USES OF GEOTHERMAL ENERGY IN AGRICULTURE

The agricultural sector is a heavy energy consumer and greenhouse gas emitter which needs to be more sustainable, competitive, and to ensure food security. This gives it a specific and urgent energy challenge: it needs to find stable, low cost, and local renewable energy, and it needs to reduce its contribution to climate change.

Much of the energy used by the industry is for low and medium level heat (less than 200°C), which is required at many stages of both production and treatment. Traditionally fossil fuels have been used, but fluctuating energy prices also expose the agri-food industry to risk.

**Geothermal is a solution for this fuel switch.**

Geothermal is increasingly being used in the agri-food industry as it meets many of the sectors’ requirements. Low or medium temperature geothermal heat is available everywhere in the world, and the systems enabling its use are simple and easy to maintain. Geothermal projects are installed locally and provide heating and cooling at competitive prices. They create direct and indirect jobs across the value chain.

**GREENHOUSES**

Greenhouses are one of the largest low enthalpy energy users in the world. Replacing traditional energy with Geothermal has been found to decrease energy costs by 80% and operating costs by 5–8%.

**DRYING**

Drying food reduces food waste and increases out of season availability. There are benefits across the production-consumption chain; dried food is lightweight, easily stored, and easily transported.

**WARM WATER IRRIGATION**

Plants need to be given water at the correct temperatures, avoiding cold stresses. Using the warm geothermal water reduces the need for energy.

**OPEN FIELD HEATING**

Root system temperature affects the production time of many crops, and warmer soil reduces dependence on warm air. After being used for other purposes, geothermally heated water can be used in open field heating.

**SPIRULINA CULTIVATION**

Rich in iron and protein, the market for Spirulina is growing. Producing the algae in protected environments using geothermal heating gives consistent high quality crops.

**AQUACULTURE**

In geothermally heated open ponds, fish can be bred throughout the year.
IN THE WORLD

Direct use of Geothermal can be found in 82 countries globally. Of the direct use, 4.5% is for greenhouses and open ground heating, 2% for aquaculture pond and raceway heating, and 0.4% for agricultural drying.

GREENHOUSES

In 2015, thirty-one countries were using geothermal energy to heat greenhouses, with Turkey, Russia, Hungary, China and Netherlands leading globally. It is estimated that 1,333 hectares of greenhouses are currently heated geothermally, a 16% increase since 2010.

AQUACULTURE

The USA, China, Iceland, Italy and Israel continue lead amongst the twenty-one countries using geothermal aquaculture. With installed capacity increasing by 6.7% in the last five years, growth in this market is slower than in others as highly specialised staff are required. Nevertheless, geothermal contributes to 49,413 tonnes of production annually.

DRIYING

Geothermal drying uses 161 MWth per year, notably in China, the USA and Hungary. The drying industry is diverse, including seaweed in Iceland, onions in the USA, cereals in Serbia, fruit in Latin America, alfalfa in New Zealand, coconut in the Philippines, and timber in Mexico, New Zealand and Romania).

IN EUROPE

In Europe the direct use of geothermal (for both industry and agriculture) employs around 9,000 people in nineteen countries. The industry is growing, with capacity reaching 1385.83 MWth in 2013 and production 2851.46 MWth.

Support for investment can be found in seventeen countries, mainly as direct financial support or low-interest loans. Risk coverage is available in four countries and for operation, only eight countries have schemes of various types for geothermal direct use.
OBJECTIVE

The Dutch horticulture sector is one of the top global leaders in terms of innovation and trade with international partners. Being a stable pillar of the Dutch economy, horticulture represents around 400,000 jobs and accounts for a yearly production value of €8 bn. Relying extensively on natural gas, the sector’s energy costs represent about 20% to 30% of its total production costs. Therefore, one of today’s challenges for Dutch horticultural companies is to achieve a more efficient and sustainable use of energy, notably through the uptake of renewables such as geothermal district heating.

KEY DATA

There are today 9 geothermal systems operating projects in the Dutch horticultural sector representing an installed capacity of 100 MWth. 2 new deep geothermal projects are planned in the next 3 years accounting for an additional capacity of more than 30MWth. The development of geothermal in horticulture is very promising as the country has a good potential in terms of geological resource were the sector is most dynamic.

GEOTHERMAL IN ACTION

GEOTHERMALLY HEATED GREENHOUSE IN THE NETHERLANDS

BENEFITS

Although it is still a rather new technology in the Netherlands, geothermal installations offer many advantages. They provide a great opportunity to significantly lower energy costs and protect companies from volatile natural gas prices. Geothermal systems are also particularly attractive thanks to a favourable regulatory framework combining existing insurance scheme for geological risks and competition-based support schemes (i.e. SDE+, "Encouraging Sustainable Energy Production").
GEOTHERMAL IN ACTION

GEOTHERMAL WINEMAKING IN ORSCHWILLER-KINTZHEIM, FRANCE

ABOUT THE PROJECT

The wine cellar of Orschwiller-Kintzheim was founded in 1957 and is today a cooperative with 80 adherents. The winery recently underwent renovation, and chose to use a geothermal system in order to reduce costs and maintain quality. The wine is still made in the traditional way, but uses state of the art equipment- in stainless steel tanks, refrigerated or reheated thanks to the geothermal system. A new technology known as ‘B.R.O.T.S.’ is coupled with vertical borehole heat exchangers. The 23 borehole heat exchangers of 100m each underneath the winery represents an energy reservoir of 170,000m³.

KEY DATA

- 194 tonnes of CO² are saved annually thanks to the geothermal system.
- 30 TOE are saved each year.
- Payback period: 6 years
- Total cost of new winery: €6 million (before tax)
- Cost of works including heat pump, B.R.O.T.S., hot water tanks, heat exchanger, SGC, collectors, glycol, building: €360,000 (before tax), 6% of the total project cost
- Cost savings per year: €15,000 compared to oil and gas and €23,000 compared to electricity
REFERENCES


