Water-Energy-Food Nexus: Geothermal water for agriculture - Geo4Food

Names and Institutions of Turkish Partners:
Izmir Institute of Technology (IZTECH) & Ege University (EGE)

Names and Institutions of Polish Partners:
Mineral and Energy Economy Research Institute, Polish Academy of Sciences (PAS MEERI) & Wroclaw University of Technology (WUST)

Project Duration:
36 months

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Information about Turkish Research Team				
Name	**Institution/Department**	**Position (title)**	**Role in the Project***	**Contribution Rate (%)**
Alper Baba	Izmir Institute Technology (IZTECH)/Geothermal Energy Research and Application Center	Prof.Dr. Director	Principal investigator	100
Gülden Gökçen Akkurt	Izmir Institute Technology (IZTECH)/Energy Systems Engineering	Prof.Dr. Head of Dept.	Researcher	10
Hatice Eser Ökten	Izmir Institute Technology (IZTECH)/Environmental Engineering	Asst.Prof.Dr.	Researcher	20
Nalan Kabay	Ege University (EGE)/Chemical Engineering	Prof.Dr.	Researcher	10
Müşerref Arda	Ege University (EGE)/Chemistry	Prof.Dr.	Researcher	10
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Project web site: www.geo4food.com

ABOUT PROJECT

Through production of safe and adequate amount of water, Geo4Food aims to ensure sustainable development in agriculture sector. Geo4Food meets the mutual benefit requirement of bilateral cooperation by offering energy efficient solutions to mutual problem of irrigation water scarcity.

Aim

The aim of Geo4Food is to establish management of low-enthalpy geothermal waters as a source of energy and water for agricultural production. The collaboration between institutions from Turkey (EGE, IZTECH) and Poland (PAS MEERI, WUST), is to implement a novel approach that integrates renewable energy resources into agri-food chain, in order to supply safe and adequate irrigation water.

Objectives

In order to achieve safe, clean and sustainable irrigation water, Geo4Food has set couple of objectives. The main objective of Geo4Food is to offer a solution to water scarcity problem in agricultural areas by desalinating low-enthalpy geothermal resources that are abundant in Poland and in Turkey.

Workpackages

Geo4Food is composed of 4 work packages. The work plan of Geo4Food is based on contributions of experiences from partners and presents innovative approach to freshwater production for agri-food chain using geothermal aquifers as water and energy source.

WORKPACKAGE 3 - Utilization of treated geothermal water for plant irrigation
WP Leader: EGE – M. Kamil Meriç (EÜBMYO)
Start Date: 1st month
End Date: 36th month

Objective

Pilot tests aimed at irrigation of crops with treated geothermal waters. Water use efficiency and yield and yield related quality parameters of plants will be investigated. At the end of the growing seasons, plants will be harvested to determine the total and marketable yield. Besides, soil and plants will be

analysed in terms of plant nutrients and relevant major ions. Research for process optimization for growing lettuce with the use of parapet greenhouse heated by geothermal energy will be done.

WP Tasks

Task 3.1 Preparation for planting [Leader – EGE, Partner – PAS MEERI]: A geothermally heated parapet greenhouse in Poland and an agricultural field next to the Balçova Geothermal Facility in İzmir will be prepared for planting lettuce and tomato, respectively.

Task 3.2 Plant growth [Leader – EGE, Partner – PAS MEERI]: Tomato and lettuce seedlings will be planted. Spring-summer growing season is chosen for tomato since will be grown in the field. Treated geothermal brine streams will be delivered to plants via drip irrigation systems. Soil temperature, moisture and electrical conductivity (EC) will be measured continuously using an automated sensor system.

Task 3.3 Crop yield [Leader – EGE, Partner – PAS MEERI]: At the end of the growing seasons plants will be harvested to determine the total and marketable yield, quality, and plant nutrient, along with ionic content – i.e. B, As and Li content.

Task 3.4 Geothermal drying of harvested tomatoes [Leader – EGE, Partner - IZTECH]: A geothermal cabinet dryer that is already installed on site at Balçova Geothermal Facility will be used for drying experiments. Measurements of temperature, relative humidity and air velocity will be done using a datalogger. In order to determine changes in weight of tomatoes, a digital weighing apparatus (± 0.01 g) will be used during the drying process. Measured temperature, relative humidity and velocity data at tray inlet, outlet and environment will be used for energy and exergy analysis. Marketable yield will be evaluated.

Task 3.5 Biogas production from plant residues [Leader – EGE, Partner – PAS MEERI]: Optimization of the fermentation process by selecting process parameters (concentration of biomass and waste sludge, temperature) will be done. In order to close the cycle that starts with water treatment, potential of produced biogas to account for the energy consumed by treatment will be evaluated with PAS MEERI.

Data obtained in this work package will be directed to other WP for energy and environmental analyses.