profitability of agricultural and also agri-processing activities in sub-Sahara Africa suffer form thin margins in general.

Nevertheless, the question remains if the effect of the additional agri-business to the mini-grid can be increased. The answer lies in **UPSCALING** !

how we did it

Key output

Comparison with pure mini-grid case

Performance		Mini-grid case	AgriGrid case	Deviation
Average EBIT margin	%	19.1	12.1	-7
Equity IRR	%	17.3	14.4	-2.9
Equity NPV	USD	101,793	67,299	-34,494
Equity payback	years	10	10	0
Cumulated flow to equity	USD	1,036,323	1,240,415	204,092

Funding		Mini-grid case	AgriGrid case	Deviation
Grants for assets	USD	543,089	885,238	342,149
Grants for first loss	USD	83,727	130,901	47,147
Village contribution	USD	0	0	0
Senior debt	USD	243,636	400,137	156,501
Equity	USD	131,188	215,458	84,270
Total	USD	1,001,640	1,631,734	630,094

AgriGrid file – Evaluation tab

Performance		Mini-grid case	AgriGrid case	Deviation
Average EBIT margin	%			
Equity IRR	%			
Equity NPV	USD			
Equity payback	years			
Cumulated flow to equity	USD			

Funding		Mini-grid case	AgriGrid case	Deviation
Grants for assets	USD			
Grants for first loss	USD			
Village contribution	USD			
Senior debt	USD			
Equity	USD			
Total	USD			

Key output
Upscaling effect

DEVELOPER INSIGHT

In a simulation we have expanded agri-processing activities with rice bran oil from a maximum production capacity of 20 metric tons (small AG case) per day to 150 tons per day (large AG case).

The results are striking and in line with the recommendations provided by specialized engineers: although operational profitability does not change substantially and although the CAPEX more than three times higher than in the small case, equity IRR jumps from 14.4% to 34.5% (+20.1%) and equity NPV is more than 1 million USD above the small case while there is no first loss.

The simulation shows that scale and economies of scale matter and can substantially increase attractivity of the AgriGrid concept to investors but also the positive impact on the livelihoods of the rural population.

how we did it

Key output

Upscaling effect

Performance	.	Mini-grid case	Small AG case	Large AG case	Deviation L-S
Average EBIT margin	%	19.1	12.1	**12.6**	0.5
Equity IRR	%	17.3	14.4	**34.5**	20.1
Equity NPV	USD	101,793	67,299	**1,364,551**	1,297,252
Equity payback	years	10	10	**5**	-5
Cumulated flow to equity	USD	1,036,323	1,240,415	**6,364,811**	5,144,396

Funding		Mini-grid case	Small AG case	Large AG case	Deviation L-S
Grants for assets	USD	543,089	885,238	**3,701,417**	2,816,179
Grants for first loss	USD	83,727	130,901	**0**	0
Village contribution	USD	0	0	**0**	0
Senior debt	USD	243,636	400,137	**1,420,588**	1,020,451
Equity	USD	131,188	215,458	**764,932**	549,474
Total	**USD**	**1,001,640**	**1,631,734**	**5,886,937**	**4,255,203**

AgriGrid file – Upscaling effect tab

Performance	.	Mini-grid case	Small AG case	Large AG case	Deviation L-S
Average EBIT margin	%				
Equity IRR	%				
Equity NPV	USD				
Equity payback	years				
Cumulated flow to equity	USD				

Funding					
Grants for assets	USD				
Grants for first loss	USD				
Village contribution	USD				
Senior debt	USD				
Equity	USD				
Total	USD				

Key output
Sensitivity Analysis

DEVELOPER INSIGHT

The question is “to which extent the grants portion can be reduced in the larger, more profitable case while preserving as a promising investment for equity investors?”

The sensitivity analysis in the table below shows that approximately below a grant threshold of 25% the equity IRR falls below the cost of equity of 12% (as assumed in this model; however, this threshold may vary from business to business and from country to country).

Grant funding can be reduced from 55% considerably by 1.5 million USD and the equity portion increased by half a million USD while debt compensates for the remaining approximately 1 million USD.

how we did it

Key output
Sensitivity Analysis

Grants (in %)	Equity IRR (% USD)	Equity payback (yrs)	Project IRR (% MGA)
55%	34.5%	5	27.2%
50%	27.3%	6	24.1%
40%	18.6%	9	19.6%
30%	13.4%	10	16.5%
25%	11.6%	10	15.2%

AgriGrid file – Sensitivity analysis

Grants (in %)	Equity IRR (% USD)	Equity payback (years)	Project IRR (% MGA)
…			
…			
55%			
50%			
40%			
30%			
25%			
…			
…			

6 EVALUATION

Investment assessment

Objective
- Decide on whether to invest in a full feasibility assessment of the proposed AgriGrid concept and value chain

Data Sources
- Proprietary data
- Survey data and financial outputs
- Employees, partners, business networks

Processes
- Business model review
- Review of financial and impact models
- Review of investment risks

Milestone
- Decision on whether to invest in a full feasibility assessment

DEVELOPER INSIGHT

Taking into account feedback on financial modeling and projections in actual implementation in rural areas, it appears that the value chain that we surveyed does not allow for a full-scale deployment of the AgriGrid model. While the business case for large sizing looks attractive, we decide not to move forward with the RBO production AgriGrid opportunity due to the operational complexity.

It is important to provide feedback during the process, and prior to any implementation, to ensure that the targeted project is achievable… as any mini-grid developer would do for a mini-grid project!

Despite the RBO value chain's complexity, ANKA Madagascar continues its investigation and has identified a promising and scalable agri value chain for deploying a first pilot on the ground. You are invited to follow our progress!

Lessons learned

CATEGORY	KEY ATTENTION POINT	RECOMMENDATION
Value chain selection	Because of seasonality, one sole agri-component may not be sufficient to upgrade the model	- Develop a portfolio of processing activities in order to have a balanced productive use of electricity throughout the entire year - Combine different agri activities which feed each other into a circular economy (like the agri-pyramid model) to avoid waste and stand stills - In order to avoid peak consumption during the harvesting season of any specific crop it is worthwhile to select crops which can be stored for several months and to have them processed over the year which also contributes to a more stable sales price and constant revenue stream
Data collection	If the targeted value chain is not considered as valuable by the local population (e.g rice bran), it is more difficult to collect actionable data	- Use informal and formal sources of data - Be prepared for uncertainty and ambiguity in the data - Models are rarely precise in their pre-feasibility stage; the objective is more about validating assumptions than creating a precisely fine-tuned model
Market opportunities	Most farmers would prefer to supply their existing crops and production to a buyer vs. begin growing new crops, or start new processing activities	- AgriGrid operators should identify and design interventions that are low-risk for farmers and that require minimal behavioral change
Agronomic understanding	A multi-disciplinary team is needed even in the early stages, especially an agriculture expert	- An agronomic expert is an indispensable asset, especially for identifying the strengths and weaknesses of value chains and anticipating technical and financial questions - The expert can be an in-house staff, as well as a short-term consultant
Scalability	The targeted value chain suffers from poor profit margin, forcing it into high volumes of activity that are not consistent with rural context	- Prefer value chains that are adapted to the rural context and easily replicable in several mini-grid projects, to achieve economies of scale
Operations	The agri process is too complex	- Prefer value chains that require limited support and that require mainly mechanical processes (chemical processes can be hard to implement in rural areas due to poor accessibility and limited supply chains)

AgriGrid

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www.enaccess.org
fabio@enaccess.org

www.go-anka.com
camille.ab@go-anka.com

The EnAccess Foundation

ANKA MADAGASCAR