



Application of Geothermal Energy for Sustainable Agriculture and Food Security in Jordan



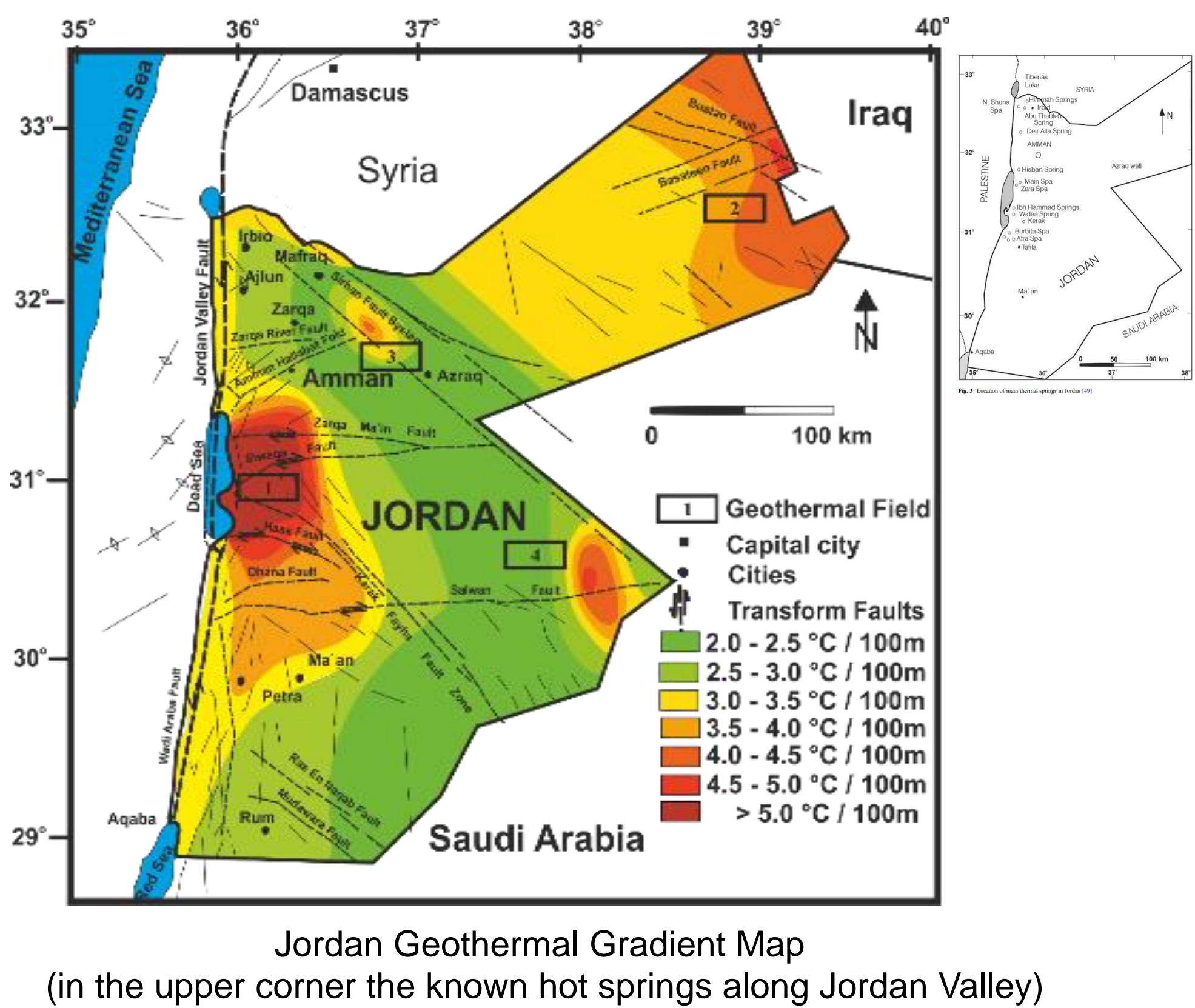
Harnessing Geothermal Resources for Climate-Resilient Agri-Food Systems in Jordan
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INTRODUCTION

Jordan's unique geological structures—such as geothermal hot springs, sedimentary reservoirs, and potential thermal gradients—present an exceptional opportunity to develop renewable energy solutions that address the country's growing challenges of food security, climate resilience, and biodiversity conservation. Jordan faces increasing pressures on its agri-food systems due to climate change, limited water resources, and energy insecurity. The challenge is to build sustainable and resilient agricultural practices while reducing reliance on fossil fuels. Geothermal energy, as a clean and renewable source, offers a transformative opportunity to address these challenges and improve food production in arid environments like Jordan. The project also recognizes that scaling geothermal solutions requires confronting potential resistance, including affordability challenges, entrenched energy interests, and policy hurdles; therefore, capacity-building programs for local communities are being integrated to ensure that adoption is inclusive, equitable, and sustainable. Consequently, the research question is How can geothermal energy support sustainable agriculture, food security, and climate resilience in Jordan?

GEOTHERMAL ENERGY IN AGRICULTURE

By utilizing geothermal heat in greenhouse production, the project reduces energy dependency and operational costs. This clean energy application enables consistent growing conditions year-round, improves productivity, and opens opportunities for cultivating high-value crops, even in harsh climatic zones.



The project explores integrated and scalable solutions for greenhouse heating and improving irrigation systems, aligning with national strategies and development goals as follows:

1. Integrate geothermal energy into Jordan's agricultural sector.
2. Overcome seasonal temperature fluctuations and high energy costs.
3. Address declining crop yields impacting smallholder farmers.
4. Support biodiversity conservation and strengthen food systems.

ENVIRONMENTAL IMPACT AND SDGs INTEGRATION

Impacts on Food Security & Climate Resilience.

The project contributes to food security by stabilizing crop yields and expanding agricultural activities in marginal areas. Geothermal integration also enhances the resilience of farming communities to climate extremes, thereby improving long-term food availability, accessibility, and affordability.

Biodiversity & Soil Health Benefits

In addition to its energy benefits, the project indirectly supports biodiversity and ecosystem health by reducing land degradation and encouraging environmentally friendly agricultural practices. Sustainable soil management under geothermal-supported farming helps maintain productivity while protecting natural resources.

Embedding Geothermal in National Frameworks

To ensure lasting impact, the project is working toward institutionalization through clear policy alignment, the introduction of targeted incentives for geothermal adoption, and advocacy for regulatory reforms that integrate energy–agriculture synergies into national development frameworks.

Alignment with SDGs & WEF Nexus

The intervention contributes to multiple Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger), SDG 7 (Affordable and Clean Energy), and SDG 13 (Climate Action). It also advances the Water-Energy-Food-Ecosystem (WEFE) Nexus by offering a model of integrated resource management.



STAKEHOLDER ENGAGEMENT

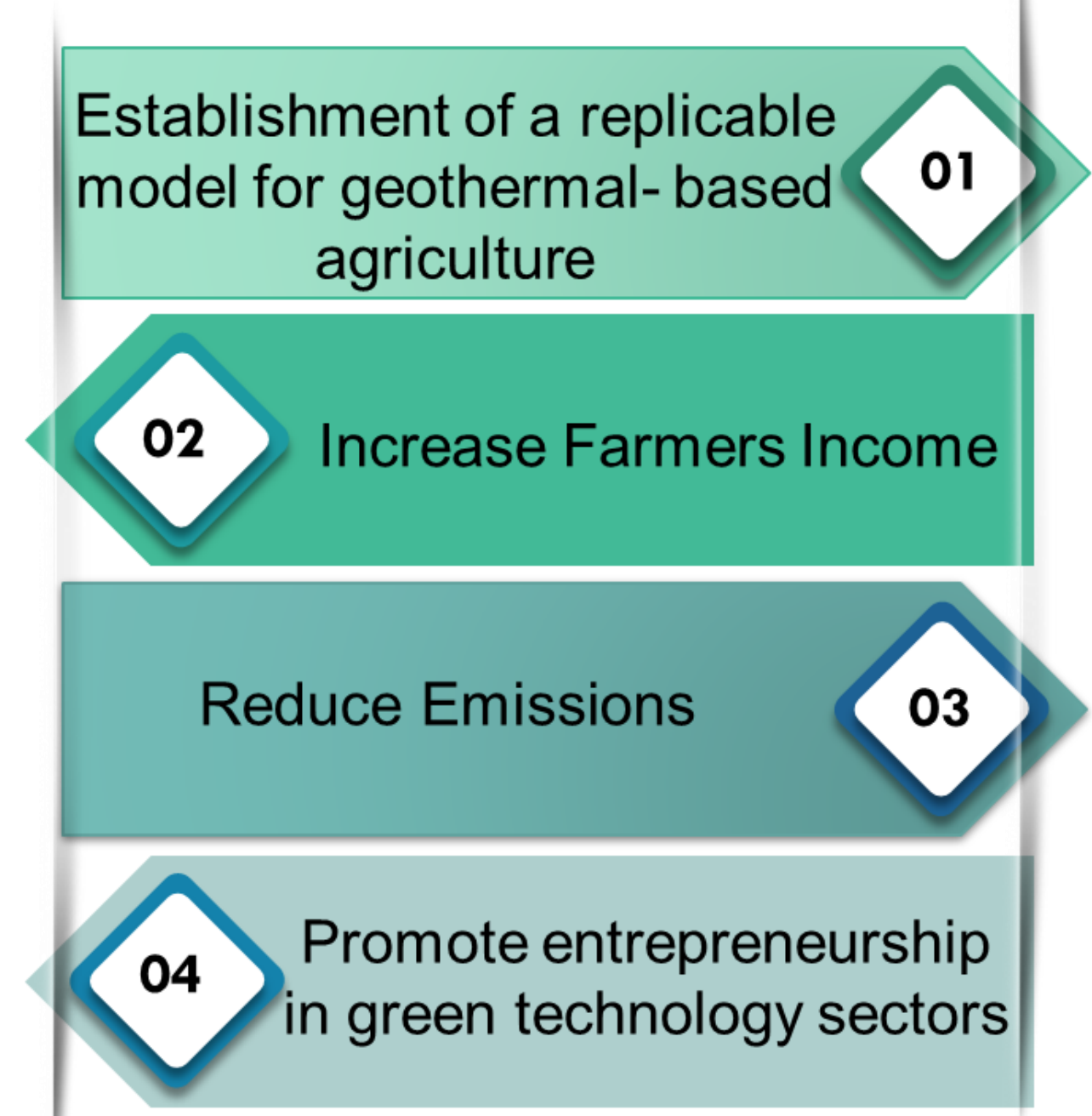
Stakeholder Category	Role in the Project
Government Agencies	Support energy policy integration and align geothermal initiatives with national agricultural strategies.
Academic and Research Institutions	Capacity building, technical consultancy, environmental assessments.
Private Sector Partners	Companies specializing in renewable technologies and agricultural innovation.
Local Communities	Empowering and capacity building farmers, women and youth, strengthening rural food systems.

INCLUSIVE PARTICIPATION IN GEOTHERMAL ADAPTATION

Effective climate adaptation strategies for geothermal energy must consider land tenure systems, as unequal access to land directly shapes how communities benefit from geothermal resources. Market inequities in resource distribution also limit the ability of vulnerable groups to use resilient construction materials from geothermal innovations. Addressing socio-political constraints such as limited policy support, is equally vital. The participation of smallholders is crucial, since their livelihoods are closely tied to land and natural resources. Ensuring their involvement in decision-making not only promotes equity but also strengthens the long-term success and social acceptance of geothermal projects.

EXPECTED OUTCOMES

The proposed project envisions a systemic redesign of energy–agriculture linkages by integrating geothermal solutions into food security strategies, enabling resilient farming systems that are both low-carbon and climate-adaptive.



CONCLUSION & FUTURE VISION

This pilot project envisions a resilient and sustainable agricultural future in Jordan, where geothermal energy is a keystone of food security strategy. By demonstrating tangible environmental and economic benefits, it sets the stage for adoption of geothermal applications in national agriculture policies.

The use of geothermal heating systems for greenhouses in Jordan offers a dual advantage: reducing reliance on fossil fuels while stabilizing agricultural productivity year-round.