Engineering and Physical Sciences Research Council Doctoral Landscape Award

PROJECT TITLE: Food or Energy? Acceptance, Adoption and Transition to Agrivoltaics for the UK

Lead Supervisor: Dr Aritra Ghosh

Co-Supervisors:
Professor Allen Alexander - a.t.alexander@exeter.ac.uk
Professor Steffen Boehm - s.boehm@exeter.ac.uk (not formally a supervisor, but providing content in policy studies, climate acceptance in an industrial context)

Webpage: https://experts.exeter.ac.uk/26277-aritra-ghosh

Project details: The urgent need to shift rapidly towards clean energy is critical to mitigate climate change impacts. However, simultaneous to decarbonizing the power sector, the UK must also safeguard food production, bringing to the fore the food-energy nexus, where limited land areas are contested by agriculture vs. industrial solar photovoltaics (PV). Independent analysis urges UK solar capacity targets of 40 GW by 2030, raising to 54 GW by 2035. However, large-scale PV deployment faces significant land constraints, especially in the Southwest, where land is scarce and predominantly agricultural. Converting farmland to solar farms has understandably met with significant opposition, based on the inherent risk it poses to food production, biodiversity, and rural livelihoods.

Agrivoltaic (APV) technology offers a promising pathway to achieve a zero-carbon economy, by safeguarding land for crop production and enabling PV energy generation, whilst also offering "shaded" food production environments that will become more prevalent as our summers become hotter. Theoretical business models suggest both a sustainable solution (by optimizing land productivity) whilst providing farms with a much-needed dual income streams, however little adoption has occurred in the UK, to date.

One aspect holding back potential adoption is that limited research exists on APV performance under UK conditions, including crop suitability, microclimate effects, and energy yields. Another is understanding the economic viability, likely socio-economic acceptance criteria and compelling narratives of how APV can become part of the UK's transition to renewable energy. Landowners require integrated techno-economic assessments, potential business models and new metrics that reflect technological, agronomic, and business realities to support informed decision-making.

This interdisciplinary project aims to address these gaps by developing integrated economic models for transition, alongside business models tailored to the UK context, unlocking agrivoltaics' potential as a scalable strategy that balances clean energy expansion with food security and rural economic resilience.

Objective 1: Develop an integrated model combining irradiance, solar energy generation, crop growth, and microclimate factors specific to agrivoltaic systems.

Objective 2: Perform a detailed techno-economic analysis for bifacial PV-based agrivoltaic systems, identifying cost drivers vs. performance parameters under different scenarios, anchored in three case studies of local crop production / land-use in the Southwest.

Objective 3: Prototype potential new business models that incorporate agrivoltaics, integrating technological efficiency with business and land-use realities, facilitating better decision-making for stakeholders.

Year 1:

- Literature review: APV systems, irradiance and crop growth models, microclimate, techno-economic frameworks and technology adoption / acceptance in renewable energy systems.
- Develop irradiance and microclimate model components specific to UK APV context.
- Identify three SW-based agriculture settings, to begin preliminary techno-economic framework design.

Year 2:

- Integrate irradiance, crop growth, and microclimate models into a unified APV simulation protocol and validate with case study data.
- Extend techno-economic analysis: include cost drivers, bPV specifics, land-use trade-offs.
- Start exploring economic metrics beyond technical performance

Year 3:

- Develop new economic metrics combining technical, agronomic, and business factors alongside narrative protocols for acceptance / adoption
- Validate economic metrics with stakeholders (farmers, investors, policymakers).

Year 3.5:

- Finalize thesis write-up, including background, methods, results, discussion, and conclusions.

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Project specific entry requirements: Strong UG performance in Engineering or Management, with desired PGT Sustainable Development, Environmental Management or Sustainable Business Management (or equivalent).

Potential PhD programme of study: Either 'PhD in Engineering' or equally a 'PhD in Management'

Department: Management

Location: SERSFs Building, Penryn Campus

Please direct project specific enquiries to: Dr Aritra Gosh or Professor Allen Alexander

Please ensure you read the entry requirements for the potential programme you are applying for.

To Apply for this project please click on the following link - **APPLY HERE**