



## Pre ARGeo C9 Conference Short Course

### Short Course 4: Powering Agri-food value chains with geothermal heat to enhance food security and climate action

Organised by the International Renewable Energy Agency (IRENA) and the United Nations Environment Programme (UNEP) in the framework of the Global Geothermal Alliance



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Coordinated By UNEP ARGeo Programme

1-2 November 2022

## 1. BACKGROUND

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Renewable energy and energy efficiency will play a central role in the ongoing global efforts to promote sustainable development, climate action, and energy transition. Renewable energy technologies can support the decarbonisation of the end-use sectors such as agri-food to promote sustainable food production while adapting to climate change.

Currently, the world is experiencing adverse weather patterns such as flooding and drought due to climate change, which have disrupted the production of food. The ongoing drought in many parts of Africa has exacerbated food insecurity in the continent, leading to inadequate food, mainly for the vulnerable populations. Renewable energy solutions such as geothermal energy, which are abundant in many countries in the regions could contribute to addressing the challenge of food insecurity in the continent.

The use of geothermal heat in the agri-food sector is increasing worldwide, with several examples in Africa, Asia, Europe, the Americas, and Oceania. However, these applications are still very few, mainly due to a lack of data (both on geothermal direct use potential and on energy usage in agri-food systems), low levels of awareness about the opportunities and benefits associated with direct use technologies, limited financing options, and lacking or inadequate enabling conditions for investment in the sector, among others.

However, more significant progress can be achieved with increased support in areas such as resource mapping, policy and regulations, financing, and capacity building, among others, as well as with the development of tools that can enable policymakers to carry out assessments of geothermal heat utilisation, such as socio-economic impacts and heat pricing. These assessments might provide relevant information to support decision making, hence fostering accelerated use of geothermal heat in the agri-food sector.

In this regard, IRENA and UNEP aim to support the countries in the region to address the challenge of food insecurity through the deployment of geothermal energy in agri-food systems. It will build on the work done by IRENA and UNEP to promote the deployment of geothermal energy through direct use applications.

## 2. OBJECTIVES

The short course will equip the participants with knowledge on the opportunities and benefits of for utilising geothermal energy in the agri-food sector, particularly with regard to food security. It will provide global best practices that have resulted in successful deployment of geothermal energy in the agri-food value chains; as well as tools and methodologies that support decision making on investment.

## 3. EXPECTED PARTICIPANTS OF THIS COURSE

The short course is expected to benefit the stakeholders from Africa whose work could contribute to increased deployment of geothermal energy in agri-food systems. A wide range of audience is targeted through the short course including policy makers and technical level persons from national governments and local administrations drawn from the ministries of energy, agriculture, and industrialisation; representatives from enterprises involved in agri-food; geothermal developers; financiers; and regional and international organisation supporting geothermal direct use, among other relevant stakeholders.

## 4. EXPECTED OUTPUT OF THE SHORT COURSE

The short course will address the challenges hindering the accelerated deployment of geothermal heat in the agri-food value chains. The participating countries will also showcase their ongoing efforts to utilise

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geothermal to enhance the food systems. In African countries, the agri-food sector employs many of the continent’s youth and women. The use of geothermal heat along the agri-food value chains e.g., for food production, processing, drying and cold storage has the potential to enhance food productivity, reduce food spoilage and add value to food produce. This would result in food security, more employment opportunities and higher incomes for the employees and other agri-food stakeholders. In addition, geothermal energy would contribute to the sustainability of the agri-food sector by reducing the carbon emissions from the sector.

## 5. OUTLINE/SUBTOPICS OF THE COURSE

The short course will be carried out in hybrid format over a period of two days. It will consist of several presentations by different experts. It will address four broad topics which are relevant to the deployment of geothermal energy in the agri-food sector as follows:

- Mapping of geothermal energy resources and co-location with heating demand
- Technology, Project Development and Financing
- Enabling policies and regulations and cross-sectoral coordination
- Capacity building, awareness creations, sustainability and innovation

## 6. AGENDA

Day 1: 1 November 2022		
09:00 – 10:00	<b>Introduction of Instructors and Trainees</b>	
	<b>Official Opening: UNEP, , GRO-GTP, NZAGF, GRG, GGA/IRENA/ AGA/AWAG/ ODDEG/ Ministry of Energy (Chief Guest)</b>	
<b>Short Course IV: Powering Agri-food value chains with geothermal heat to enhance food security and climate action</b>  <i>Four short courses will be taking place in parallel</i>		
<b>Introduction</b>		
<b>Time</b>	<b>Topic</b>	<b>Presenter</b>
10:30 – 11:00	Leveraging Renewable Energy in Agri-food	Manas Puri, FAO
11:00 – 11:30	Overview of geothermal agri-food applications – Opportunities and benefits	Jack Kiruja, IRENA
Geothermal Resources for Agri-food applications and Demand for Energy		
11:30 – 11:45	Geothermal Resource and Demand Mapping	Jack Kiruja, IRENA
11:45 – 12:30	Geothermal resources for agri-food applications in Africa – Direct Use Technical Guide	Meseret Teklemariam, UNEP
12:30 – 13:00	Q&A	All
13:00 – 14:00	Lunch Break	
Technology and Project Development		
14:00 – 14:30	Direct use project set up, Business models and financing options	Jack Kiruja, IRENA

14:30 – 15:15	Technological considerations in establishing direct use projects - Geothermal village concept	Jacques Varet, Consultant
15:15 – 16:00	An approach to develop direct use projects – from concept to commercialisation	Martha Mburu, GDC
16:00 – 16:30	Direct Use Possibilities in Africa	Martha Mburu, GDC
16:00 – 16:30	Q&A	All

Day 2: 2 November 2022		
Case Study Presentations		
09:30 - 09:50	Ethiopia	
09:50 – 10:10	Uganda	
10:10 – 10:30	Tanzania	
10:30 – 11:00	Coffee Break	
Capacity building, awareness creations, sustainability and innovation		
11:00 – 11:30	Addressing Knowledge gaps	Jack Kiruja, IRENA
11:30 – 12:15	Building capacity for direct use through Technical Assistance – Nakuru Pilot Projects	Meseret Teklemariam, UNEP
12:15 – 12:45	Q & A	All
12:45 – 14:00	Lunch	
Enabling policies, regulations, and Financing		
14:00 – 14:15	Enabling framework Conditions for geothermal agri-food applications	Jack Kiruja, IRENA
14:15 – 14:35	Establishing regulatory framework for Direct Use deployment	Michelle Ramirez, Geothermal consultant/Wing country representative - Mexico
14:35 – 15:05	Alignment of cross-sectoral policies to support direct use deployment - Geothermal Energy Park concept	Peketsa Mangi, KenGen
15:05 – 15:35	De-risking geothermal resources for direct use (agri-food) applications	Kai Imolauer, GRMF Technical Consultant
15:35 – 16:00	Q & A	All
16:00 – 16:30	CLOSING SESSION AND CERTIFICATE AWARD	All
16:30 - 17:00	Rebranding of African Women in Geothermal	

1. Dr Meseret Teklemariam



Dr. Meseret Teklemariam Zemedkun (PhD, Earth Science, Geothermics), is an Ethiopian woman internationally recognized and acclaimed professional with over 20 years' experience in Energy field, management, project management, international donor relations and more. Since 2011, she works in UN at UN Environment Programme (UNEP) Africa office in Kenya, as Programme Manager for Africa Rift Geothermal Development Programme (ARGeo) and also as Regional Energy Programme Manager in Africa. Is a recipient of many international awards and has authored more than 20 professional papers some of which have won international awards. She has also served as international consultant on geothermal energy in various assignments (including African Union Commission and UNIDO). Dr. Zemedkun has played a seminal and stellar role in conceptualization, visibility and institutionalizing the ARGeo activities; and, in coordination with donors and institutions, she has helped to mobilize funds for projects, programmes and investments. She has led the development of energy initiatives, policies and programmes as Regional Energy Programme Coordinator. She has played a leading role in the initiative and development of programmes for support to Women Entrepreneurs in Energy sector in Africa. She is currently implementing this programme with various partners through the Africa Women Energy Entrepreneurs Framework (AWEEF). She has been a regular faculty of UN University- Geothermal Training Programme in Iceland for many years. She has also been training geothermal staff in Africa as invited faculty. She focusses on Capacity Development in Africa with zeal and has been instrumental in conceptualizing and making possible the African Geothermal Center for Excellence.

2. Jack Kiruja



An Associate Programme Officer for Geothermal Energy at the International Renewable Energy Agency (IRENA). Since 2019, has been supporting the Agency's geothermal activities which are implemented in the framework of the Global Geothermal Alliance, a multi-stakeholder platform for geothermal stakeholders, that supports the establishment of enabling frameworks to accelerate investments in geothermal energy. Previously, worked at the Geothermal Development Company in Kenya where was involved in promoting the development of direct use including demonstration projects and assessing the viability of various direct use applications. Holds a master's degree in Sustainable Energy Engineering from Reykjavik University, Iceland and is a Fellow of the Geothermal Training Programme in Iceland - GRO GTP (formerly United Nations University – Geothermal Training Programme).

### 3. Manas Puri



Manas Puri works with FAO as an expert on using sustainable energy in agriculture. He is an experienced sustainable energy professional and has several years of experience in analyzing and deploying sustainable energy solutions across food value chains. Manas is keenly interested in using clean energy technologies to increase agricultural productivity by modernizing the food value chain to be more efficient and reducing food losses caused by a lack of cooling and processing infrastructure. He holds a bachelor's degree in Physics and a PhD in Economics. After finishing his Ph.D., he joined FAO's Climate and Environment division and has since supported several countries in Africa, Asia, and the Near East in

developing evidence-based energy and agriculture policies to support the countries' transition to a low-carbon, sustainable agriculture sector.

### 4. Jacques Varet



Expert in geothermal resource assessment, exploration, feasibility studies and development. Senior engineer with 50 years' experience in geothermal resources and technologies world-wide, and more particularly in the Euro-Mediterranean and Arabo-African plate's environment. Originally geologist, volcanologist specialized in petrology and mineralogy and relations between tectonics and magma genesis (Paris South & Addis Ababa Universities). IAVCEI Wager Prize with F. Barberi (1975). Head Geothermal Dt., BRGM: resource assessments in Europe, ECWA, OLADE, East Africa, SE Asia, & developments in France (now serving more than 300.000 households). Created Compagnie Française de Géothermie (CFG) in 1984, and IFEN (Institut Français de l'Environnement) in 1994, was director of the French

Geological Survey (since 1996) and twice President of Eurogeosurveys. Created in 2011 SARL Géo2D (Ressources Géologiques pour le Développement Durable) operating mainly in EARS: Kenya, Ethiopia, Djibouti, Rwanda, Eritrea, Tanzania, Yemen, RDC, Somalia, Comoros.... Associate Professor DEKUT (Kenya), directing research of young Kenyan geothermal engineers from KenGen and GDC. Co-PI for Geopower Africa USAID research project. Member of the Technical Advisory Team (TAT) for the Geothermal Centre of Excellence (under UNEP). Renown for geosciences applied to exploration, & geothermal energy technologies for local development, particular cascade uses, medium and low enthalpy, including binary systems. Promoting project appropriation by local communities for sustainable development and climate resilience. Most recent (last 10 years) references: France (ALCEN group, Electerre), Ethiopia (Afar with AGAP, MER with Boortmalt, Tulu Moye and other geothermal projects with Meridiam), Djibouti Republic (advising Minister of Energy, Asal-Fiale for AFD, Resources assessment for UNDP; strategic planning for ODDEG/BGR, Kenya (with USAid, KenGen, GDC, SEPCO); Rwanda (EDCL/EDF). Launched the Geothermal Village (GV1) project under LEAP-RE EU (R&D programme 2021-2024). Writing the Guidebook of Direct Uses Geothermal Development (DUGD) in Africa (UNEP 2021). Author of several books including: La Géothermie en France, Masson, 1972 ; Geology of Afar (2008). Over 300 publications in international scientific and professional journals (list on site [www.geo2d.com](http://www.geo2d.com)).

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5. Eng. Martha Mburu



A graduate of the UoN Kenya with a BSc in Mechanical Engineering, and a MSc from Reading University, UK in Renewable Energy-Technology and sustainability. Her research concentration was in geothermal direct use. She holds a postgraduate diploma in geothermal energy technology from New Zealand and a post graduate certificate in geothermal reservoir engineering from UNU-GTP, Iceland. Martha experience in geothermal energy engineering spans over 20 years, of which more than 10 years has been in geothermal direct uses. Martha has spearheaded several programs in geothermal direct use in the areas of research, projects planning, implementation and operations, training, authoring and co-authoring several papers in local and international forums. Since 2007, she has given lectures during the annual short course series in Kenya in the areas of Direct-Use and low energy utilization. Martha has also presented on the same subjects on local and international seminars and forums. She is currently the Manager of the Direct Use department at GDC, a position she has held for more than 10 years. Eng. Martha is passionate about geothermal energy utilization, specifically its use to improve community livelihood and enhance food security.

6. Michelle Ramirez



Michelle is a senior consultant for geothermal energy, specializing in regulation. Over the last ten years, Michelle has collaborated with Governments at the international level, international cooperation agencies, and the main international stakeholders of the geothermal industry in consultancies of regulation, governance, and public policy.

Since 2012, she has been involved in designing and implementing public policies and regulations for the energy transition focused on geothermal. She is well known for her contributions to fostering geothermal energy worldwide for developing cutting-edge public policies through analytical and logical work, but primarily because of the ease of presenting and transmitting technical subjects and translating their solutions into public policies and legal wording.

On a personal level, Michelle has been committed to gender equality issues; she participates in consultancies by developing and implementing tools to combat discrimination.

7. Peketsa Mangi



The General Manager-Geothermal Development Department with over 20 years' experience in Geothermal energy sector. He holds a Master of Science (Information Science) from Moi University and is currently pursuing PhD. in the same discipline from the same institution. He is a Certified Project Manager (IPMA Level C). Some of the key certifications he holds include Earth Sciences, Reservoir Management, Drilling technology, Executive master negotiation skills, Public procurement, Geothermal projects management and financing. He is currently the Vice Chairman of the Geothermal Association of Kenya (GAK), a member of the Geological Society of Kenya (GSK) and International

Geothermal Association (IGA). He is responsible for coordination and management of geothermal development at the Olkaria and Eburru geothermal fields which have a combined generation capacity of 799 MW. In addition, he ensures sustainable utilization and development of the geothermal resource and capacity expansion in line with the Company strategy while also ensuring human capacity development commensurate with geothermal development requirements. He is responsible for strategic coordination and management of external geoscientific and drilling contracts that KenGen is undertaking in the region including Kenya, Djibouti, and Ethiopia. Mr. Mangi has been instrumental in geothermal networking and partnerships with other organizations globally. He is passionate about urgent investment in green and sustainable energies, particularly increased geothermal energy deployment as a means of access to affordable and reliable power and, direct use applications to abate greenhouse gas (GHG) emission.

8. Kai Imolauer



With a background as Master of Business & Engineering - is in touch with geothermal projects his whole work life as a consultant, like e.g. in the field of district heating projects, combined cycle in Germany & Europe, as well as the design of risk mitigation systems in Latin America, Indonesia & Africa. Currently he is heading the Technical Consultant Team for the African Union Commission's Geothermal Risk Mitigation Facility (GRMF).