

ALL YOU NEED TO KNOW WHEN BUYING A SOLAR IRRIGATION PUMP

WHY CHOOSING SOLAR PUMPS?

Check out the NEW
**Solar Irrigation Pump
Selector (SIPS)** app for
your smartphone
and learn more on
available pumps for
your farm



A wide range of solar pumping solutions are on the market to irrigate up to 1 acre (4000 m²). But how to select an affordable solar pumping package for your farm?

Learn about the implications of your water source, pump, field dimensions, storage options and efficient applications to bring the water to the crops.

- ✓ Free energy from the sun
- ✓ No noise, bad smell or pollution
- ✓ Easy to operate
- ✓ The stronger the sunshine the larger the flow of water... and that's exactly when the plants need it!
- ✓ Can be used for other purposes like charging mobile phone or batteries



CONSIDERING INVESTING IN A SOLAR PUMP?

Buying a small solar pump set is a significant investment and ranges between 30 000 KES and 200 000 KES (300 USD & 2 000 USD).

- It reduces the production cost by 30-60% because no fuel is needed and maintenance costs are much lower.
- Compared to manual pumping such as treadle pumps or simple rope and buckets, solar pumps will allow you to increase the irrigated size of the land and save significantly on labour costs and labour efforts.

Within 2 to 5 growing seasons, investment costs for solar pumping can be fully recovered.

	Solar pumps	Fuel pumps	Manual pumps
Price	More expensive	Less expensive	Cheapest
Running costs	Very cheap	Expensive	Very cheap
Maintenance	Very little	More often	Very little
Lifetime	3-10 years*	3-5 years*	3-5 years*
Maximum plot size	Less than 1 acre (< 4000 m2)*	More than 2 acres (> 8000 m2)	Up to 0.2 acre (< 800 m2)
Pumping time	Daytime only	Can be always	Can be always
Power, pressure, flow	Low	High	Lowest
Typical use	Let it pump the entire day	Only when you irrigate or fill a tank.	After 2 hours you get tired
Not suitable for	High pressure sprinklers. Hose and furrow irrigation.	Small pipe diameters.	Spray tubes, sprinklers, furrows, filling elevated tanks
Very suitable for	Low pressure water application such as drip, spray tube, mini pivot. Filling a (low) storage tank.	Hose, spray and furrow irrigation. High pressure sprinklers. Long distance pipes.	Hose irrigation. Small gardens.

*Depends on the type of pump

IT'S NOT ALL THAT SUNNY!

Water supply depends on sunshine:

- Solar pumps only operate during sunshine hours, not in early mornings nor late afternoons
- When there are clouds the pump works less hard!

Solar pumps work slower:

- It takes about 8h to get what a fuel pump would irrigate in 1h.
- Because of that most solar pumps can only irrigate 0,25 to 0,5 acre (1 000m² to 2 000m²)

Solar pumps have less power, water flow and pressure:

- It requires changing irrigation practices & alternative application methods
- Investment is needed for storage or efficient irrigation packages

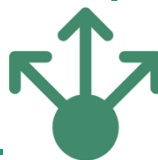
HOW TO SELECT A SOLAR IRRIGATION SOLUTION?

STEP 1: Selecting the type of pump

	Suction pump	Submersible pump
Placement	Next to the water source	Inside a borehole or hand dug well, below the water
Maximum water depth	7m maximum	15-40m depending on pump
Usually applied to	River, stream, pond Hand dug well, borehole (<7m)	Hand dug well, borehole (>7m)
Type of installation	Generally portable	Generally fixed
	All fuel pumps are suction pumps	

CHOOSE YOUR PUMP DEPENDING ON:

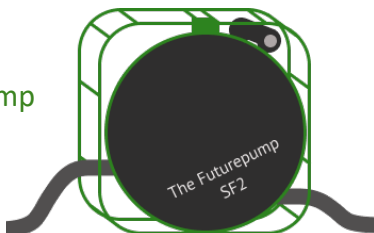
- Source of water
- Total pressure and volume of water needed
 - Price
- Repairing and replacement of parts
- Resistance to silt/sand in the water
 - Transportability



A FEW EXAMPLES OF SOLAR PUMPS ...

... aspiration

SF2 Futurepump



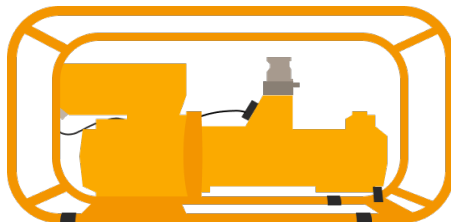
- Flow: 0 – 3 600 L/h
- Head: 0 – 15 m
- Local maintenance: **Easy**
- Possibility to use manually: **Yes**
- Possibility to pump dry: **Yes**
- Solar panels: 2 x 60 Wp



Included: box
for remote data
collection



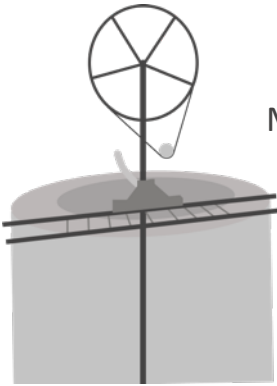
SunLight - Ennos



- Flow : 0 – 2 700 L/h
- Head: 0 – 40 m
- Local maintenance: **Hard**
- Possibility to use manually: **No**
- Possibility to pump dry: **No**
- Solar panels: 200 - 560 Wp



... submersibles



Mini Volanta

- Débit : **0 – 1 800 L/h**
- HMT : **0 – 24 m**
- Réparation locale : **Facile**
- Possibilité pompage manuel : **Oui**
- Possibilité pompage à sec : **Oui**
- Panneaux : 2 x 80 Wp



Pompe immergée asiatique



- Débit : **0 – 3 600 L/h**
- HMT : **0 – 40 m**
- Réparation locale : **Difficile**
- Possibilité pompage manuel : **Non**
- Possibilité pompage à sec : **Non**
- Panneaux : 200 - 800 Wp

Achetées en ligne, les pompes immergées asiatiques semblent souvent moins chères au premier abord. Mais les panneaux solaires doivent être achetés séparément. Selon le nombre, le prix peut ainsi doubler voire tripler.



STEP 2: Choosing the specification of your pump

The **Total Pressure Head** is the sum of:

1. The elevation between the surface of the water in the water source and the highest point of your plot. Make sure you take the actual depth during pumping, preferably after several hours of pumping when the water level is low.
2. Pipe pressure is the force needed to push water through the pipes until it reaches the field. The smaller the pipe diameter, the more pressure you need.
3. The application pressure is the pressure needed by the application method, such as sprinklers.



The higher the total pressure head the lower the water flow. When the pressure head of your system increases, the pump will give **much less water** than the Max Flow indicated on the pump.

The **total pressure head** determines the **actual flow** of a pump when used on **YOUR field**.



You can reduce the total pressure head in the following ways:

- When you use a tank, do not put it very high
- Use an application method that works with low pressure (e.g. spray tubes)
- Use large diameter pipes (min 32 mm) to transport your water to the field

The **flow** indicates how many acres you can irrigate.

Your **application method** also **influences** how much you can irrigate. With furrow irrigation you lose more water than spray or drip irrigation.

Some brochures give the flow in Litre/minute other in Litre/hour. Multiply the L/min by 60 and you get L/h. Multiply this by 6 and you get the Litre/day.

STEP 3: Selecting your power source

SOLAR PANELS:

- The size of the solar panel is expressed in Watt-Peak (Wp) generated at full light.
- More solar panels = More power = More water
- Solar panels' lifetime is up to 20 years. When you will change the pump you will be able to **keep the same solar panels!**



BATTERIES:

- They make your pump work more hours
- They give a more constant flow
- BUT they are **NOT recommended**:
 - Expensive
 - Short life time
 - Heavy to transport
- **It is more useful to invest in water storage**

Do NOT use car batteries because they are not made for solar applications. Better use "deep cycle batteries".

STEP 4 : Selecting an appropriate application method

A FEW EXAMPLES OF APPLICATION TECHNOLOGIES ...

Drip
irrigation



Spray tubes



Sprinkler



Furrows



Pipe



Mini-Pivot



Water application systems are an important choice. They determine your water use efficiency, or **how much of the water will be used by your crop.**

High water saving
+
Low pressure system

You can irrigate a larger area
with the same pump



Here are some important criteria to consider when choosing your application system.

A **green box** means it is optimal for usage with solar pumps.

	Drip	Misters & spray tubes	Low pressure sprinkler	Mini Pivot	Hose or pipe 32 mm	Furrow / Basin
Water saving	Very high	High	Medium	High	Medium	Low
Pressure needed	Low	Medium	High	Low	Very low	Very low
Labour time needed	Very low	Low	Medium	Low	Very high	Very high
Price indication ² (KES) (for ½ acre)	96 000 (\$950 ³)	58 000 (\$ 570)	30 000 (\$ 300)	30 000 (\$ 300)	18 000 (\$ 180)	7 000 (\$ 70)
Lifetime	2-3 years	4 years	5 years	5 -8 years	5-8 years	N/A

1. N/A: Not applicable
2. Price indications are based on a complete system including tubes, hoses and connections.
3. There are many types of drip systems on the market of different qualities and with different characteristics. Price based on Netafim dripkit.

STEP 5: Do I need water storage ?

During the **early morning** and **late afternoon** the sun does not have much energy, so the water flow from solar pumps is small. If you use a hosepipe or furrows it will take longer to irrigate. If you use sprinklers or spray tubes the water may not be distributed evenly.

At this time of the day a reservoir can be used to store the water for later. Keep your storage low so that your flow does not reduce too much. The stored water allows you to irrigate faster than the pump flow, at a convenient time.

Keep in mind that **elevated storage is not obligatory** when using a solar pump! You can also choose for low pressure application systems like drip or mini pivots, or use ground storage basins.

ELEVATED STORAGE



- It is possible to store the water at a certain elevation, so that you will have enough pressure to keep on using your application system.
- A good option for this is to install a **polytank**, because of its low weight. The cost of a polytank is about 10 000 KES (\$100) per 1000 litres, and their lifetime is about 10 years.
- The elevation tower can be made of wood, concrete or steel, and costs depend on the material and the height.
- it is recommended to keep the level of the storage tank **lower than 4 m**.
- It is important to **fix the tank strongly to the tower**: when the tank is empty, strong winds may blow it away.

GROUND STORAGE

- Ground storage is a low-cost alternative. Keep in mind that the water can only flow into your application system if your field is situated lower. You can also use watering cans if the storage basins are on the field.
- The construction of a ground storage in brick masonry costs about 10 000 KES (\$100) per 2000 litres; cheaper options without bricks go for 5 000 KES (\$50) per 2000 litres reservoir.



STEP 6: Checklist before buying

Use the following check list to make sure you know all the advantages and disadvantages of the pump of your interest.

- ☒ The pump is suitable for my water source and depth
- ☒ The pump gives enough water looking at the total pressure head of my system
- ☒ The pump gives enough water for the size of my field
- ☒ I know the pump efficiency and number of solar panels needed
- ☒ The lifetime of the pump is sufficient for the investment I make
- ☒ The pump is resistant to the amount of silt in my water source
- ☒ I have checked the risk of damage caused by dry running of the pump
- ☒ My place is secure or I can take the pump and panels home
- ☒ The pump has a guarantee and I know what is included
- ☒ I know if the pump can be repaired and where I can find spare parts
- ☒ The complete price is good and I know what is included

STEP 7: Buying a pump

FINANCE SOLUTIONS

Solar pumps demand a relatively high initial investment, but it pays off on the long term. Several suppliers offer a finance solution that allow you to pay back over time. This can help you to take the step to solar irrigation. Find out the answers to the following questions first:

- ☐ Which suppliers offer a finance solution? How much does it cover?
- ☐ What are the requirements to get access it?
- ☐ Is it a leasing/renting arrangement or do I become the owner of the pump after paying back?
- ☐ What are the pay back periods and how much interest do I pay?
- ☐ How can I make the payments?
- ☐ What happens if I cannot pay timely?

WHERE TO BUY A SOLAR PUMP?

Via Internet

You can order many pumps with their motors via internet, for example via alibaba.com. For this, often you need a credit card and post address.

Advantage: This may be much cheaper than buying a complete solar pump set at a local dealer.

Disadvantages:

- It is difficult to get service or guarantee.
- It is also difficult to know their quality, specifications and lifetime.
- Pumps without a known brand are generally cheap, but may have a short lifetime. (1-3 years, depending on how intensive their use is).
- You will have to figure out yourself how many solar panels you need of what voltage and power, and buy them separately.

In-country, local and national dealers

It is recommended to buy from a dealer that offers after-sales service. You may visit several dealers to obtain further advice and compare prices.

STEP 8 : Start using your pump



Solar pumping changes the way you irrigate.

Here are some of the best practices when using solar pumps:



All day operation: The best use of a solar pump is to let it run the entire day. It pumps silently and quietly. This yields the maximum amount of water.

Use your water wisely: Solar irrigation is best combined with efficient water application techniques. Furrow irrigation does not use water efficiently. This will decrease the plot size that can be irrigated.

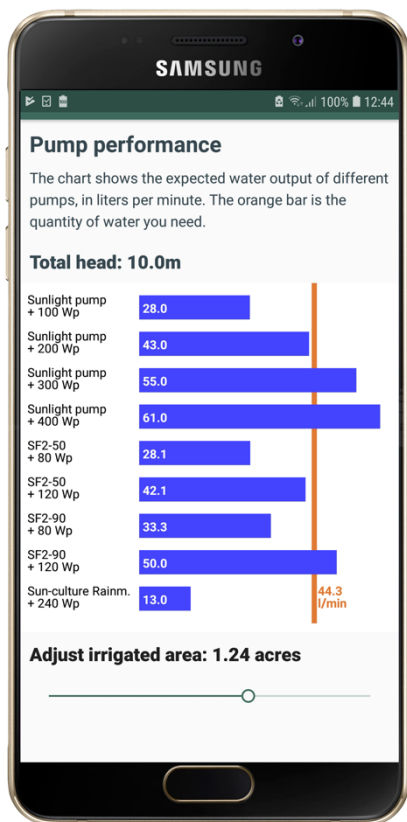
Low pressure application: A low-pressure distribution and application system is the best option for solar pumps. A drip system, min-pivot, low-pressure (butterfly) sprinklers or spray tube. Most high pressure sprinklers will not work at all or at a minimum output. And the extra pressure needed to operate high-pressure sprinklers means that the pump will deliver less water.

Smart transportation: Use large diameter pipes (minimal 32 mm) to transport the water, especially over longer distance. This will result in less friction losses and a larger flow compared to small diameter pipes and hoses. An example of smart transportation are buried PVC pipes.

Labour: Using a solar pump directly with a hose and sprayer will take a lot of time to irrigate a plot, because the flow is relatively small. If you use a hose, first fill a tank and spray from the tank.

Marketing: You will need to sell some of your produce on the market, so that you can earn back your investment.

DIGITAL TOOL FOR FARMERS: SOLAR IRRIGATION PUMP SELECTOR



Every farm is unique in terms of its location, size of the irrigated plot, crop, terrain, water source and irrigation method. PRACTICA Foundation developed a simple smartphone app to calculate which solar pumps fit your situation.



www.practica.org

Geulweg 16
3356 LB Papendrecht
The Netherlands

It is a tool to estimate the amount of water you need and the total required pressure head. As a result it shows which pumps are suitable for you.

You can download it in the Google Play Store, looking for "Solar Irrigation Pump Selector" (SIPS).

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