

# Solar Water Pumping for Irrigation in Oujda, Morocco



<b>Subject</b>	Noureddine Lahmidi	<b>Location</b>	Ain Sfa, Oujda, Morocco
<b>Application</b>	Drinking water and irrigation	<b>Project Partner</b>	AMASYS-SEWT
<b>Size</b>	6 ha, daily requirements 120 m <sup>3</sup>	<b>Installation</b>	2012

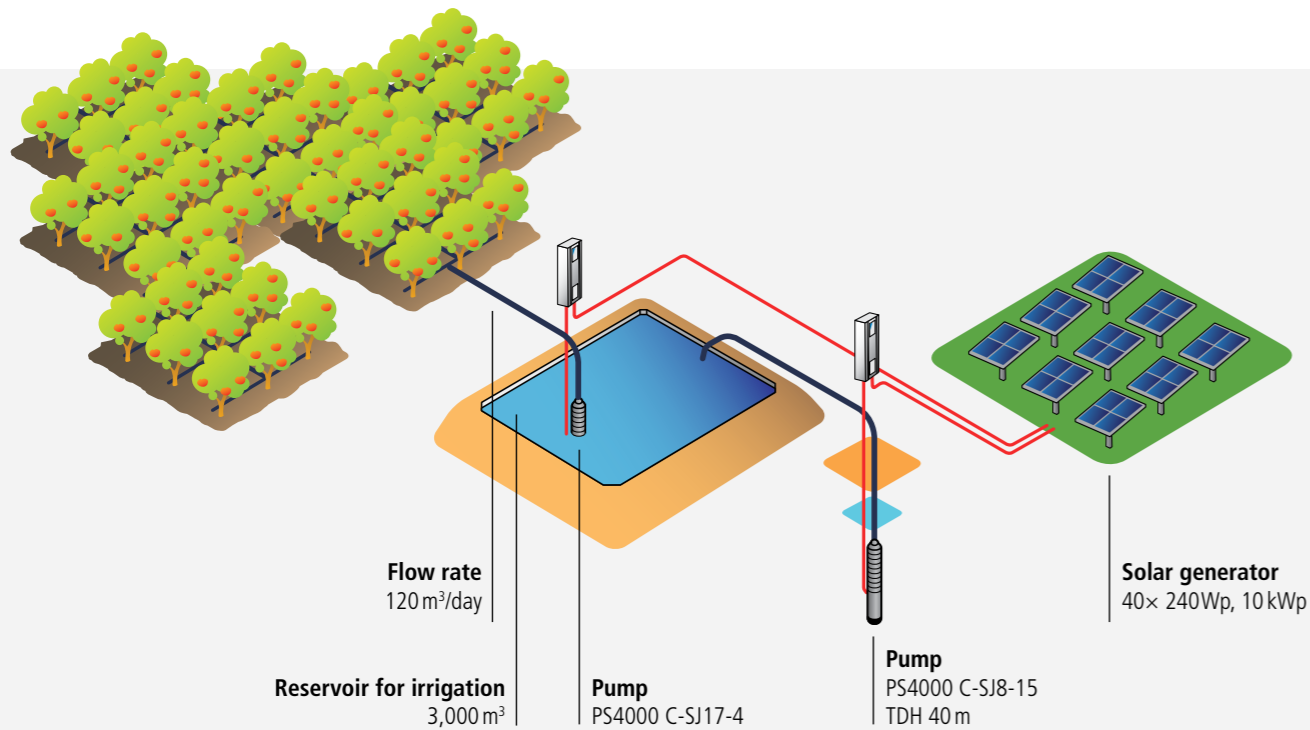
**PROBLEM:** In the village of Ain Sfa 30 km from the city of Oujda (Morocco), Noureddine Lahmidi used diesel and subsidized butane to power his irrigation pumps which irrigate 6 ha of olive trees. Increasing energy prices and supply problems meant that an alternative power supply was required. This remote village is not connected to the electrical grid. Diesel and butane prices are increasing due to market prices and subsidy reductions. Fossil fuel deliveries are

also subject to supply difficulties resulting in an inability to water crops. The internal combustion engines were also unreliable. These combined difficulties resulted in an increase in the cost of production and therefore a decrease in competitiveness.

The government in Morocco provide subsidies on both diesel and butane for rural users. These subsidies are the subject of reform as they have now

reached a level above 6% of GDP, a total cost of 32 bn Dirhams (USD 3.8 bn). These subsidies will be reduced significantly.

**SOLUTION:** Following a usage and cost analysis it was decided to replace fossil fuel powered pumps with solar powered pumps. The principle of solar water pumping is simple and the techniques and technologies are proven and very reliable.



**System components**

The system has been designed with two pumps. One to draw water from deep below the ground and pump it into a pool. A second pump is used to pump water from the pool to the crops. The pumps are connected to the solar modules via a controller (see figure 1.)

**Table 1: Technical Data**

Submersible pump (well)	120 m <sup>3</sup> /day
Submersible pump (pool)	120 m <sup>3</sup> /day
Depth	40 m
Total power of PV modules	10 kWp
Return on investment	4,5 years

**Benefits**

- Solar water pumping systems require no fuel. This removes the energy bill plus the time and cost of filling fuel tanks and having fuel deliveries.
- The sun is a stable and reliable energy source, there are no concerns about fuel supply problems, transport issues or increasing operating costs.
- Solar pump systems have few moving parts which makes maintenance unnecessary and gives them a long life. These elements give this solution a good return on investment and a best quality/price ratio in comparison to conventional pumping systems, especially in remote areas.
- Solar energy is a clean and inexhaustible energy source. Solar provides a long term reliable supply of energy without producing any emissions. Use of solar energy preserves the environment and has no impact on human health.

**Photos of the Project**

From left to right: PV panels, electric control cabinet, farmland with solar generator, filling of the reservoir



**Equipment**

Two models of LORENTZ solar pumps have been installed, PS4000 C-SJ 8-15 and PS4000 C-SJ17-4.

Solar modules: Isofoton 40× 250Wp, size 1667 × 994 × 45 mm, have been installed. Each module weighs 19 kg and contains 60 cells, sized 156 × 156 mm.

**Client**

Noureddine Lahmidi was interviewed by Moroccan National Television. In a broadcast made on 4 Dec 2012 he said: "I am very pleased with the project, and request support on the part of the Ministry of Agriculture, Rural Development and Fisheries to encourage other farmers to use this technology."



Mr Lahmidi commissioned a more powerful pump system for another larger farm. He also invites many farmers in the region to visit the solar installation to demonstrate the reliability and success of his solar pumping project.



## Calculation of the Energy Cost and Financial Analysis

Table 2 compares the cost of operation of different energy types. Over five years the solar solution is significantly cheaper than the diesel powered alternatives and very close to the butane comparison.

Both diesel and butane are subsidised (butane over 50%) by government. Significant cost increases in diesel and butane are inevitable over the next years as market prices increase and subsidies are removed. The solar solution provides the cheapest and most fixed known cost over five years of ownership.

**Table 2: Comparison of Energy Costs**

For: daily water requirements: 120 m<sup>3</sup>, daily energy requirements: 30 kWh

Energy source	Diesel	Butane	PV
Efficiency	30 %	32 %	100 %
Energy required	100 kWh	100 kWh	100 kWh
Fuel energy content	9.29 kWh/l	160.23 kWh/bottle	-
Fuel consumed	10.76 l	0.62 bottles	-
Cost per unit	0.864 USD/l	5.28 USD/bottle	0 USD
Fuel cost per day	9.30 USD	3.30 USD	0 USD
Fuel cost per month	283 USD	100 USD	0 USD
Fuel cost per year	3,395 USD	1,203 USD	0 USD
<b>5 year cost</b>			
Fuel cost	16,973 USD	6,014 USD	0 USD
Cost of fuel deliveries / refilling	3,000 USD	3,000 USD	0 USD
Engine servicing / replacement parts	3,600 USD	3,000 USD	0 USD
Initial cost	2,400 USD	2,400 USD	16,800 USD
<b>Total costs</b>	<b>25,973 USD</b>	<b>14,414 USD</b>	<b>16,800 USD</b>
<b>Costs per m<sup>3</sup></b>	<b>0.12 USD</b>	<b>0.07 USD</b>	<b>0.08 USD</b>



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SEWT's services include:

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- Assistance and support for customers in the choice of solutions and their projects
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## LORENTZ

**LORENTZ is a market leader in solar powered water pumping solutions.**

Founded in Germany during 1993 LORENTZ has pioneered, innovated and excelled in the engineering and manufacturing of solar powered water pumping.

Today LORENTZ is active in over 120 countries through a dedicated network of professional partners. LORENTZ technology uses the power of the sun to pump water, sustaining and enhancing the life of millions of people, their livestock and crops.

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