

## Innovative Photovoltaic-Thermal (PVT) Systems for Swine Farms

Intensive livestock farming consumes a considerable amount of thermal and electrical energy, especially in swine farms where piglets need heating all year round. Therefore, Photovoltaic thermal (PVT) collectors, that convert solar radiation into usable thermal (for hot water and space heating) and electrical energy are a promising form of renewable energy generation for agriculture and livestock farming specifically. A heat storage tank can be used to store excess heat during the day for use at night.

To have available heat all year round, the PVTs can supply heat to a heat pump and thereby increasing the efficiency of the heat pump by up to two times. This was the case in the ILVO pilot farm in Belgium. PVT collectors can also be combined with a geothermal seasonal heat storage system to store excess heat during the summer for the winter. This is case in the Golinelli swine farm in Emilia-Romagna, Italy.



### ILVO Swine Farm PVT System with Heat Pump Highlights

- 24 Aбора aH72 PVT collectors (45m<sup>2</sup>) were installed in combination with 2 heat pumps that deliver the final space and domestic hot water heat to the farm.
- Expected annual solar heat supply to the farm of 15 MWh to 21 MWh with 24 Aбора aH72 PVT collectors.
- Expected annual electric PV supply to the farm of 4 MWh with 24 Aбора aH72 PVT collectors.
- Annual maintenance costs are less than 500 EUR.
- With the heat pump and PVT installation, no gas is expected to be consumed by the farm all year round.
- Expected return on investment is less than 8 years, which can be reduced with increasing gas and electricity prices as well as increasing price volatility.



Figure 1: PVT collectors at ILVO swine farm in Belgium, before insulation of pipes



### Golinelli Swine Farm PVT System with Geothermal Storage and Heat Pump Highlights

- 24 Samster uninsulated PVT collectors (45m<sup>2</sup>) were installed in combination with a seasonal geothermal storage and heat pump to deliver the final space and domestic hot water heat to the farm.
- Expected annual solar heat supply to the farm of 19 MWh to 25 MWh with 24 Samster PVT collectors.
- Expected annual electric PV supply to the farm of 10 MWh with 24 Samster PVT collectors.
- Annual maintenance costs are less than 300 EUR.
- With the heat pump and PVT installation, no fossil fuels are expected to be consumed by the farm all year round.
- Expected return on investment is less than 6 years, which can be reduced with increasing gas and electricity prices as well as increasing price volatility.



Figure 2: PVT installation at Golinelli Swine farm in Italy

