



**INNOVATIVE SWISS TECHNOLOGY**

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**BPW International member project  
Switzerland**

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# SUNLIGHT PUMP

**URNS SUNRAYS INTO SAVINGS**

A solar water pump for  
smallholder irrigation and  
domestic water supply in  
developing countries

[www.ennos.ch](http://www.ennos.ch) [info@ennos.ch](mailto:info@ennos.ch)

# Fetching water

a time-consuming daily task

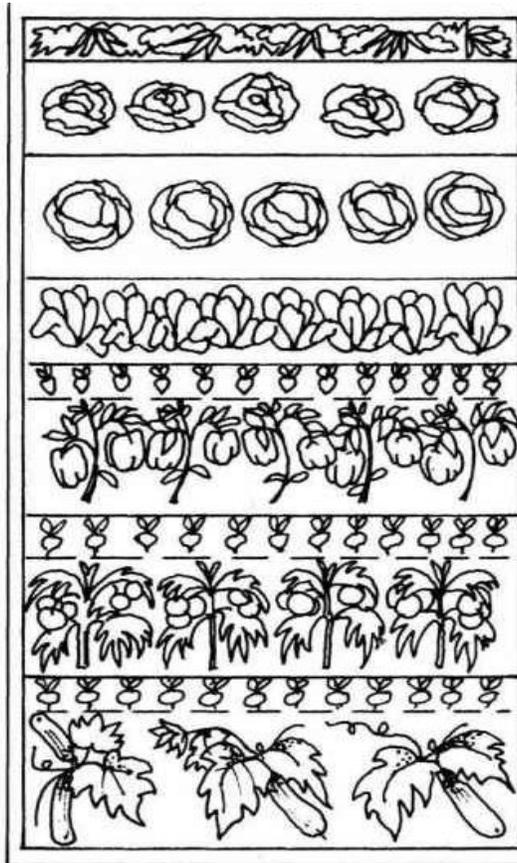


Around the globe,  
girls and women spend  
**200 million hours**  
**a day**  
fetching water

# Fetching water

## A heavy physical burden

Small vegetable garden  
of 500m<sup>2</sup>



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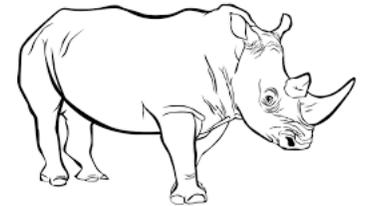


x 125

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**ennos has the solution:**

**A solar-powered  
water pump**



# Innovative Swiss Technology to serve the needs of smallholders



The “sunlight pump” is a small-scale solar water pump specifically designed to serve the needs of smallholder farmers. It is robust, user-friendly, highly efficient and portable. It can be used for a wide range of applications (irrigation, drinking water supply, sanitation and hygiene – or a combination of those). The sunlight pump is solar-powered which reduces the CO2 emissions to zero and taps into the huge solar power potential that a lot of developing countries have.

# The sunlight pump



User-friendly  
Electronics



Highly efficient  
Motor



Robust  
Pump head

# Technical specifications

- **0.5HP (375W)** solar water pump
- **100-400W** panel required depending on water lift and daily amount of water
- **Discharge capacity** of max. 45 litres/min or around 20'000 litres/day
- **Vertical water lift** up to 40 meters
- Solar PV panel **and** battery use are possible
- **Bluetooth interface** to monitor the performance of the pump and diagnose technical problems
- **Automated system** due to water flow and tank overflow sensors
- **Portable design:** L575mm x W200mm x H270mm, 14 kg

The sunlight pump is a **surface pump**. The maximum suction depth (= vertical distance between the pump and the water level) is **7 meters at sea-level**. For every 1'000 meters higher in altitude, the suction capacity will decrease by 1 meter. This applies to all surface pumps, not only the sunlight pump.

Consequently there are two possibilities:

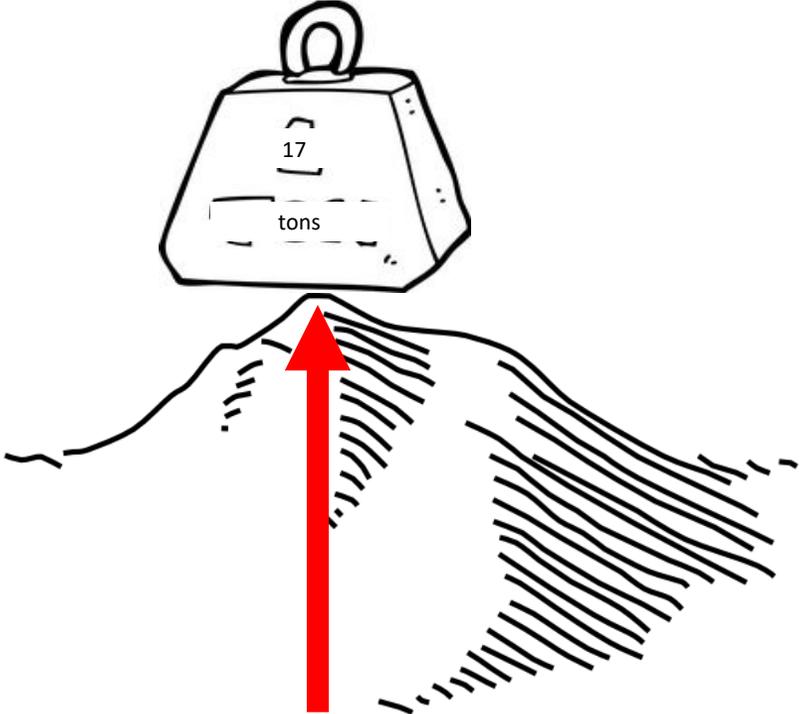
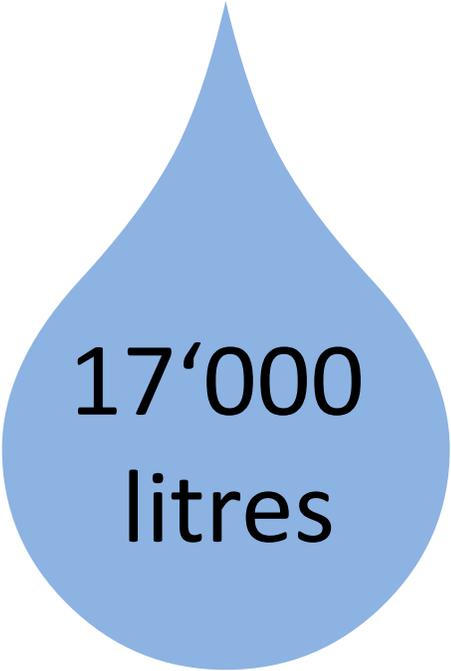


Installation on the surface if suction depth is < 7 meters

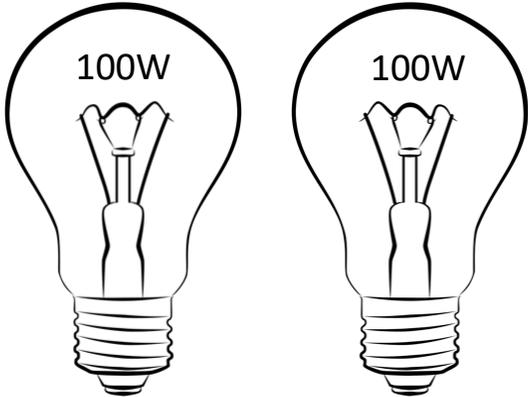


Lower the pump down into the well and closer to the water table if it is lower than 7 meters

# Delivery on a sunny day



@10 meters lift



Requiring 200  
Watt power

# An innovative technology with many advantages

- ✓ No cost for diesel
- ✓ Simple installation and use
- ✓ Portable
- ✓ Very low repair and maintenance cost
- ✓ High quality & longevity
- ✓ No CO<sub>2</sub> emissions

# One solar pump ideal for different applications



**Irrigation**

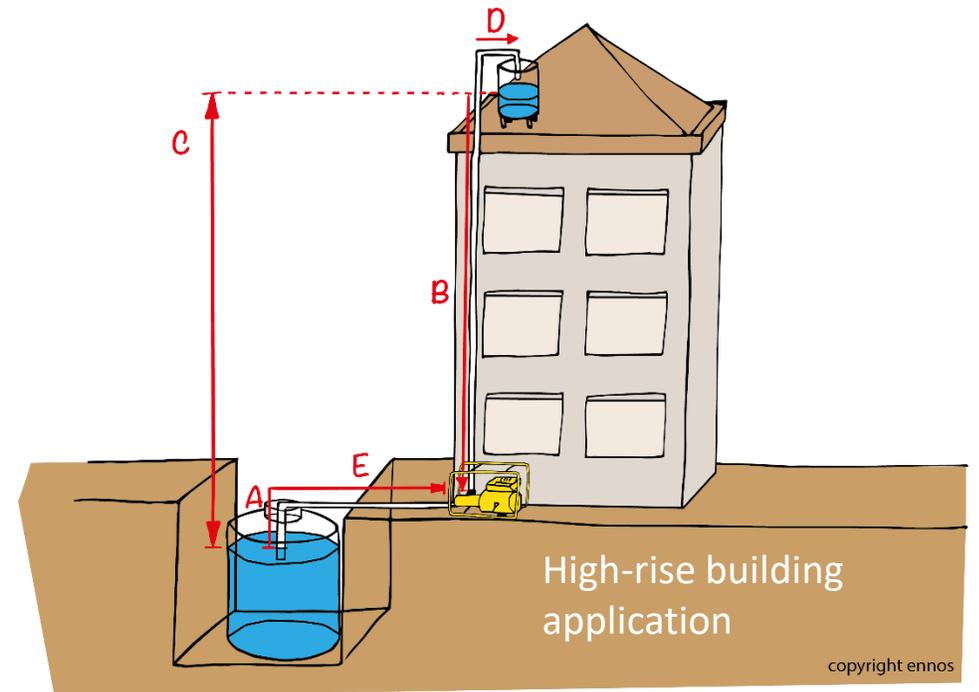
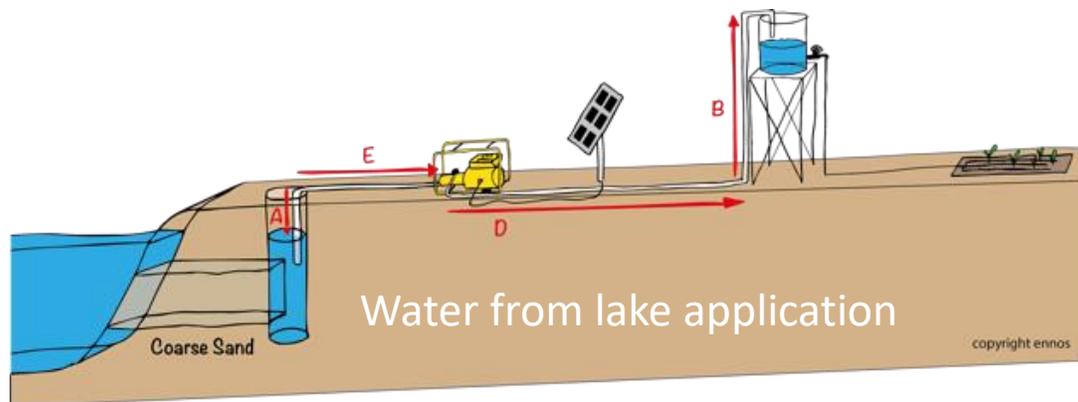
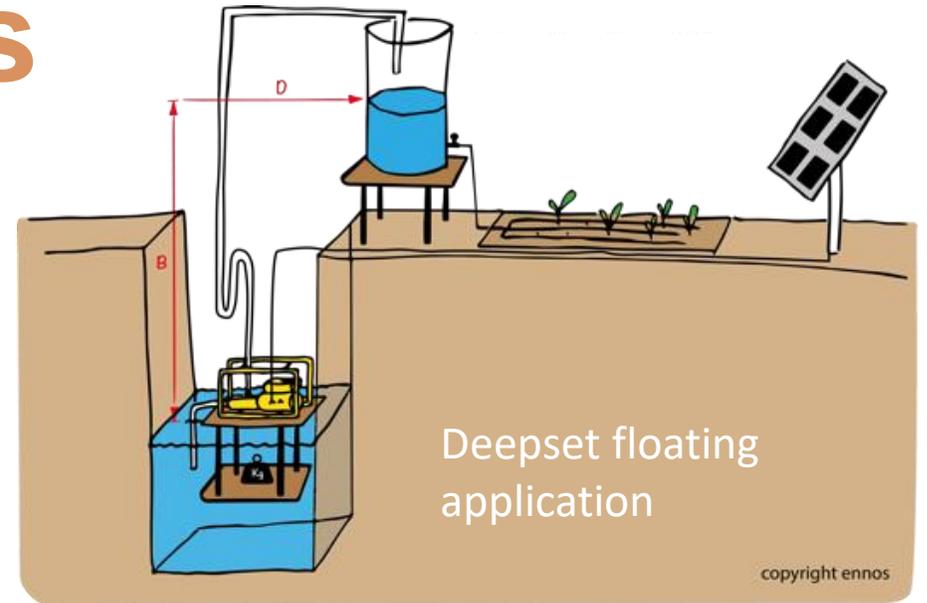
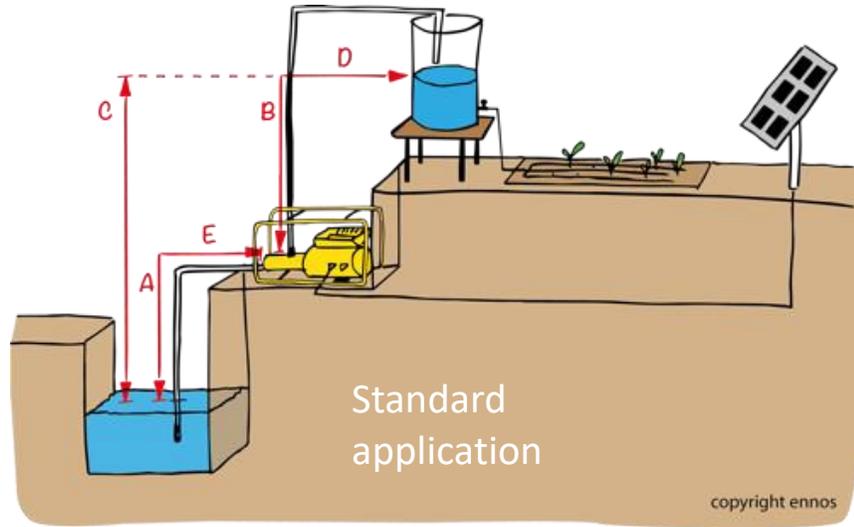


**Drinking water**



**Sanitation & hygiene**

# Four main applications

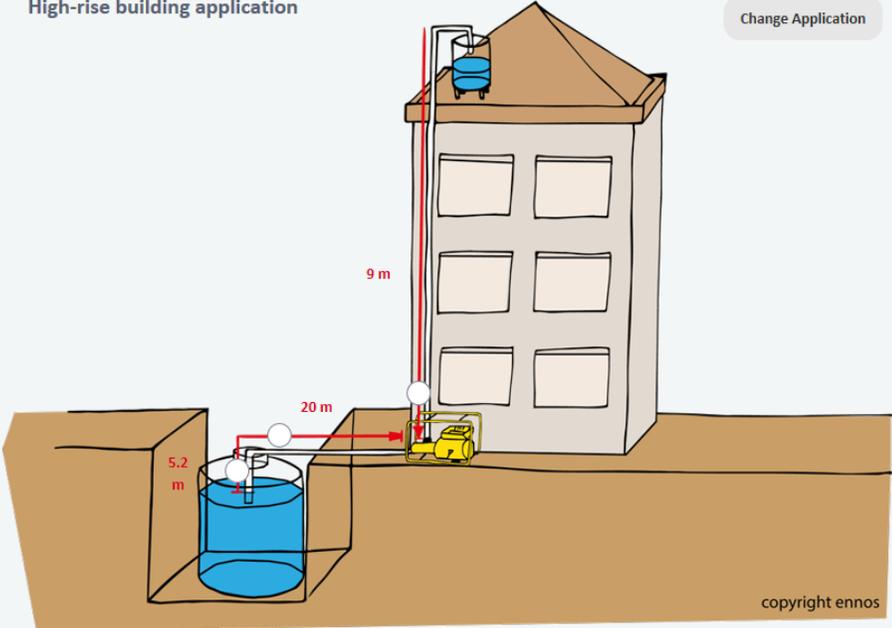


# Configurator Tool

On our website [www.ennos.ch](http://www.ennos.ch) you can calculate your needs and figure out the power needed for your application. Coming soon on the configurator: Comparison with the cost of a diesel pump.

High-rise building application

Change Application



copyright ennos

Change this data for your setup:

Geographic Data	Region	Asia	Edit
	Altitude	2500 m	
	Solar Irradiation	6 kWh/m <sup>2</sup> /day	
Water Lift	Total Physical Head	14.2 m	Edit
	Total Horizontal Distance	21 m	
	Number of Valves	1	
Water Requirement	Water Requirement	5000 L/day	Edit
	Crop Water Requirement	7.1 l/m <sup>2</sup> /day	
Operation	Operation Days	250 days/year	Edit
	Diesel Cost	1.2 \$	
Pump	Type	JSPB10.3/HF2.4-5	Edit
	Maximal Head	40 m	
	Maximal Water Flow	45 L/min	
Hose Diameter	Suction Side	25 mm	Edit
	Pressure Side	25 mm	

Power needed for your application:

106 Watt  
5000 L / Day  
= 100 %  
Irrigation Capacity:  
704 m<sup>2</sup>

Output with different solar panels:

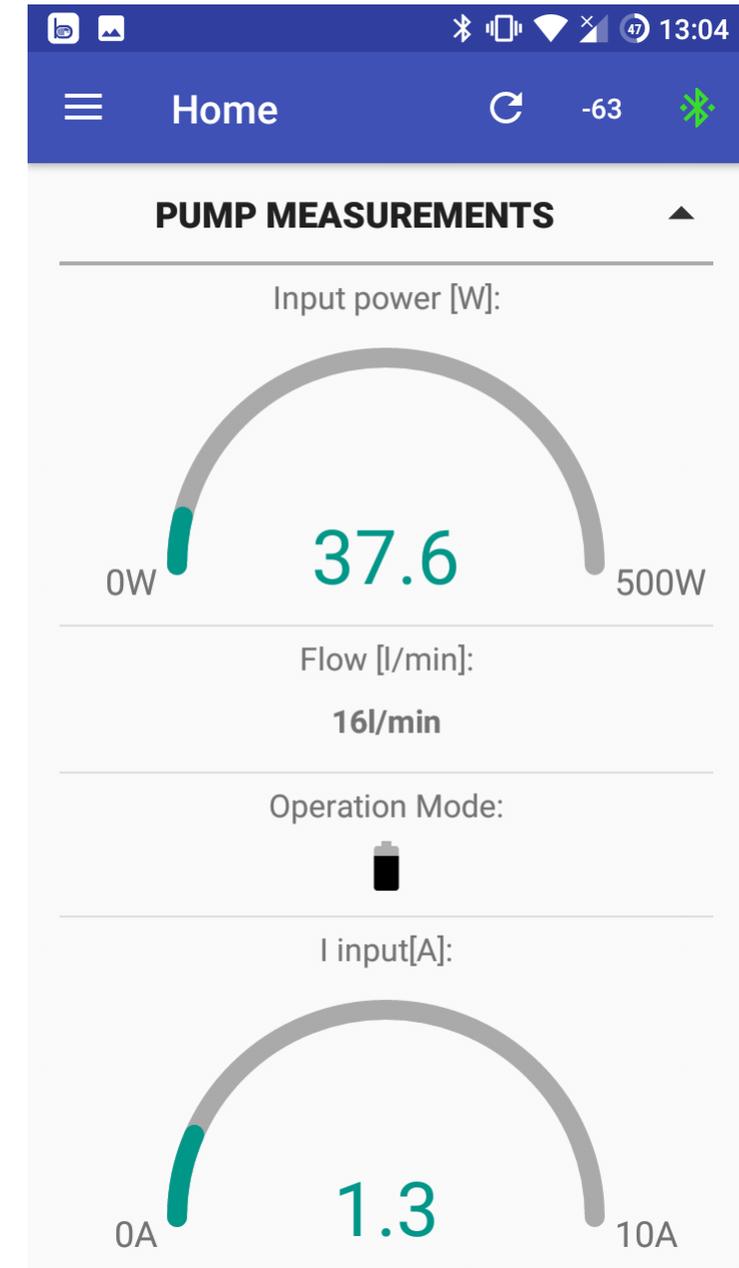
100 Watt Panel 5160 L / Day = 103 % Irrigation Capacity: 704 m <sup>2</sup>	300 Watt Panel 14440 L / Day = 289 % Irrigation Capacity: 704 m <sup>2</sup>	400 Watt Panel 14440 L / Day = 289 % Irrigation Capacity: 704 m <sup>2</sup>
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Select Panels

# ennos Android App

ennos App for smartphones (Bluetooth) supports easy monitoring during installation and services.

- **Input power[W]** shows the amount of power the battery or solar panel is delivering to the pump in Watts
- **Flow[l/min]** shows the water flow rate in liters per minute
- **Operation mode** shows if the pump is running in PV (solar) or battery mode
- **I input[A]** shows the current of the source in Amperes
- **U input [V]** shows the voltage of the source in Voltages
- **Speed [rpm]** shows the speed of the rotor in rotations per minute
- **Temperature [°C]** shows the temperature of the electronics in degree Celsius
- **Error** is indicated on the pump display. The error state will be written here. In the operation manual are the error states described.



# Innovative diffusion

## last mile distribution

Beyond the technical innovation, ennos also pursues innovative ways in the diffusion of this technology. It is our vision to make the sunlight pump accessible to farmers even in remote areas. For this, the last mile distribution has to be built up. For us it is of high importance to provide extensive before and after sales services to the end-users – something most competitors will not do. The users need to be supported in the design, installation and use of their solar pumping system in order to make sure that it can be used productively over many years. In order to guarantee these services, a pool of well-trained sales men/women and technicians must be established.



# Innovative financing options

A considerable barrier for many potential solar customers is the high upfront investment for a solar pump. Like with any solar equipment, the upfront investment is high but the operating costs are close to zero. ennos needs to have local partners who will be able to develop innovative financing options for the users – for example farmers can pay in installments after each harvest when they have cash available. Further more, ennos will develop a Pay-as-you-go solution.



# **Social impact** **all along the value chain**

The sustainable distribution of the sunlight pump is only possible, if local partners can build themselves an economic future in this field. Therefore, wholesaler, retailers and service providers involved must operate profitably. This means that the services that they provide have to be covered with a margin which in turn has to be reflected in the pricing strategy. At the same time, it is our concern that the solar pumping system remains affordable.

# Social impact

## local capacity building

At the level of the service providers, there is extensive technical capacity that will be created. One of the roles of ennos is to provide continuous theoretical and practical training to the local technicians with regard to application, installation, maintenance and repairs of the sunlight pump. The practical training is especially done through implementation of real installations of the sunlight pump in the field. This know-how transfer is an important aspect and will contribute to the establishment of a local sector for renewable energy technologies.



# User impact

Impact is also created at the level of the user. The transition from low-productive, highly risky irrigation practices to an automatized, environment-friendly pumping system is a huge step. Today, the burden of manual irrigation mainly falls on women and children. Our long-term vision is that by availing the sunlight pump for irrigation, the dependency on rain fall will be reduced and the farming season will increase from the current 2 to 4 which will generate more revenue. This will directly increase the availability of food for household consumption, sales and export.



# The users' experience with the sunlight pump

## Women cooperative, Honduras

„We think the sunlight pump is a good technology because it is made for the needs of smallholder farmers. We have not seen such a high quality and affordable solar pump before. For our cooperative, this may also become a business opportunity because we could become retailers and service providers.“



# The users' experience with the sunlight pump

## Farmer Mrs. Achamma, India

„I like the sunlight pump because it is a completely automated system. This allows me to save a lot of time and irrigation is not hard physical work anymore.“



# The users' experience with the sunlight pump



## Farmer Mr. Murimi, Kenya

„Since I own a sunlight pump, I don't have to use an expensive gasoline pump anymore. Also, I am independent from rainfall which has become unpredictable in recent years. This allows me to increase the production and generate more income for my family.“

# Impact for households

In combination with a water tank installed on the roof of or next to the house, the sunlight pump can guarantee a continuous water supply in an urban or rural home.

With this, the families can become independent from the unreliable electricity grid and increasing fuel costs on the one hand. On the other hand, with a water tank next to the house women benefit from easier water supply for washing which is a big relief.





# Impact for drinking and hygiene

The sunlight pump is an ideal technology to supply domestic water for drinking purposes, personal hygiene, washing and cleaning to a family or village community. The sunlight pump can also supply water to a school or hospital and is an interesting option for a water kiosk installation because it can be equipped with a “pay per litre” software.

# The users' experience with the sunlight pump



**Kennedy Wanyama, Director  
Uganda Water School**

„The sunlight pump delivers water over 2 kilometres from Lake Victoria into a filter system. This allows us to supply safe drinking water to 300 school children every day. I am impressed how powerful this small pump is.“

# Impact with multiple use of the solar panel

Throughout the year and especially during rainy season, when irrigation is not needed, the excess energy from the solar panel can be stored in a battery. The battery can then be used to power different appliances e.g. machines for food processing, light, cell phone charging, cooling, entertainment. Especially school children benefit from having light at home in order to be able to study also in the evenings. And to have a good education is key for their future prospects.



# Impact on the environment

Solar pumps are a necessary alternative to the millions of diesel and electric water pumps currently in use around the world. Those pumps produce tremendous amounts of harmful emissions. While they may be available at cheap rates on the local market, their life expectancy is very low which also creates a problem of waste management. Most of such cheap pumps need to be replaced after longest one year.



# Impact on the environment

The sunlight pump is a solar-powered pump with zero CO<sub>2</sub>-emissions. One sunlight pump with a 300 Watt panel can save around 135 liters of diesel a year and around 380 kilograms of CO<sub>2</sub> if one calculates with a utilization rate of 50%. With 1000 pumps installed the annual diesel savings will amount to 135,000 liters and the CO<sub>2</sub> savings will amount to 380,000 kilograms.



# Solving social problems with entrepreneurial ideas

Besides the distribution and servicing, it is also possible that local female and male entrepreneurs buy a pump and start their own pumping service business. We expect a whole range of business activities such as renting the pump or offering pumping services to neighbors, village communities, schools and so on.



# History of ennos



## 2006 ENNOS

The Swiss company ennos gmbh was founded in 2006 as a spin-off of Berne University of Applied Sciences under the lead of Prof Dr. Andrea Vezzini who has longtime experiences with solar energy and motor drive systems.



## 2008 PROTOTYPES

Prototypes of a solar water pump are designed by ennos, manufactured in India and tested in India and Bangladesh.



## 2012-2015 FIELD TESTS

Filed tests of 300 pumps in 10 different countries. Feedbacks of users were implemented in further technical development.



## 2016 MANUFACTURING

Transformation of the limited liability company into the stock corporation ennos ag. Business model with development and distribution. Partnership with Jain Irrigation in India for manufacturing the sunlight pump. A Technology License Agreement has been signed. Jain has the exclusive rights for production and distribution in India.

# Market entry



## Production

Production in 2017 of 3000 pumps, including pumps for the market in India



## Identified markets

Kenya, Uganda, Burkina Faso, Rwanda, Tanzania, Nicaragua, Honduras



## Identified partners

In all markets ennos identifies local distribution partners



## Orders

Placed orders for Kenya, Uganda, Rwanda, Tanzania and Burkina Faso

# Value chain

## Profitability and impact



### PRODUCTION

Product-Portfolio for  
solar water pumps and  
drip irrigation kits

### ENNOS

R&D  
Know-how transfer  
Distribution  
Training

### WHOLESALER

Distribution  
Job creation,  
Training  
Building up solar  
sector

### RETAILER

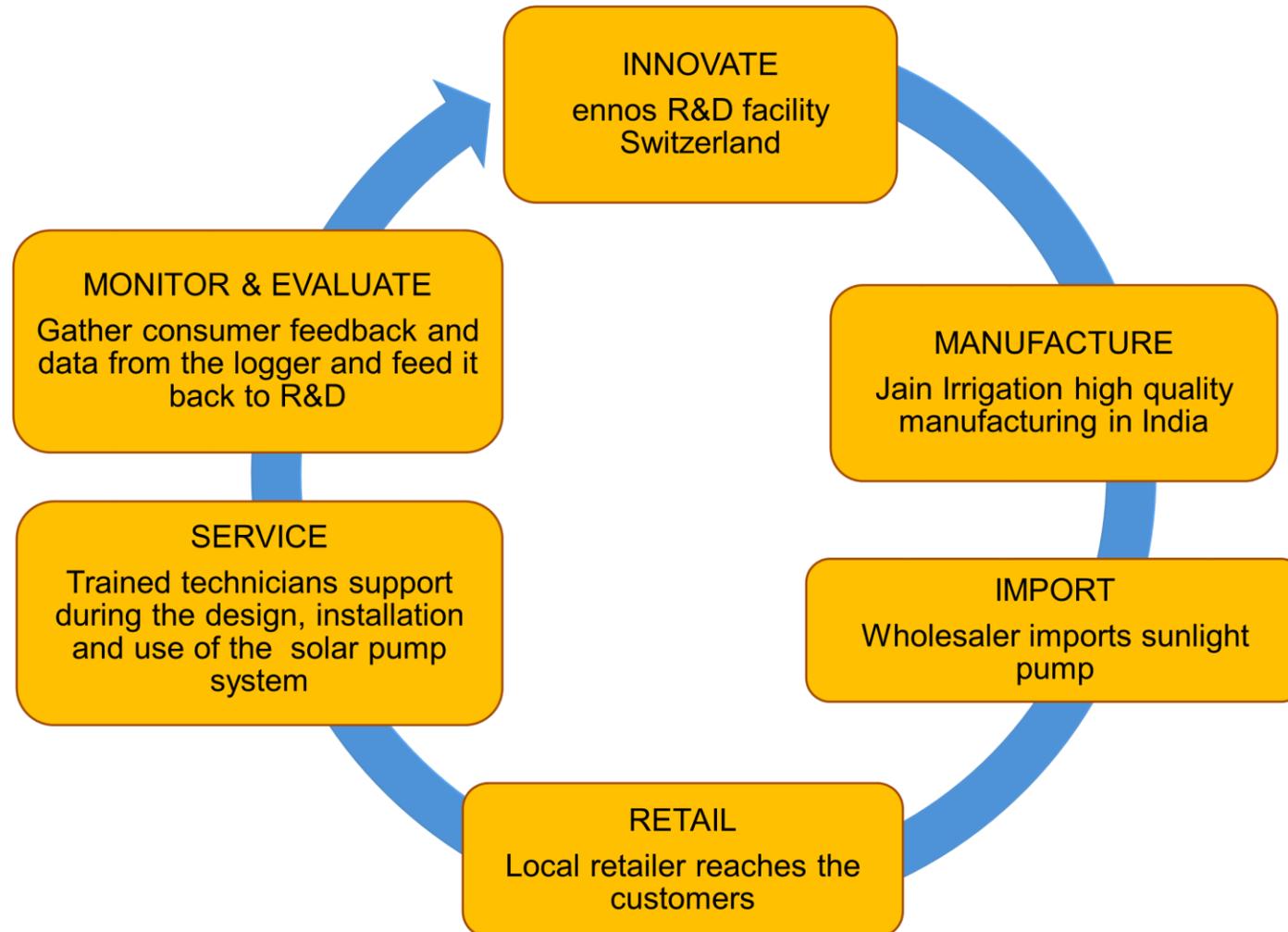
Jobs in rural areas  
Services  
Building up solar sector

### TECHNICIANS

### END-USER

Increase in  
productivity, income  
and of quality of life

# ennos dissemination model



# Meet our team



## PROF. DR. ANDREA VEZZINI

Prof. Dr. Andrea Vezzini, President of Board, Advisor R&D ennos ag. Dr. sc. techn. ETH, Professor for Industrial Power Electronics at Berne University of Applied Sciences and Head of the BFH-CSEM Energy Storage Research Center



## ALOIS MÜLLER

Board Member and Advisor Production ennos ag. Ing. FH, specialist for environmental technologies in developing countries with more than 30 years of experience. Co-founder of Myclimate und seecon.



## DR. URS HEIERLI

Board Member and Advisor Marketing ennos ag. Ph.D economics HSG, specialist for market-based approaches to poverty and lecturer for development economics at the University of St. Gallen.



## KARIN JEANNERET VEZZINI

Board Member  
CEO ennos ag  
Attorney-at-law



## KARIN IMOBERDORF

Head Marketing & Sales  
M.A. HSG, specialist for market-based approaches to poverty



## STEFAN BRÖNNIMANN

Head Software Team  
Dipl. Ing. FH Electrical Engineering



## ROMAN BUCHER

Head Hardware Team  
MSc. Engineering MSE  
Electrical Engineering



## CHRISTOPH GIGER

BSc Mechanical Engineering

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# Awards



Finalist 2017

Winner of public voting with 66%



Ennos is among 15 selected start-up companies on which dev.tv will broadcast a short presentation



Invitation to and participation at SA Innovation Summit 2017 in Cape Town South Africa

THANK YOU



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