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Harvesting the sun twice: Enhancing livelihoods in East African agricultural communities through innovations in solar energy

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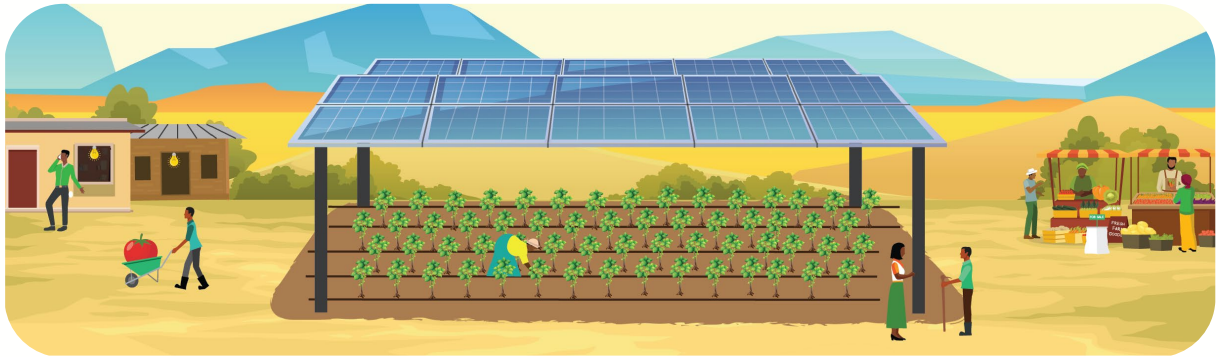
Principal Investigator: Prof Sue Hartley. Funder: UK GCRF-ESRC



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Contents

1. Agrivoltaics concept
2. Factors driving agrivoltaic performance
3. Why East Africa, and potential benefits of agrivoltaics
4. “Harvesting the sun twice” project in East Africa
5. Roadmap to support agrivoltaics in Africa

Talk duration: 20 slides, 20 minutes.

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Agrivoltaics: combining agriculture with photovoltaics

A triple win for the food, energy and water nexus

Conventional solar park
Westmill Solar Park, Oxfordshire, UK

Agrivoltaics research site
Montpellier, France

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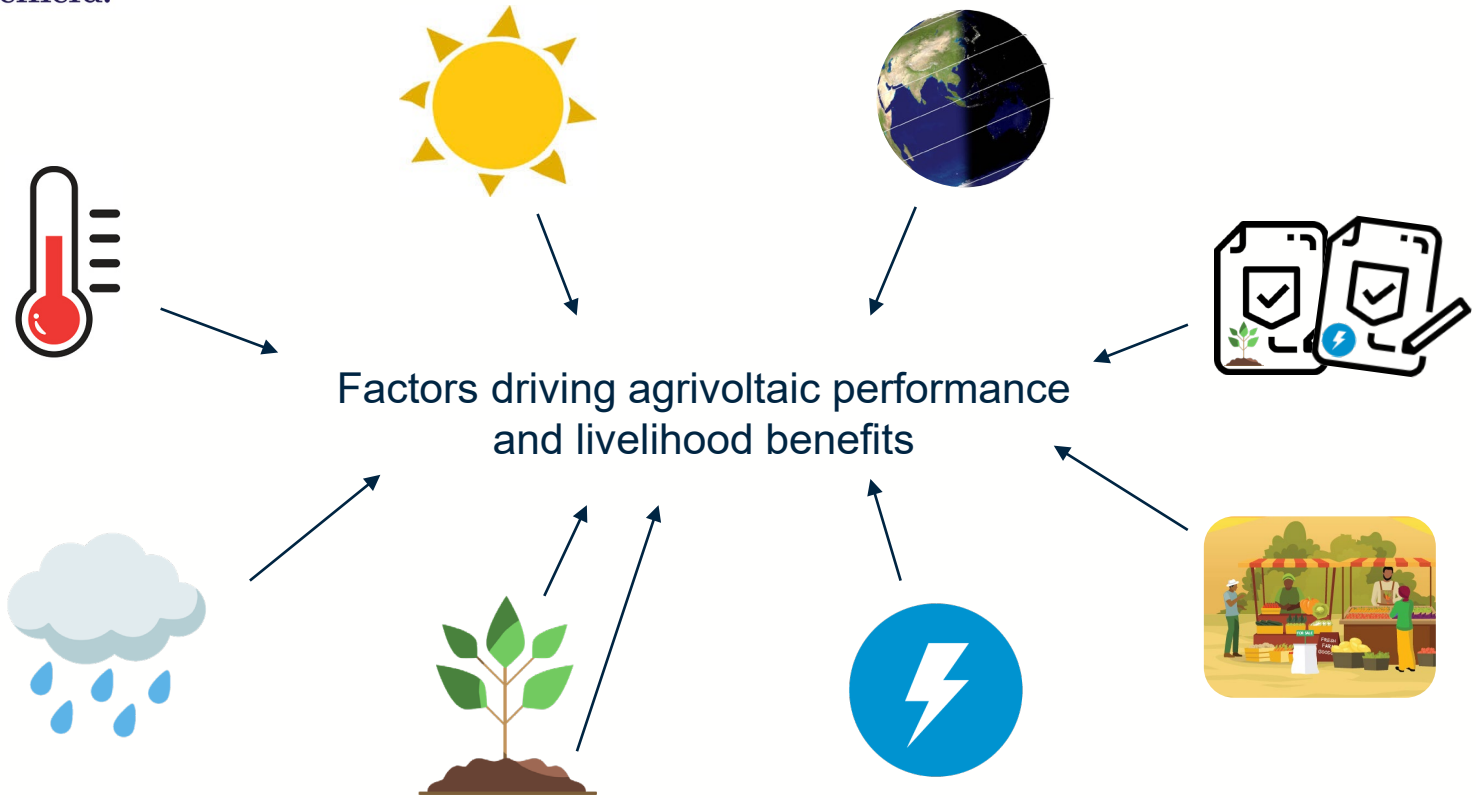

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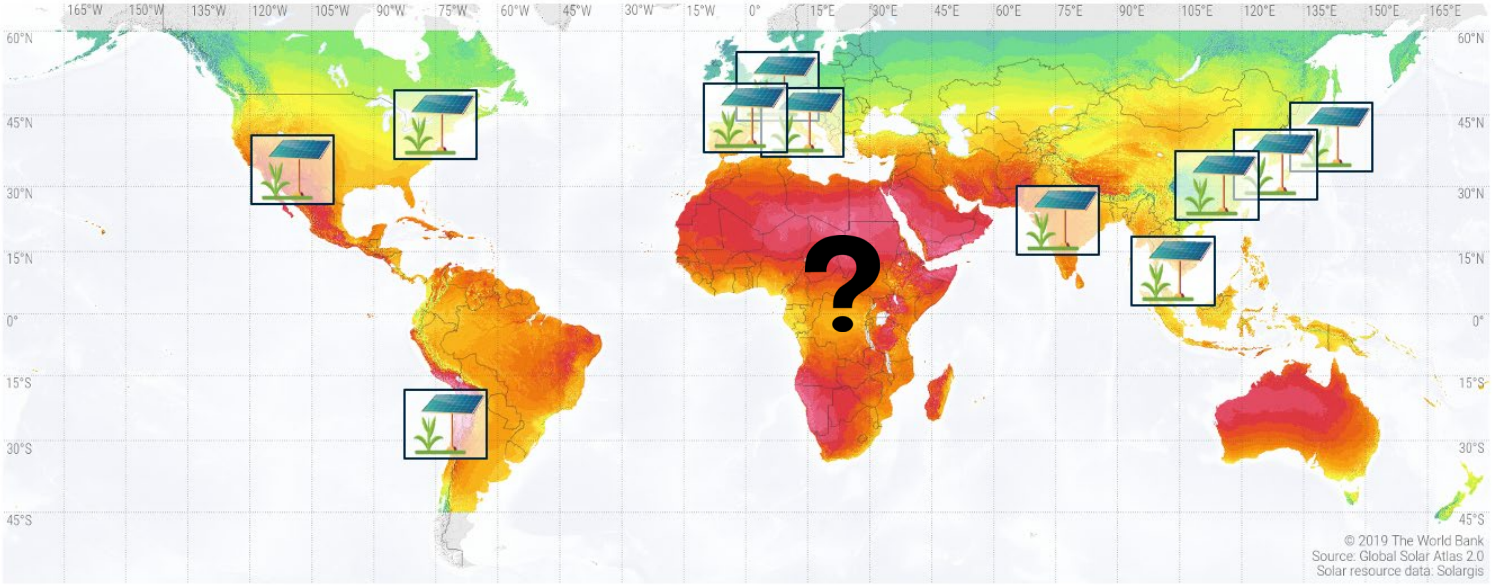
Location of existing agrivoltaic research sites



Long-term average of global horizontal irradiation (GHI)

Daily totals:	2.2	2.6	3.0	3.4	3.8	4.2	4.6	5.0	5.4	5.8	6.2	6.6	7.0	7.4 kWh/m²
Yearly totals:	803	949	1095	1241	1387	1534	1680	1826	1972	2118	2264	2410	2556	2702

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Why East Africa?

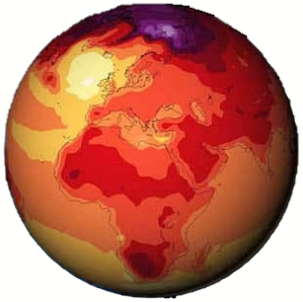
$^{2}/_{3}$

71%

Off-grid/
mini-grid

75%

↓ 8-45%



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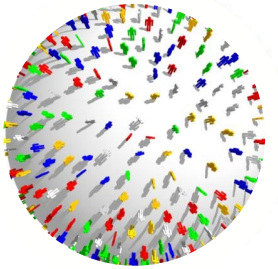

72% ↑ 448m

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Potential benefits of agrivoltaic systems in East Africa

Energy

- **Electrification for off-grid communities.**
- Power farming activities, education, healthcare, clean cooking etc.
- Low-emission electricity.

Food

- Improve crop yields.
- Switch to nutritious and high economic value crops.
- **Expand growing ranges into marginalised land and extend seasons.**
- Mitigate climate change.
- Electricity for post-harvest processing.

Water

- Mitigate drought impacts on crops through reduced evapotranspiration/ improved water use efficiencies.
- **Harvest rainwater for irrigation.**

Land

- Dual use of land.
- Avoid land use conflicts.
- Avoid land degradation and deforestation.
- **Soil conservation.**

Socio-economic

- Diverse income streams.
- Business and employment opportunities.
- **Shade for farm labourers.**
- **Reduce household particulates.**
- **Gender inclusion.**

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Best technology?

Optimal agrivoltaic designs?

Which crops?

Livelihood benefits?

Community decision-making?

Socio-economic benefits?

Optimal business models?

Health benefits?

Equitable energy access?

Knowledge exchange?

Affordability?

Inclusive community engagement?

Stakeholder perceptions?

Best locations?

Political support?

Environmental impacts on performance?

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UKRI Economic and Social Research Council

GCRF Global Challenges Research Fund

Harvesting the sun twice: Enhancing livelihoods in East African agricultural communities through innovations in solar energy

£1.4m to determine livelihood benefits derived from agrivoltaic systems for agricultural communities in East Africa

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African Centre for Technology Studies ACTS Knowledge for Better Livelihoods

University of York

Latia We Build Agripreneurs

SEI Stockholm Environment Institute

CREEC Centre for Research in Energy and Energy Conservation Energy for generations

SAT Sustainable Agriculture Tanzania Solutions for a better future

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

The University of Arizona

World Agroforestry Centre

Teesside University

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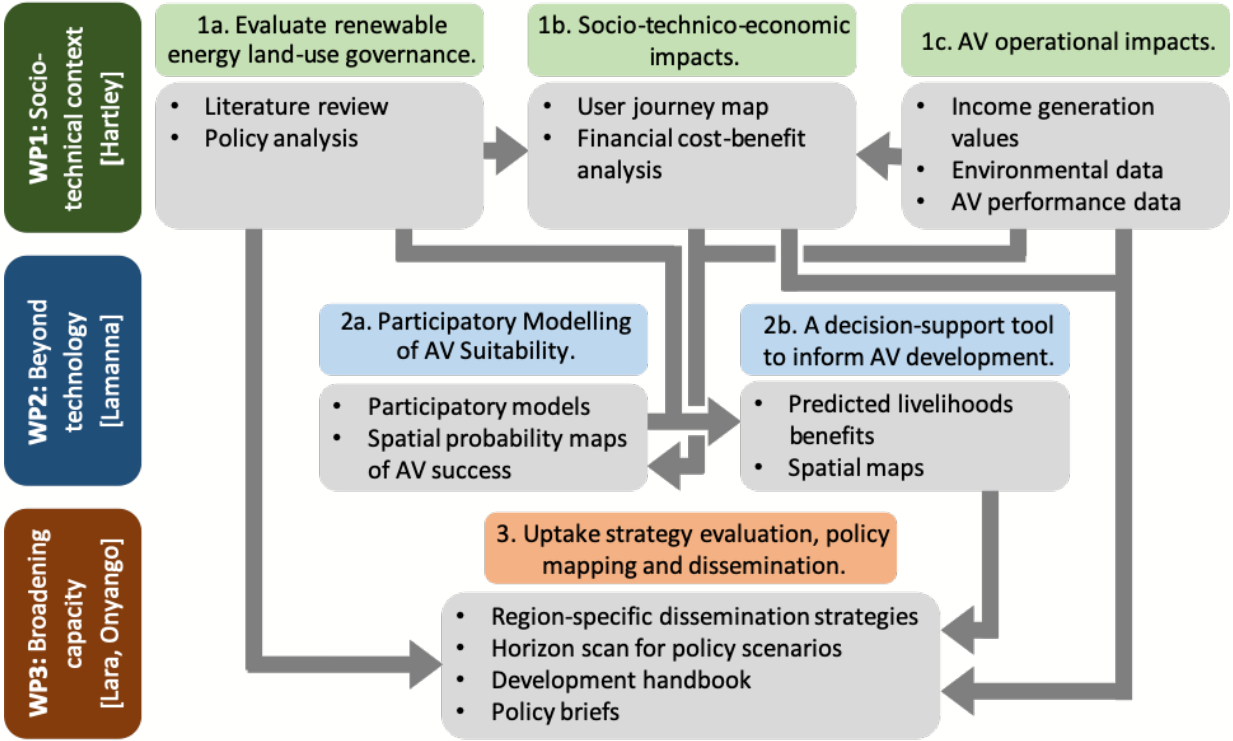
Project structure



AV = Agrivoltaics

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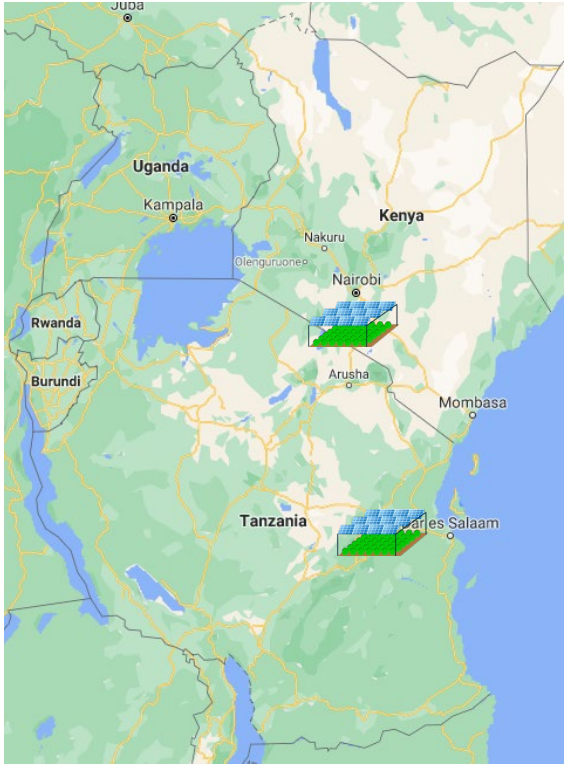
Our agrivoltaic systems in Kenya and Tanzania



	Kenya	Tanzania
Stakeholders	Agri-business	Agri-business
Capacity	65 kWp	36 kWp + battery storage
Agro-Ecological zone	Semi-arid	Semi-arid

Latia
We Build Agripreneurs

SAT
SUSTAINABLE AGRICULTURE TANZANIA
SOLUTIONS FOR A BETTER FUTURE

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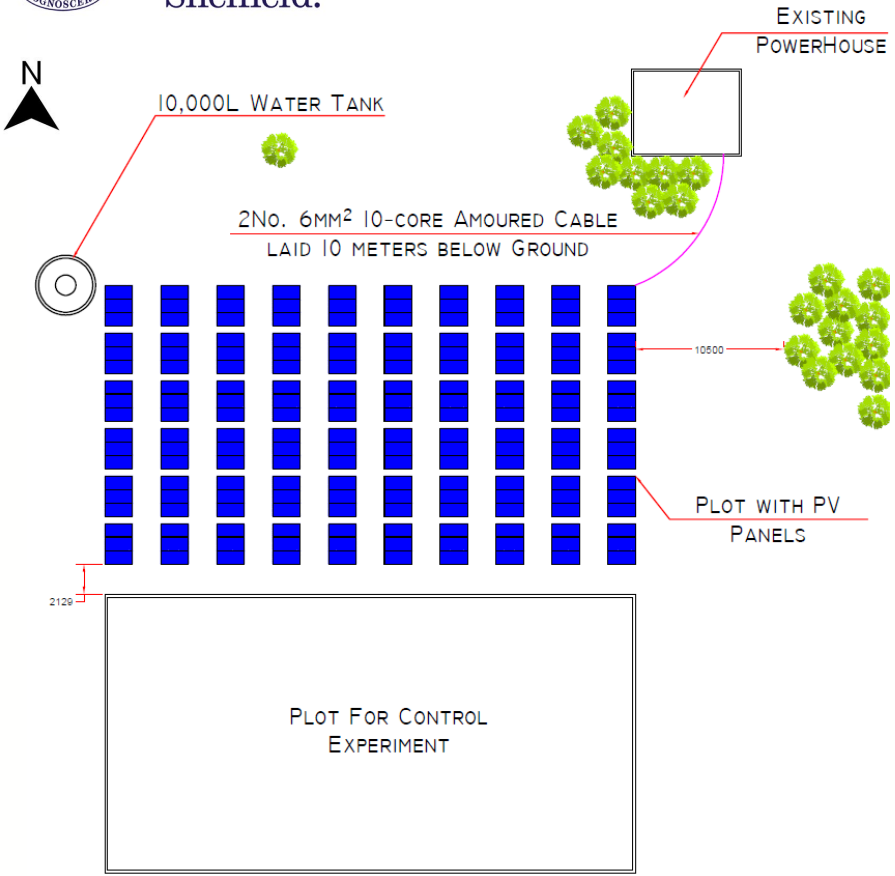
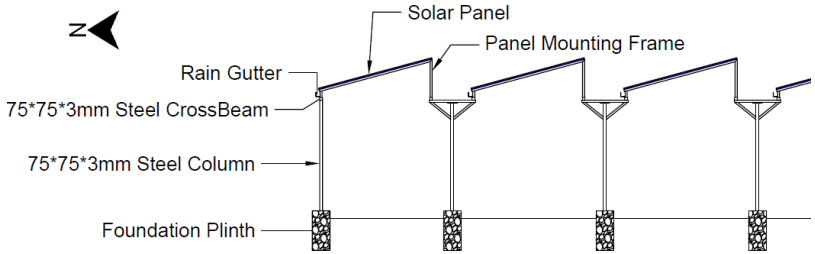
Latia
We Build Agripreneurs

65 kWp Agrivoltaic system
Latia Farm, Kenya





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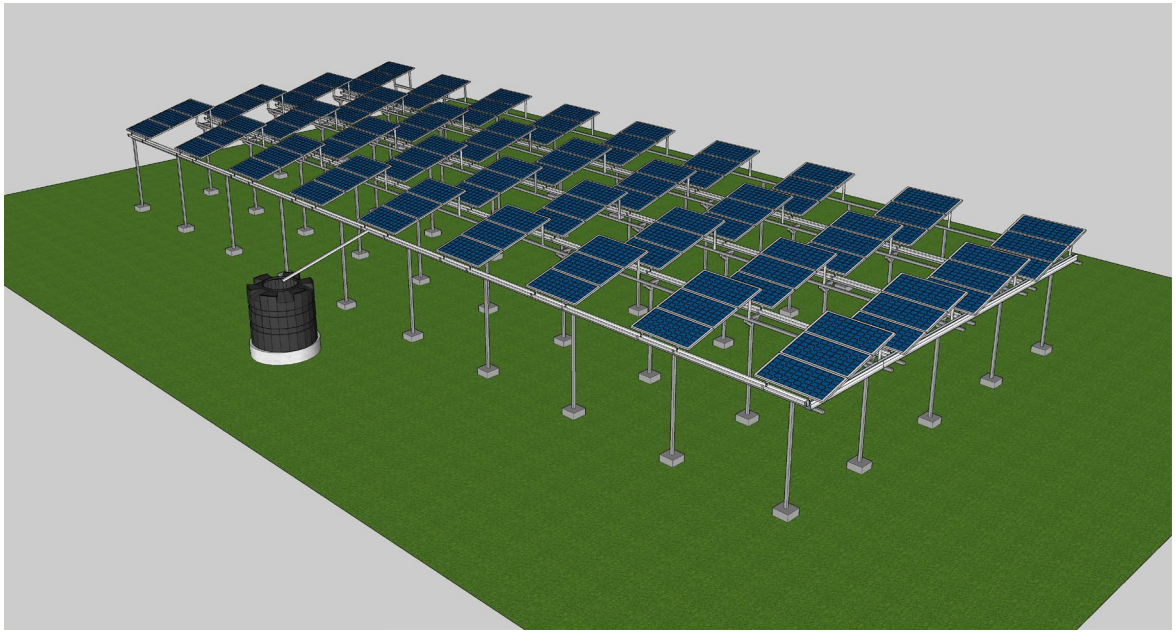
SUSTAINABLE AGRICULTURE TANZANIA
SOLUTIONS FOR A BETTER FUTURE

36 kWp Agrivoltaic system
Sustainable Agriculture Tanzania



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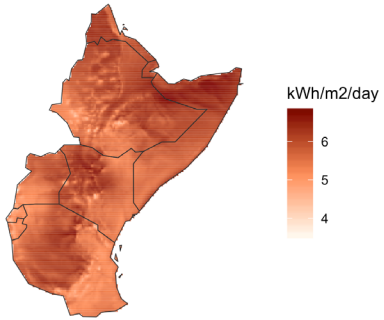
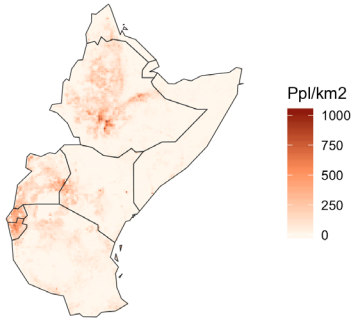
Spatial potential for agrivoltaics in East Africa

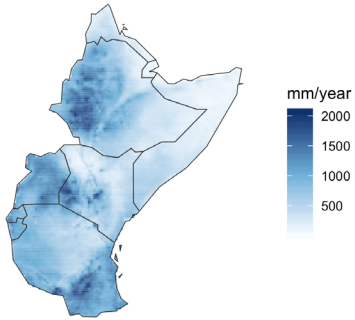
a) Global Horizontal Irradiation



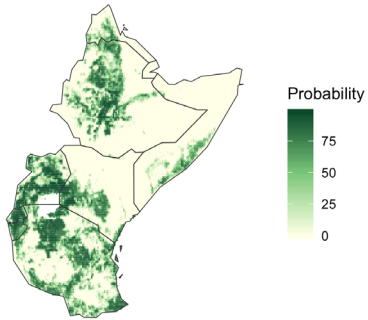
b) People without Energy Access



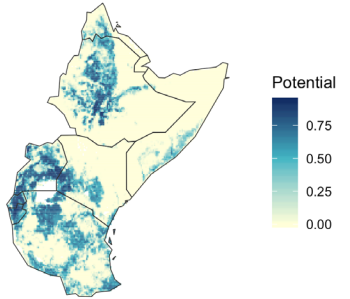
c) Mean Annual Precipitation



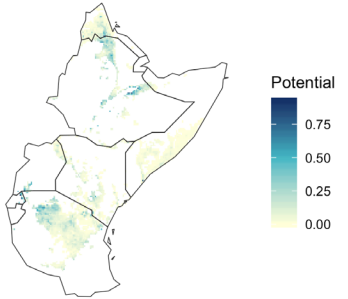
d) Agricultural Croplands



e) Agrivoltaics:
Avoiding land-use conflict



f) Agrivoltaics:
Enhancing marginal cropland



Analysis by Christine Lamanna (ICRAF Nairobi)

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Initial stakeholder perspectives

Communication

- Have agrivoltaic “champions”
- Engage with wider community beyond the direct site

Opportunities

- Diversify into new agricultural processes e.g. irrigation or post-harvest processing
- Lighting for evening activities
- Commercial and economic opportunities for developers

Challenges

- Security
- Prevents mechanised activities
- New approach for developers and engineers

Led by Steve Cinderby (SEI York) and Cassilde Muhoza (SEI Africa)

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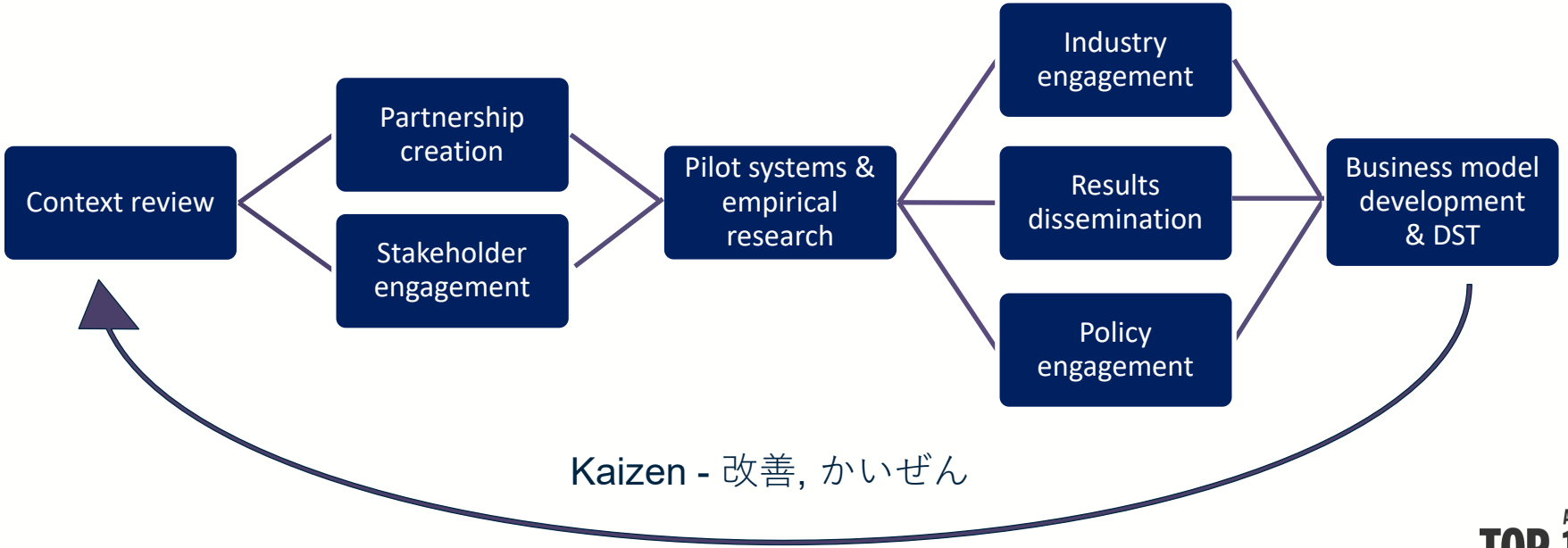
Roadmap for agrivoltaic development



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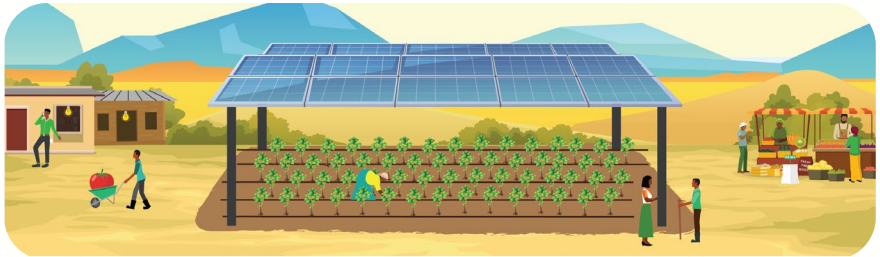
Summary

- Agrivoltaics offer **energy, food, water, land use and socio-economic benefits.**
- **Huge potential in East Africa:** suitable environment; food and energy needs; livelihood benefits.
- Several questions need addressing and **locally relevant evidence needed.**
- **“Harvesting the sun twice” project:** assessing potential livelihood benefits.
- Initial spatial assessment of suitability and stakeholder perspectives.
- **Co-design and community engagement is key!**



GCRF
Global Challenges Research Fund

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Thank you

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Latia Farm, Kenya

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