

**EFFICIENCY  
FOR  
ACCESS**



**UK  
ENGINEERS  
WITHOUT BORDERS**

# Agriculture and productive use appliances



Funded by:



**IKEA Foundation**



# Agenda

- Solar Power Irrigation
- Conversation with Steward Craine
- Productive use appliances
  
- Q&A
- Webinar feedback survey





# Our speakers



## ▶ Max Garnick

- Product Manager with SunCulture, a Nairobi based AgTech company.
- Holds a Mechanical Engineering degree at Northeastern University in Boston, Massachusetts.



## ▶ Steward Craine

- Co-founder and Managing Director at Village Infrastructure Angels.
- Over 20 year experience as project manager for the construction of several microhydro minigrids in Nepal, building large wind farms in Australia with Hydro Tasmania and renewable energy consultant and also assisting Light Up the World Foundation.
- Co-founded Barefoot Power as a commercial for-profit social enterprise to raise larger quantities of investment for villages.



## ▶ Julien Potron

- Founder of Nadji.bi Senegal.
- active in Products Development, marketing and strategies linked to end-users experiences, but also in the management of the group.



**EFFICIENCY  
FOR  
ACCESS**

---

# Solar Power Irrigation

Max Garnick - SunCulture



UK

**ENGINEERS**

WITHOUT BORDERS



SunCulture

**Max Garnick**  
**October 30th, 2020**

<https://www.youtube.com/watch?v=idaQL1irGU>





A person is holding a rectangular solar panel vertically in a field of green plants. The panel is dark blue with a grid of cells. The background is a dense field of green foliage.

**Vision: To build a world where people take control of their environment in rewarding, sustainable ways**

**Mission: To develop and commercialize life-changing technology that solves the biggest daily challenges for the world's 570m smallholder farming households**



**SunCulture**

# 96% of Africa's smallholder farmers rely on rainfed agriculture

Waiting for the rain presents significant challenges, especially as weather patterns become more unreliable

## Low-value crops

Rainwater is only sufficient to grow staple crops like maize and potatoes

## Low yields

Africa's agricultural productivity is 50% lower than the world average

## Limited growing seasons

Farmers cannot use their fields during the dry seasons



## Farmers are trapped at the bottom of the productivity ladder

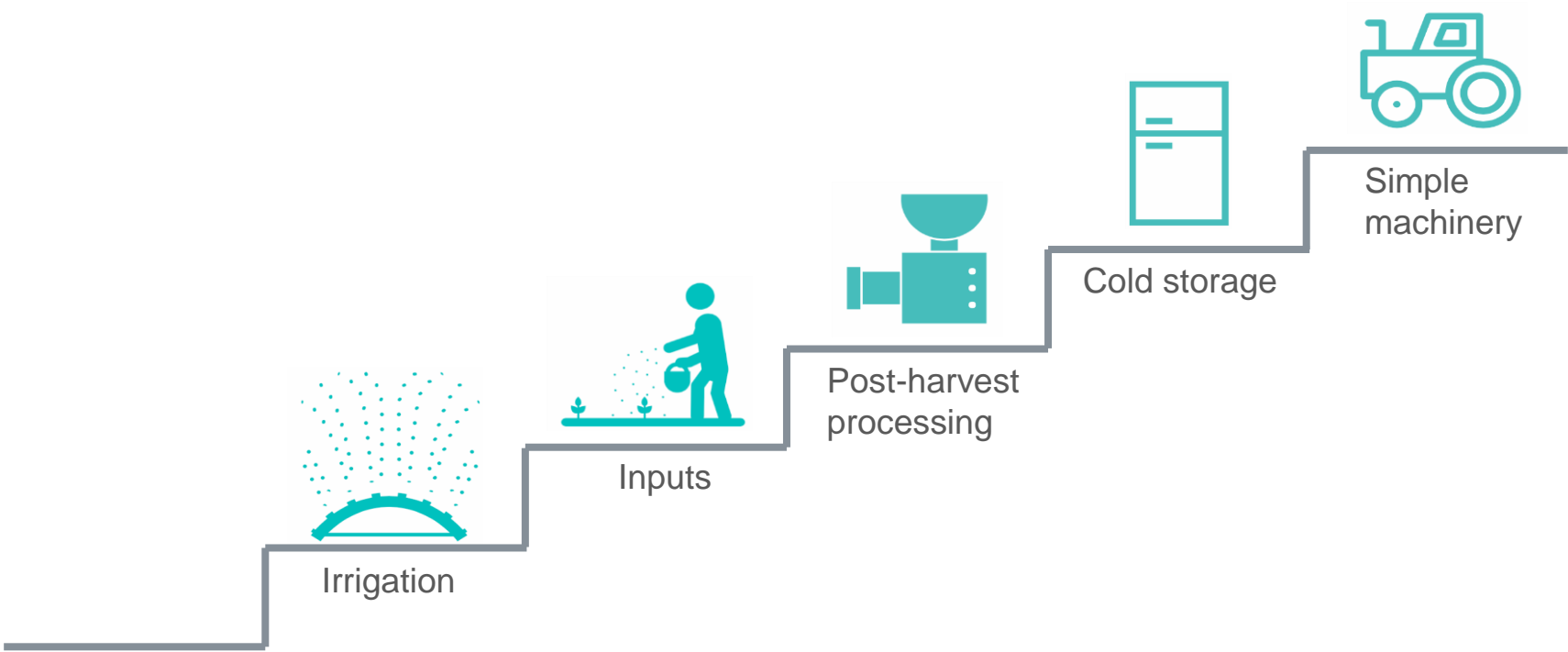
Smallholders make only \$600-\$1,000 a year, and are always just one bad harvest away from financial insecurity. As a result, they are unable to invest in their farms or in their families' futures



Sources: World Bank

# Irrigation is the first step up the productivity ladder

With 2X – 5X higher yields, farmers can raise their incomes and continue investing in productive-use technology





# Irrigation is a \$65 billion opportunity in Africa

With new technologies, we can channel the continent's existing resources into unlocking agricultural productivity

## Groundwater

There is enough water below our feet to expand irrigation by 20X across Africa, and 120X in 13 countries (covering 13.5m hectares of land)

## Solar power

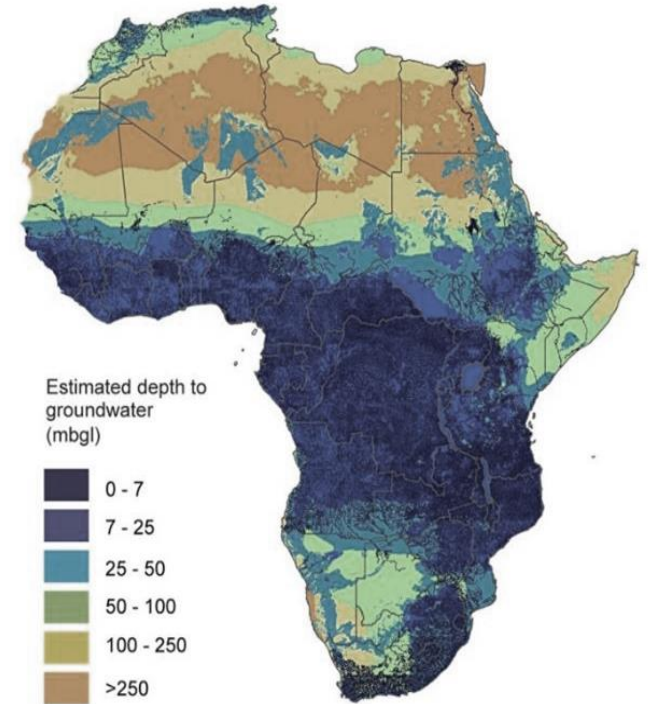
Abundant sunshine, paired with the falling costs of solar panels and lithium batteries, provides clean, affordable energy sources for irrigation systems

## Mobile connectivity

High mobile penetration streamlines payments and customer communication, while introducing the potential for data-driven, precision agriculture

## Arable land

Africa has 65% of world's unused arable land. Irrigation will enable more land to be cultivated and increase the productivity of land under use today



Sources: McKinsey, IFRI, CGIAR, World Bank

# ClimateSmart™ Direct RainMaker2S



**WINNER**  
**2019**

- Works best at <40m
- **Maximum flow rate of 1.1m<sup>3</sup>/H** | Optimized irrigation solution for a 0.5 - 1 acre farm



# ClimateSmart™ Battery

## RainMaker2S



WINNER  
2019

### Features

- Works best at <40m
- Max flow - 1.2m<sup>3</sup>/H | Optimized irrigation solution for a 1 acre farm



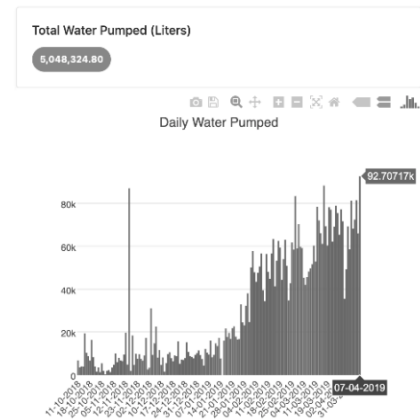
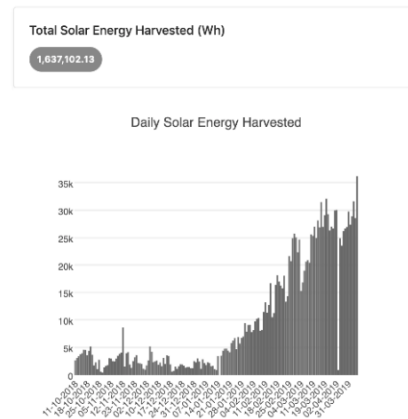
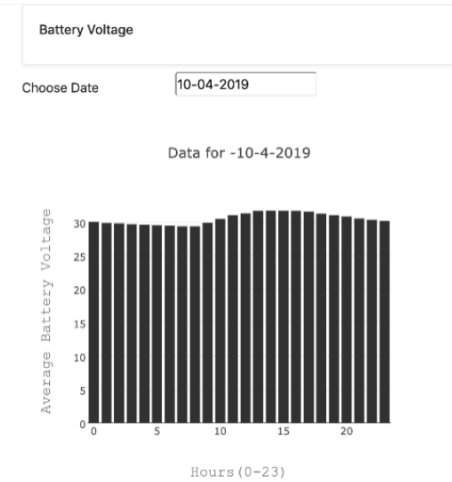
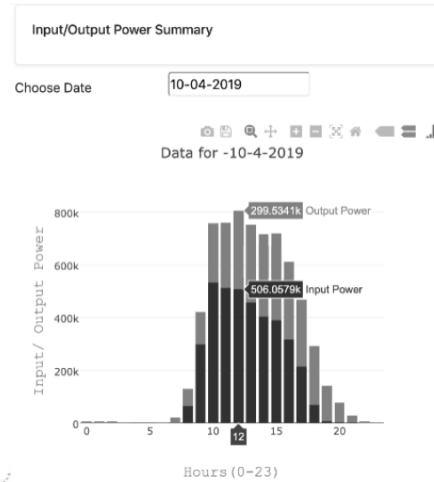
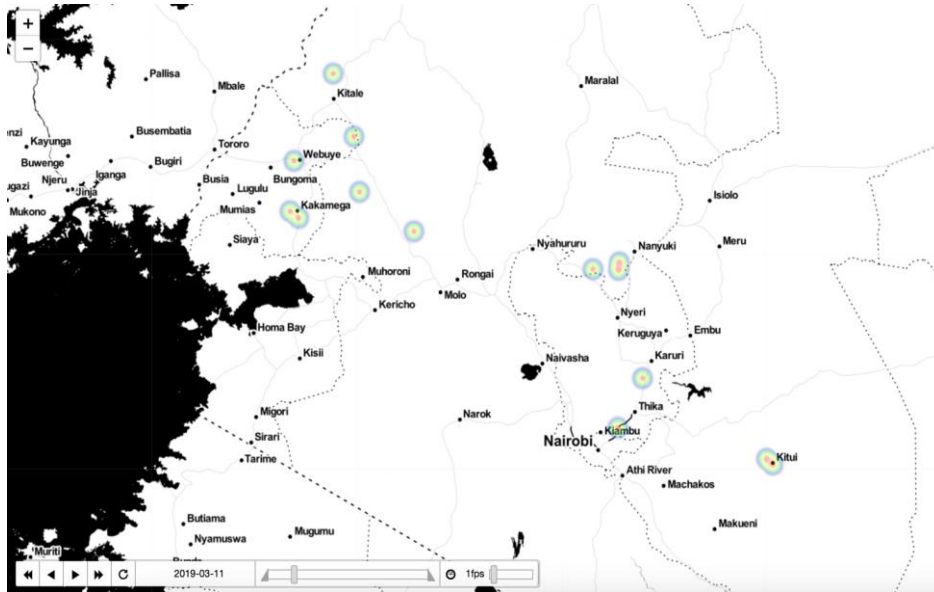


# Sentinel IoT Dashboard



## SENTINEL IoT DASHBOARD MACRO DATA for Distributors:

- LOW-VOLTAGE DISCONNECT (LVD) COUNTS
- INPUT / OUTPUT POWER SUMMARY
- AVERAGE DAILY BATTERY VOLTAGE
- TOTAL LITERS PUMPED PER DAY
- DEVICE LOCKING & UNLOCKING



# Our customers increase their incomes by 5X - 10X

SunCulture offers a diverse value proposition for an underserved market

## Higher yields

Yields increase by 2X - 5X, while eliminating risk of losing harvest due to insufficient rain

## More livestock and milk

More water and feed for raising livestock, along with 1.5X - 2X increase in milk production

## More cash crops

An abundant supply of water sustains cash crops, like kale, tomatoes, and spices

## Time savings

Not having to fetch water manually gives farming households back 17 hours a week



## More land under use

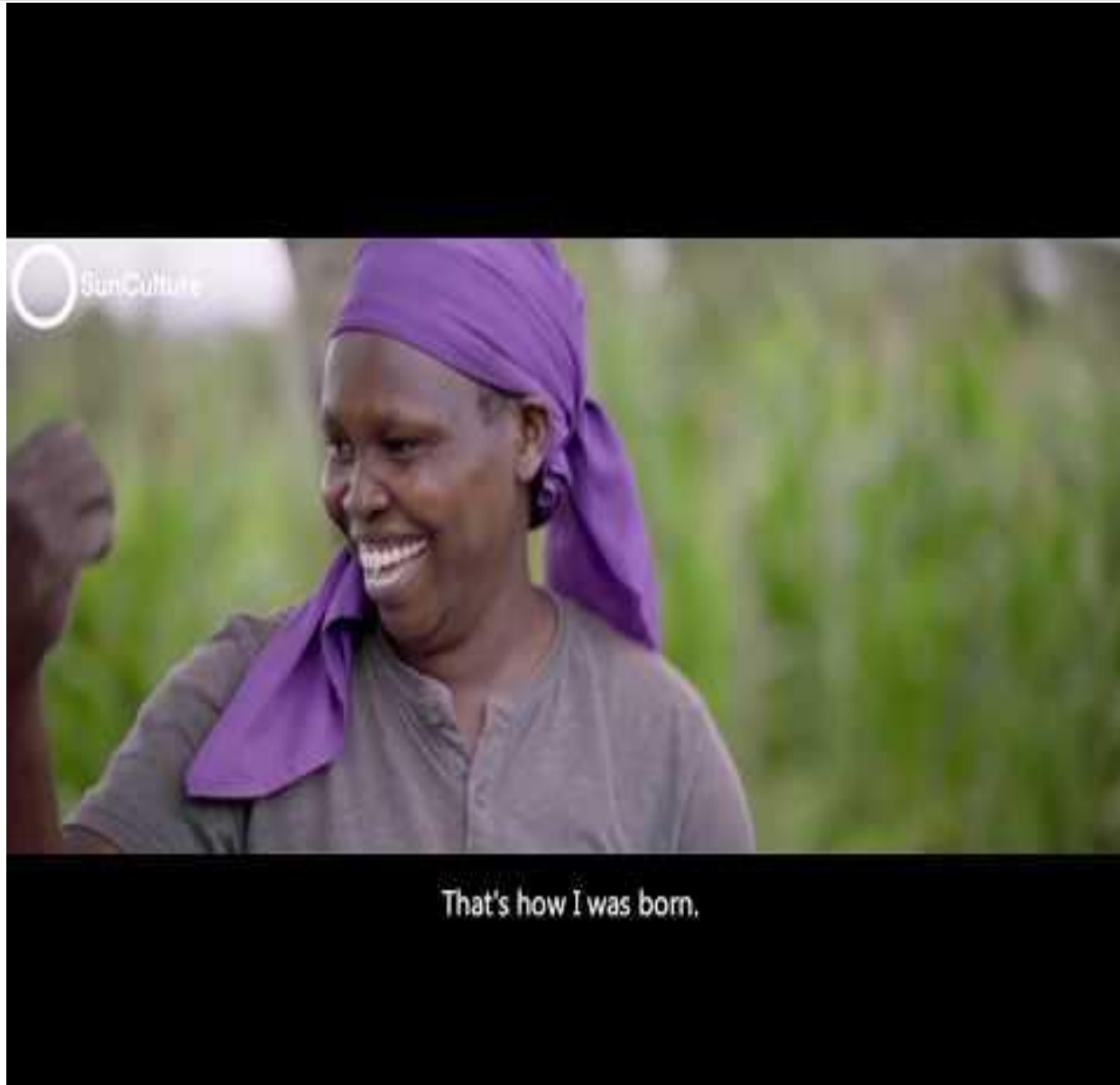
Customers can grow during the dry season, and put more of their land under cultivation

## Access to clean energy

Switching from kerosene to electricity improves respiratory health and children's ability to study at night

# Customer Testimonial - Monica Riitho

Single Mother in Laikipia County, Kenya





# Scaling up access to irrigation has far-reaching effects

Unlocking the productivity of smallholder farmers is critical for inclusive, sustainable development in Africa

## Improving food security



Despite having most of the world's arable land, Africa is projected to spend up to \$110B per year on importing food by 2025. Increasing agricultural productivity will empower Africa to feed itself

## Lifting millions out of poverty



There is \$150B in unmet annual demand for agricultural finance in Africa. De-risking farming through irrigation enables farmers to tap into the financing and markets that will keep them climbing up the productivity ladder

## Fueling economic growth



Agriculture employs more than half of the population in Africa, and comprises 15% of the continent's GDP. Irrigation expansion in sub-Saharan Africa could generate up to US\$22B per year

Sources: African Development Bank, Malabo Montpellier Panel, UN, World Bank, AGRA

# R&D Challenges with Solar Water Pumps

Through continual innovation, complex issues with SWP Systems can be mitigated

## Sedimentation



## Saline Water



**EFFICIENCY  
FOR  
ACCESS**

**Thank you**

**Sun Culture**

236 Washika Rd., Lavington, Nairobi, Kenya

+254 700 327 002

info@sunculture.com



UK

**ENGINEERS**

WITHOUT BORDERS



**EFFICIENCY  
FOR  
ACCESS**

# Conversations with

Steward Craine – Village Infrastructure Angels



UK

**ENGINEERS**

WITHOUT BORDERS













## Solar crop / food mills

Rice huller

Rice polisher

Cassava grater

Coconut grater

Corn sheller

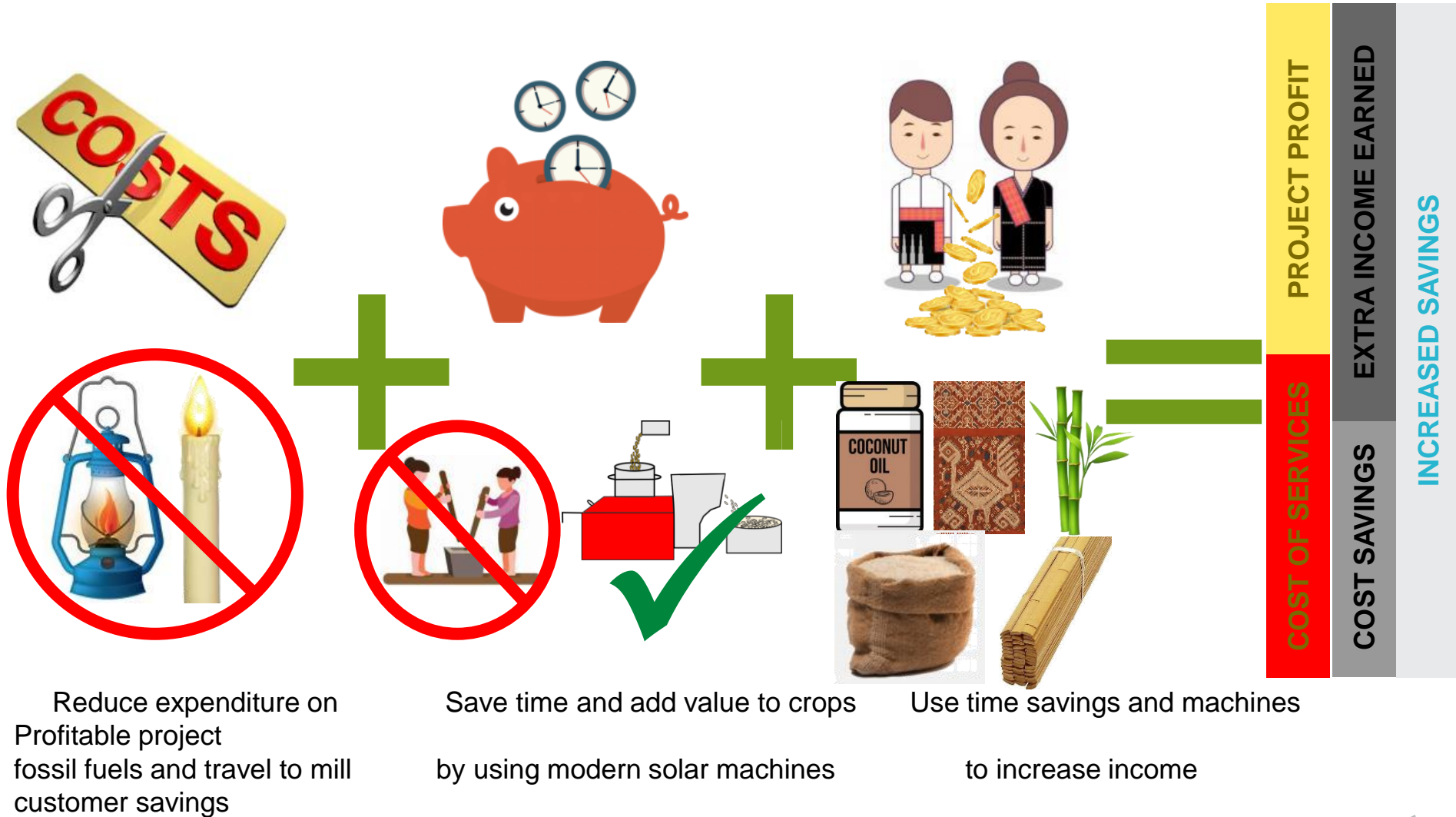
Flour grinder

(Meat grinder, not shown)

[www.psspng.com](http://www.psspng.com)



# Theory of Change





# Non-cash payments



Handicrafts

Bamboo

Weaving

Crops

Fish

Coconut oil

Others?

Time?

Education?

Digital?

(Photos, music,  
video)



sumba\_sustainable\_solutions •

Tandulujangga, Nusa Tenggara Timur, Indonesia



Liked by olinmonteiro and 157 others

sumba\_sustainable\_solutions So excited, our first bamboo = solar light swap! Petrus and Padii an... more



# Impacts of solar mills - pilot project

Average amount processed at distant mill	30-50 kg bags
Average amount processed at local solar mill	11 kg
Average amount eaten per day	1-2 kg per household
Days between visits to local solar mill	7 days
Average time spent milling crops by hand	48 mins per day
Average time spent using solar mill	22 mins per 7 days = 3 mins per day
Time savings per household	45 mins per day, 280 hours per year
Cost of solar mill usage (same price as distant mills)	Rp 500 (US\$0.04) per kg = \$1.70/month
Value of time savings, at \$0.50-\$1.00 per hour	\$0.22-0.45 per day = \$12-24/month
Value added to excess crops sold in local markets	10-20% due to hulled vs unhulled, corn brown rice with bran is 10% he

## Key innovations

Pro-poor non-cash payments allowed

Centrifugal rice huller 30% more efficient



**EFFICIENCY  
FOR  
ACCESS**

---

**Thank you**



UK

**ENGINEERS**

WITHOUT BORDERS





**EFFICIENCY  
FOR  
ACCESS**

---

# Productive use appliances

Julien Potron – Nadji.bi Senegal



UK

**ENGINEERS**

WITHOUT BORDERS



Easy Solar for Everyone!  
L'Électricité Facile pour Tous !



# Nadji.Bi Group SA

The sun does not ignore a village,  
just because it is small.

EN – Local, Digital and Industrial  
Value-Added – October 2020







# NADJI.BI ORGANISATION

Nadji.Bi Group is structured in 4 departments



*Nadji.Bi  
Devices*

R&D /  
Manufacturing



*Nadji.Bi  
Projects*

EPC / Full EPC  
Service



*Nadji.Bi Digital*

IoT / Mobile  
Banking / Big  
Data / E-  
Business / E-  
Training



*Nadji.Bi  
Consulting*

Training /  
Technical &  
Financial  
Engineering



Made in Sénégal

# NADJI.BI COMPANIES



## Implantations Nadji.Bi :

/ Afrique – Europe – Asie / Janvier 2019 /

- Nadji.Bi Group – Holding (HQ based in Sénégal)
- Nadji.Bi Sénégal
- Nadji.Bi France
- Nadji.Bi Gambia
- Nadji.Bi Guine Bissau
- Nadji.Bi Hong Kong





Made in Sénégal

# Our Production & R&D Units (1/2)

## Research & Development / Quality / Training

### Unique in WCA



4





Easy Solar for Everyone!  
L'Électricité Facile pour Tous !

# Our excellence center Mbour / Sénégal

## Our university partners

Ecole Polytechnique de  
Thiès



Electronique,  
Electrique, Mécanique

African Institute of  
Mathematical Science de  
Mbour



**AIMS**  
Mathematical Sciences  
SENEGAL

Logiciels, Algorithmes

Earth Institute –  
Columbia University

THE EARTH INST  
COLUMBIA UNIVERSITY

Programme de  
Recherche Appliquée

CFPT Sénégal Japon



Mécanique,  
menuiserie métallique







Made in Sénégal



# Devices Department – Lighting

Nadji.Bi group has developed and manufactures numerous solar solutions ranges



### *Lamps Solar Torches*

- NJB Lion v.1
- NJB Lion v.2
- ....



### *SHS Solar Home System Kits*

- NJB Zebu v.1
- NJB Zebu TV v.1
- ....



### *Solar Street Lights*

- NJB Star v.1
- NJB Star v.2
- ....



Made in Sénégal



# Devices Department – Productive

Nadji.Bi group has developed and manufactures numerous solar solution ranges



## *Breeding*

Milk tank

Watering point

Anti-theft for livestock....

## *Agriculture / Conservation*

Cereal Mill

Cold room

Water pump....

## *Hybride Residential Kits*

Kit hybride 1,5 kW

Kit hybride 3 kW

Kit hybride 4,5 kW

Made in Africa

# Devices - Our Best-Seller for Universal Access to basic Lighting Service

## A Mini Solar Kit 3 LEDs / Phone Recharge - NJB SN PAYG

**Warranty Component per Component**

- Installation: 5 minutes
- Recharge: 5H STC
- Autonomy 28H / 1 Bulb
- Autonomy 15H / 2 Bulbs
- Autonomy 9H / 3 Bulbs
- 30min Recharge Phone



**Customization 100% Product And Packaging - Mobile Panel - Military Version Available**

**Zebu v.1 F.**

www...

système d'éclairage et charge  
ar Home Lighting and Charge

introduit une nouvelle gamme de mini-sy  
gné de 3 LEDs à interrupteur et de câble

ie	
maximum des LEDs	
charges	
erie	
ue	
Ampoules LED de 2W	
Ampoule LED de 2W	
STC*	
Boitier	
Clubes	
irradiance : 1000W/m <sup>2</sup> Température	

Présentation Produit :

Fabriqué au S  
Made in Sen



Document confidentiel - Nadji.Bi - 2018



Made in Africa



# Devices - Our Best-Seller International Certifications

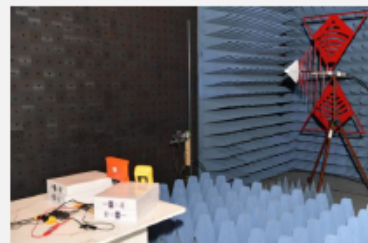
## EMC Certification - Compliance with the CE standard

[https://ec.europa.eu/growth/sectors/electrical-engineering/emc-directive\\_en](https://ec.europa.eu/growth/sectors/electrical-engineering/emc-directive_en)



Certification validating:

- Compliance with EN 55022, B class,
- Compliance with the specifications of the European market.



## Certification Lighting Global

<https://www.lightingglobal.org/products/njb-zebu/>

Certification validating:

- Compliance with IEC 62257-9-5, ed. 2.0
- The observance of the quality specifications of the World Bank,



**Nadji.Bi Zebu v.1:** Only solar product manufactured on the African continent having these certifications.

Category 3 Points Lighting Global Lighting:

**1 Manufactured in Senegal vs. 10 Made in China / 1 in Thailand / 1 in India / 1 in Malaysia**

**Nadji.Bi Zebu v.1:** 1st Design Electronics / 1st Battery Life / First Rendering

GLOBAL



AN ASSOCIATION OF  
WORLD BANK GROUP  
THE WORLD BANK IFC

Product Testing Verification  
Zebu v.1

Expiration Date: May 3  
Reference #: njb-zeb

According to the Quality Test Method  
9-5 and complied with the Lighting

da, senegal@nadji.bi.com

ing  
center, Arcata, CA USA

tion of this verification:





Made in Africa

# Projects Department – PV Hybride



Nadji.Bi group offers an EPC service line (Engineering, Procurement, Construction) for many solar and hybrid projects across the continent.



*Low-Costs,  
Prefabricated  
Solar Building*

Schools, Health centers...



*Business Hybride  
Solar Solutions*

Factories  
Hospitals Schools  
Hotels ....



*PV Hybrid Plant*

EPC et Full EPC,  
Outsourcing....



*Agriculture  
Solutions*

Cold room  
transformation  
Machines  
coupling RE ...



# Département Digital – Mobile & IoT

Nadji.Bi group offers series of Digital Solutions to accelerate current structural changes of our economies and to optimize impacts of its solutions.



## *Mobile Banking*

USSD, Tokens,  
API, Back-  
Office  
Solutions, ...



## *E-Business*

Web-Android  
Sales Platform,  
Accounting  
Management...



## *E-Training*

Training and  
Tutoring online  
contents  
development....



## *IoT / Big Data*

Connected  
Objects, Big Data  
collection and  
analyzis...



# Consulting & Training Department



Nadji.Bi Group offers a range of Consulting & Consulting services in the Solar industry. Across the continent.



## *Training*

Engineering  
Schools  
NGOs /  
International  
Agencies....



## *Technical studies*

Technical  
feasibility / Solar /  
Hybrid /  
Productive ....



## *Financial Studies*

Financial  
Feasibility /  
Business Plan /  
Financing Plan  
....



## *Business Intelligence*

Market Research  
Benchmarks ....

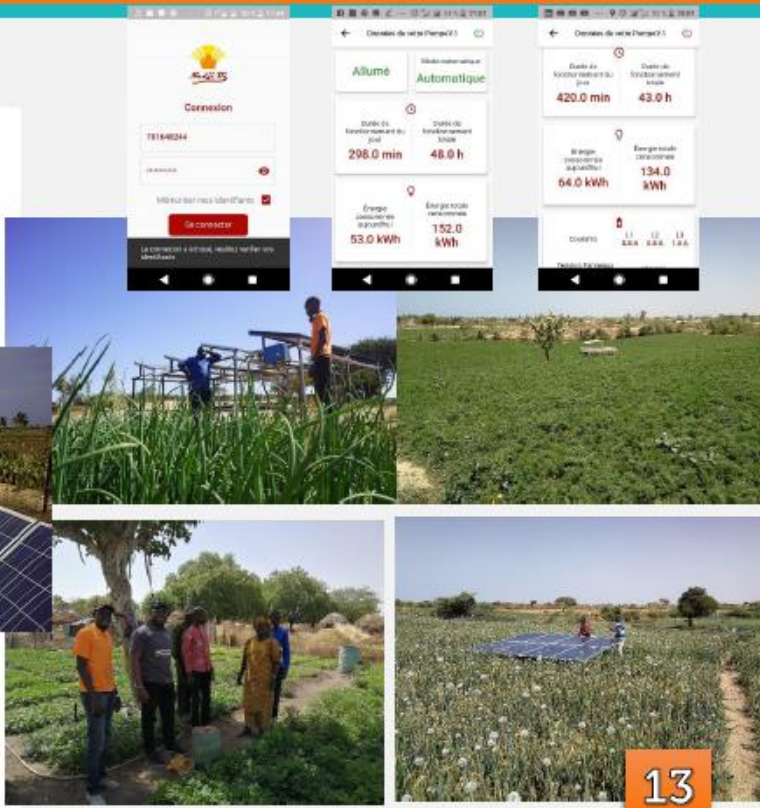




# Solutions developed



## Solar Water PULSE



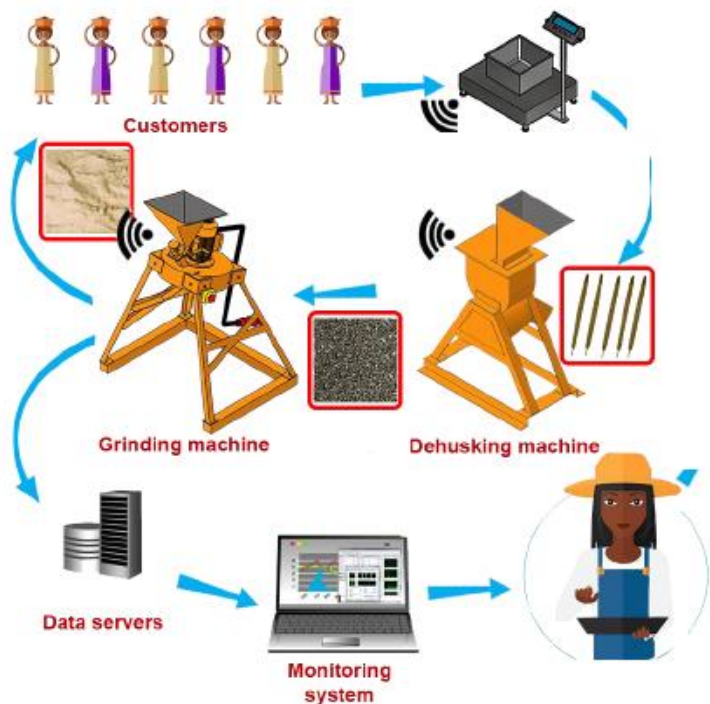




# Solutions under developed



## Solar Cereal Milling Platform



The screenshot shows the mobile application interface for the Solar platform. It features a **Dashboard** with options for **New recharge**, **New customer**, **Order**, **Payment**, and **Logout**. Below the dashboard, there are sections for **Milling: 5kg** and **Order** details, including a list of orders with their status (e.g., **Ready**, **Not ready**).



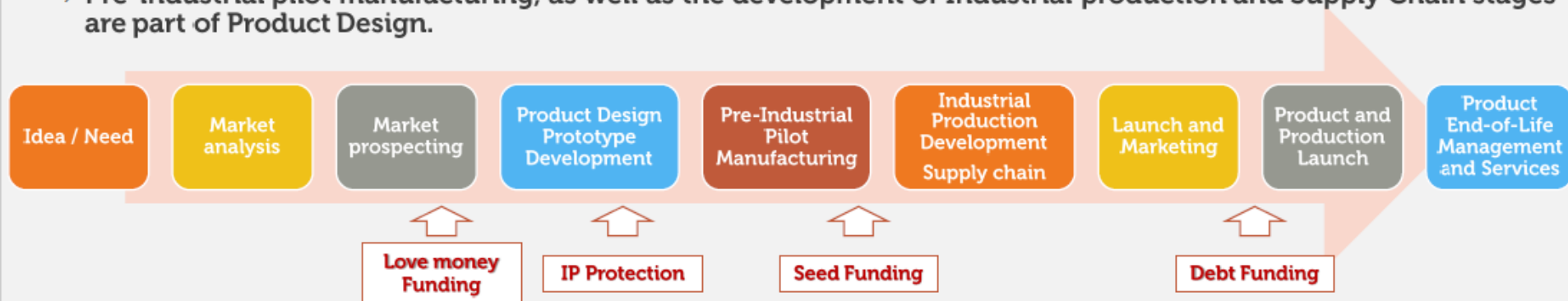


# Our product development process

## Our goals : Design of Industrializable Products

Only the Research and Development of Industrializable Products makes sense in our emerging industries. This must take place in a "market" framework by seeking competitiveness and profitability, respecting the product life cycle and having as objective a mass industrial production. Points to highlight:

- ⇒ Prototyping is not enough,
- ⇒ Market analysis and prospecting must precede prototyping,
- ⇒ Pre-industrial pilot manufacturing, as well as the development of Industrial production and Supply Chain stages are part of Product Design.



The Product Life Cycle / from idea to design / to market and mass production

15



Made in Sénégal

# Vidéos & Références



## Our Projects

<https://youtu.be/BWPHMmg5FQc>



## Our Group

<https://youtu.be/CMJw66BdctU>





Easy Solar for Everyone!  
L'Électricité Facile pour Tous !

**"The sun does not ignore of a village  
Just because it is small."**

*African Proverb .*

**Nadji.Bi Group**

**Easy Solar for Everybody!**

Installation in Gabon  
November 2016

17





**EFFICIENCY  
FOR  
ACCESS**

---

**Thank you**



UK

**ENGINEERS**

WITHOUT BORDERS





**EFFICIENCY  
FOR  
ACCESS**

---

**Q&A**



UK

**ENGINEERS**

WITHOUT BORDERS





**EFFICIENCY  
FOR  
ACCESS**