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WATER AND ELECTRICITY FOR MEDITERRANEAN FARMERS [PVP + SHS] or [PV-Diesel-HYBRID] ?

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State of the art

Water pumping systems and electrification of remote houses are two of the most important needs in the rural electrification sector. Often both needs emerge at the same time and same place.

The installation of one **PhotoVoltaic Pumping** system (PVP) and one **Solar Home System** (SHS) might be one concept for the satisfaction of those needs. The installation of a Hybrid system composed of PV Modules, Inverters, Batteries and Genset could be another reliable solution. Aim of the work presented in this paper is the energetical and economical comparison of the two concepts and the identification of their advantages and disadvantages.

Work and methods

University of Kassel identified two such cases on the island of Lesbos in Greece. There are two sites in a distance of approximately 10 km of each other, having very similar climatic conditions (solar radiation and temperature). Both sites are far from the public electric grid. The needs are very similar too; both sites need water for irrigating and electricity for a farm house.

At the first site, a combination of a photovoltaic pumping system (PVP) and of a solar home system (SHS) has been installed with following characteristics (see Fig. 1):

PVP:

- Photovoltaic generator: 400 W_p, 5 Modules, BP Solar BP 580F, à 80 W_p
- Inverter: Solartronic SA 400, nominal power 400 W, nominal DC voltage 90 V, AC frequency 25-61 Hz
- Solar water pump: Grundfos, SP400 1A-9, nominal power 550 W
- Water reservoir: capacity approx. 21 m³

SHS:

- Photovoltaic generator: 50 W_p, 1 Module, Siemens S50
- Battery: 1 Dryifit, 12V, 30 Ah (C₂₀)
- Battery Charger: Steca Solsum, 12 V, 6A

At the second site, a HYBRID system has been installed, consisting of following components (see Fig. 2):

HYBRID:

- Photovoltaic generator: 960 W_p, 12 Modules, BP Solar BP 580F, à 80 W_p,
- Inverter: Studer Compact C1824, nominal power 1800 W, including Battery chargers
- Battery: 4 Dryifit, à 12V, 230 Ah (C₁₀₀)
- Diesel Genset. Yanmar, 5 kW, 3-phase, nominal voltage 220V/380V
- Water pump. Nominal power 1,5 kW

Both systems are being continuously measured by an installed monitoring system. The monitoring data are being transferred automatically once per month by three GSM modems to University of Kassel.

Expected results

The load profiles and installed power of both systems are not the same, but comparable. The power flow data of both systems will be indicated and an economical comparison of both concepts will be presented. Even maintenance, problems, failures and other lessons learned will be mentioned to the paper. Advantages and disadvantages will be detailed discussed.