The viability of low-tech hydroponics for sustainable local lettuce production in the United Kingdom

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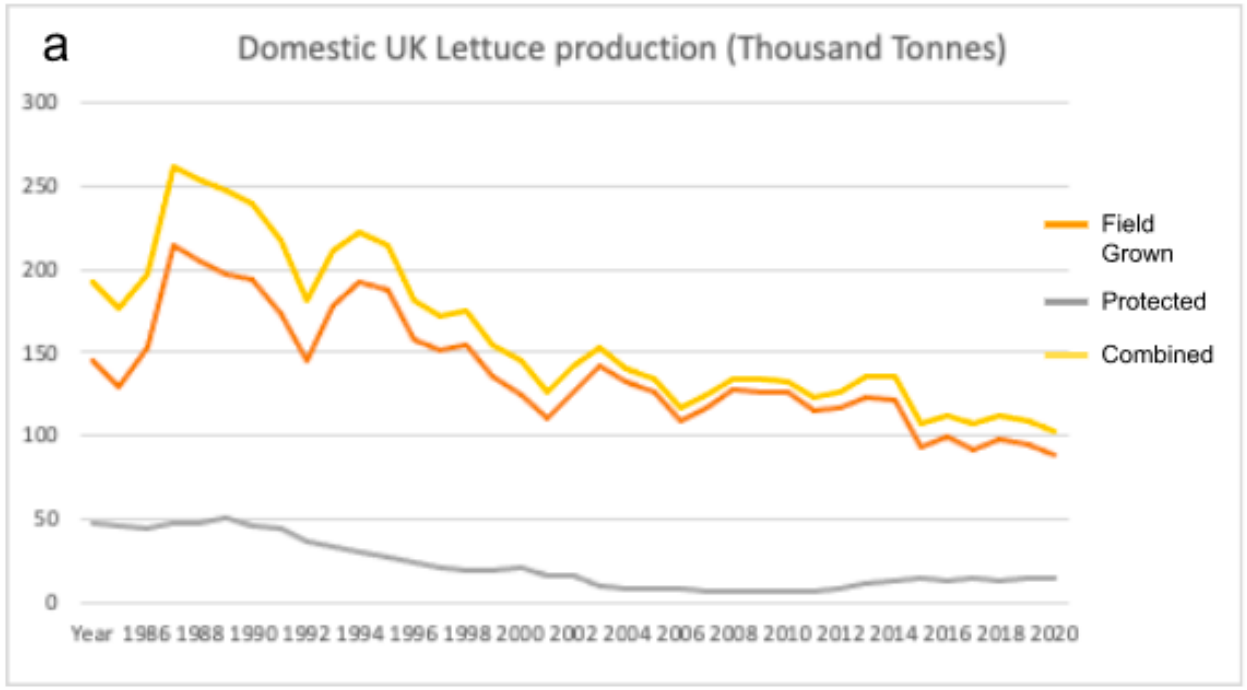
TUKFS Annual Conference 2026

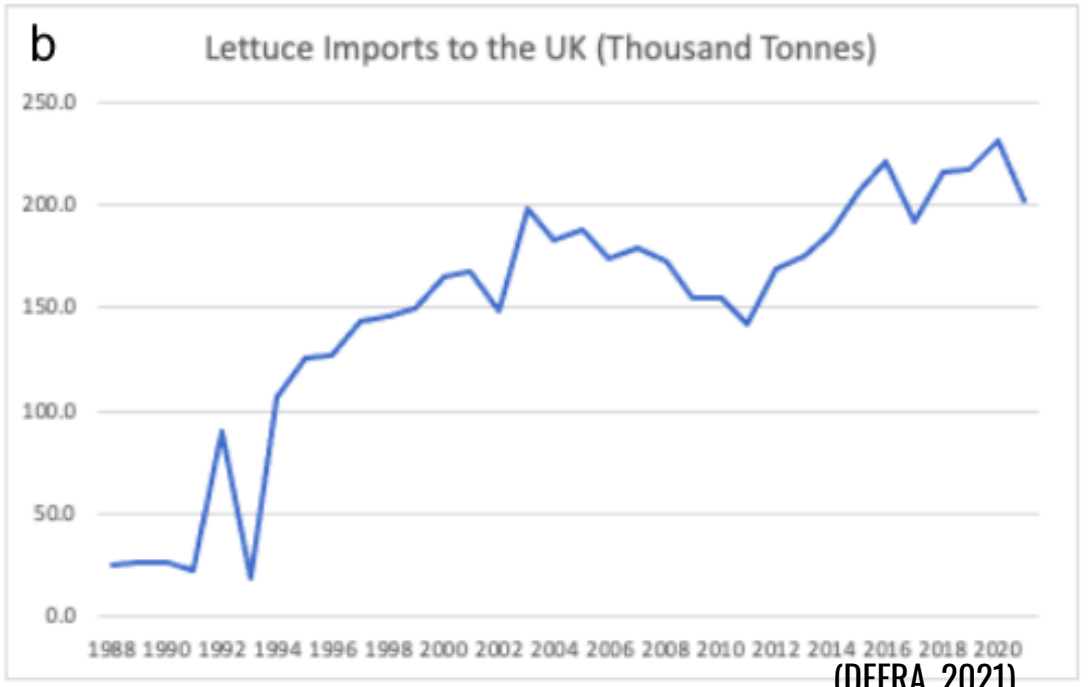
Leafy Greens in UK Horticulture

Environmental Cost: Current field lettuce relies on high-impact peat soils.

Systemic Risk: Heavy reliance on Spanish/Dutch imports.

Energy Needs: High-tech CEA (Controlled Environment Agriculture) is becoming economically infeasible due to energy costs.





(DEFRA, 2021)

Project Aims

System Design

Design low-cost hydroponics systems for use in plastic polytunnels without supplementary lighting or heating

Lettuce Growth

Quantify yield and seasonal extension across varied lettuce genotypes within low-input hydroponic systems

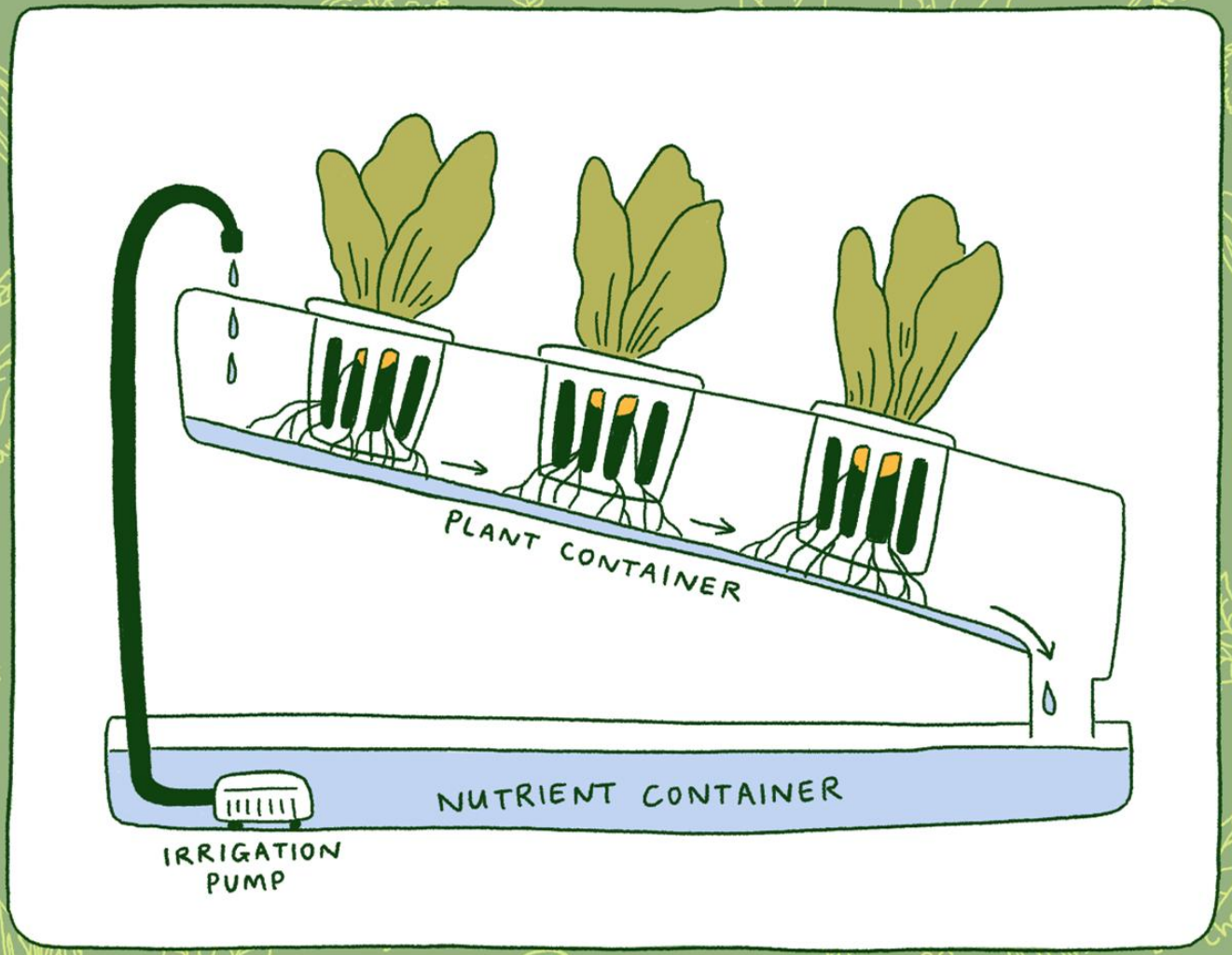
Commercial Viability

Compare the costs of production against potential revenues over a 15-year period to assess the potential to provide returns on investment

Integration into the UK food system

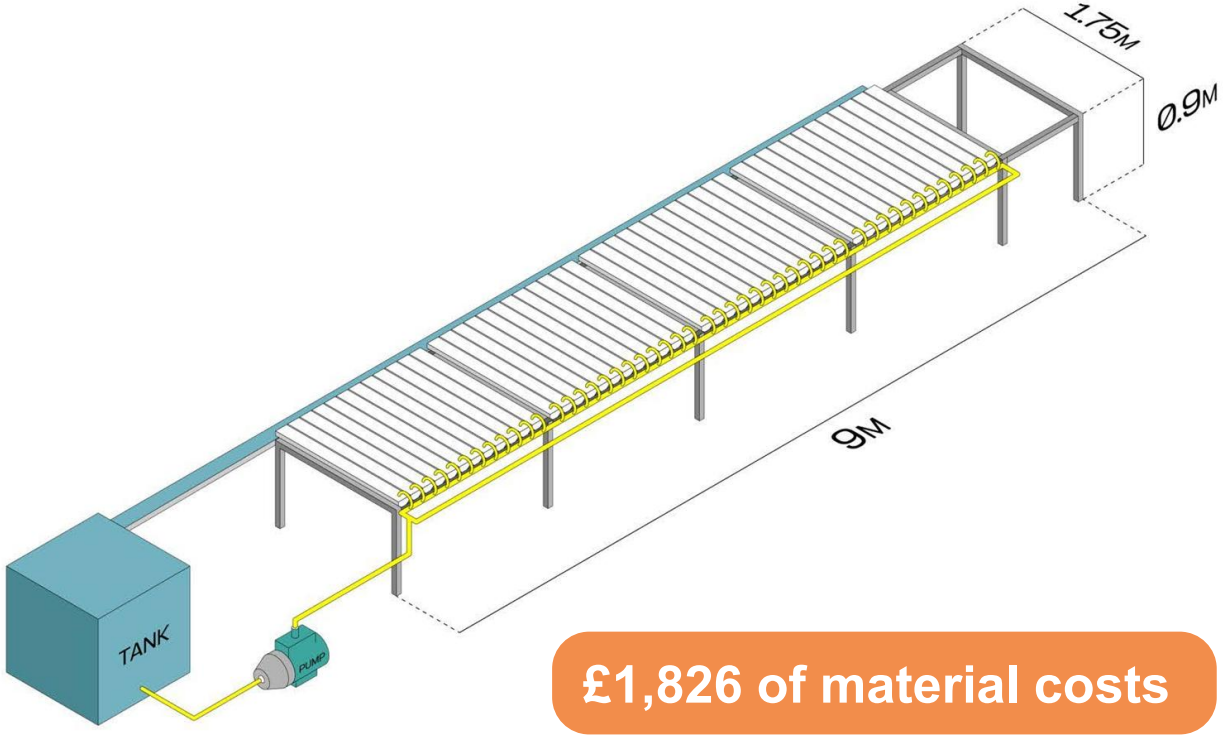
Investigate what may be needed to facilitate the use of these production systems to produce food for local markets

NUTRIENT FILM TECHNIQUE (NFT)



- Plants grow in long channels
- A thin film of water passes over the roots
- Popular crops include lettuce, herbs, pak choi and strawberries

Low-Cost DIY Hydroponics System Design

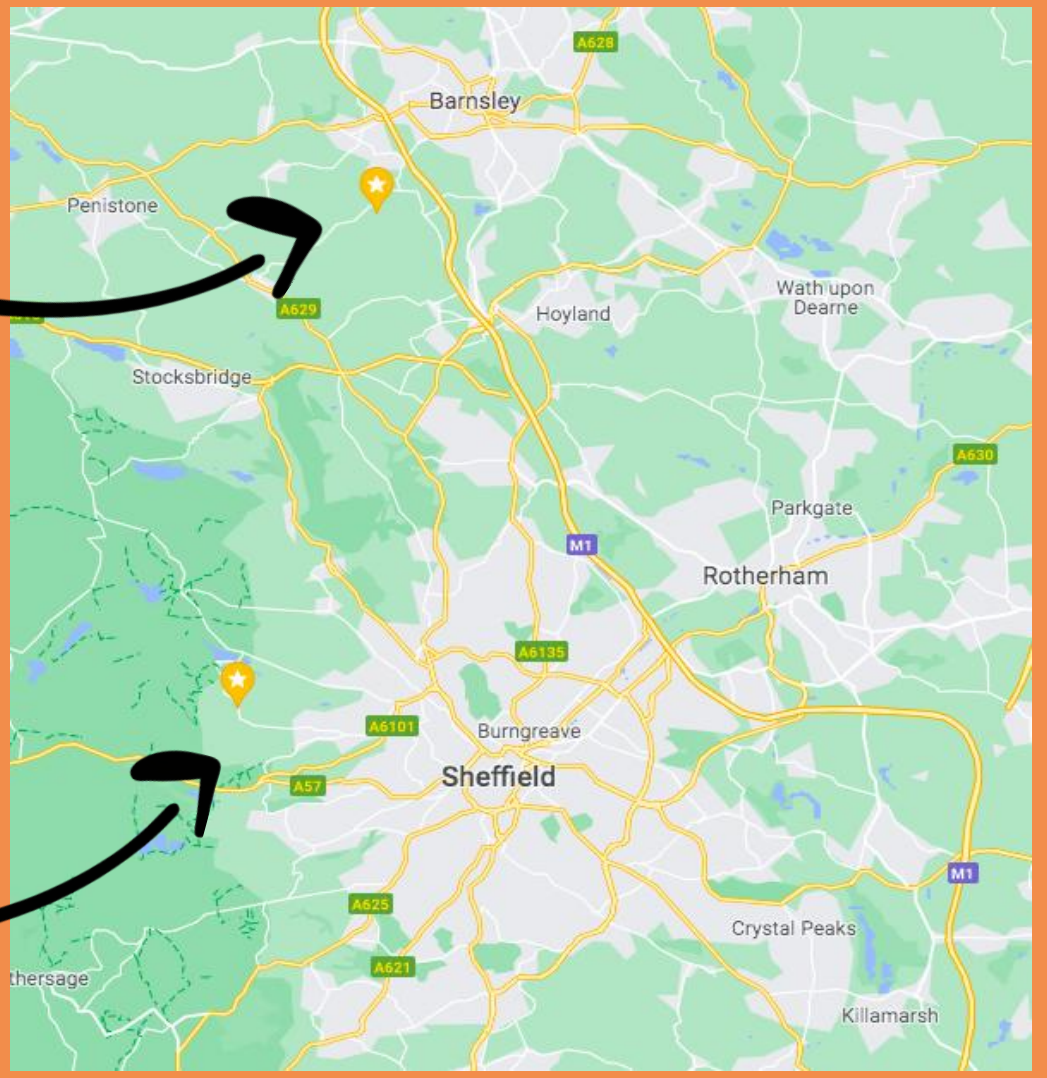


£1,826 of material costs

Full Season Crop Trials (Oct 23 - Dec 24)

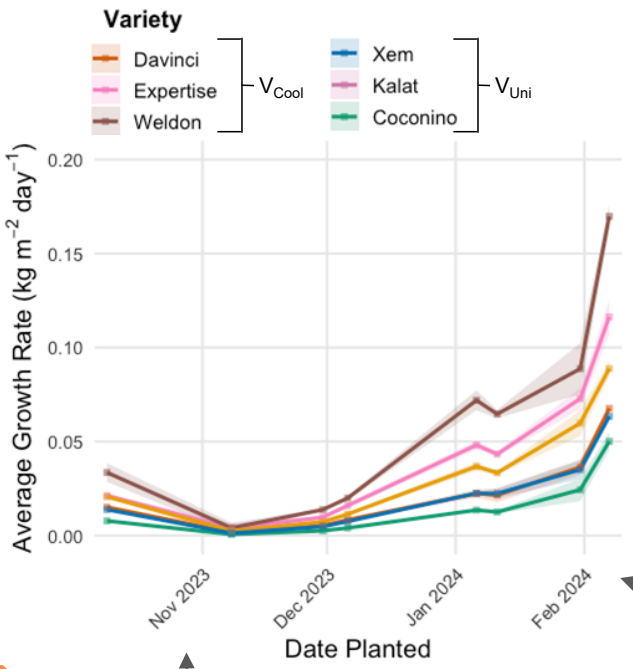
Wentworth Castle Gardens (WCG)

Our Cow Molly (OCM) Dairy Farm

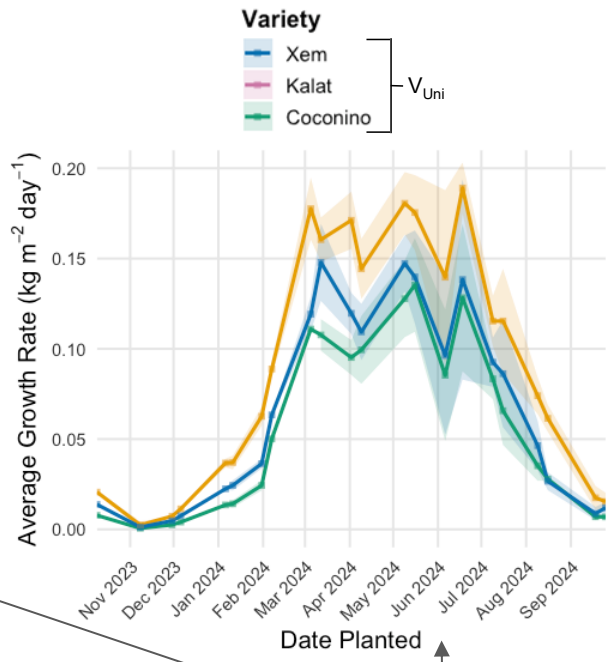


Daily Growth Rates

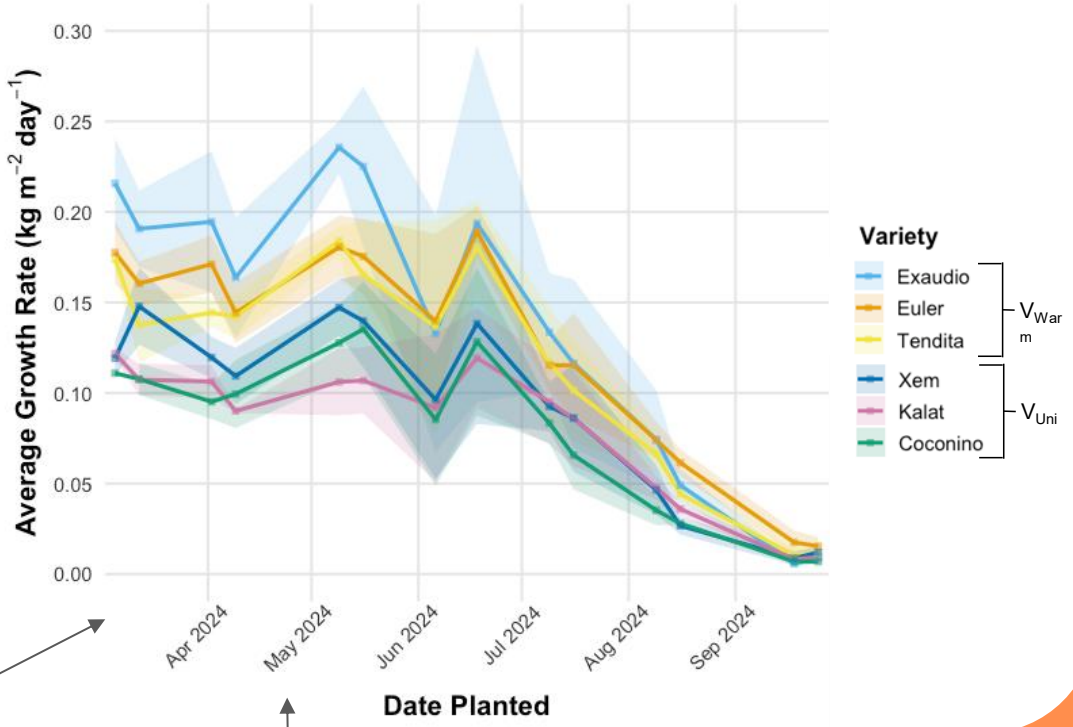
Autumn / Winter



Full Year



Spring / Summer



Cool Specific (V_{Cool})

Weldon

Expertise

Davinci

Universal (V_{Uni})

Euler

Xem

Coconino

Warm Specific (V_{Warm})

Tendita

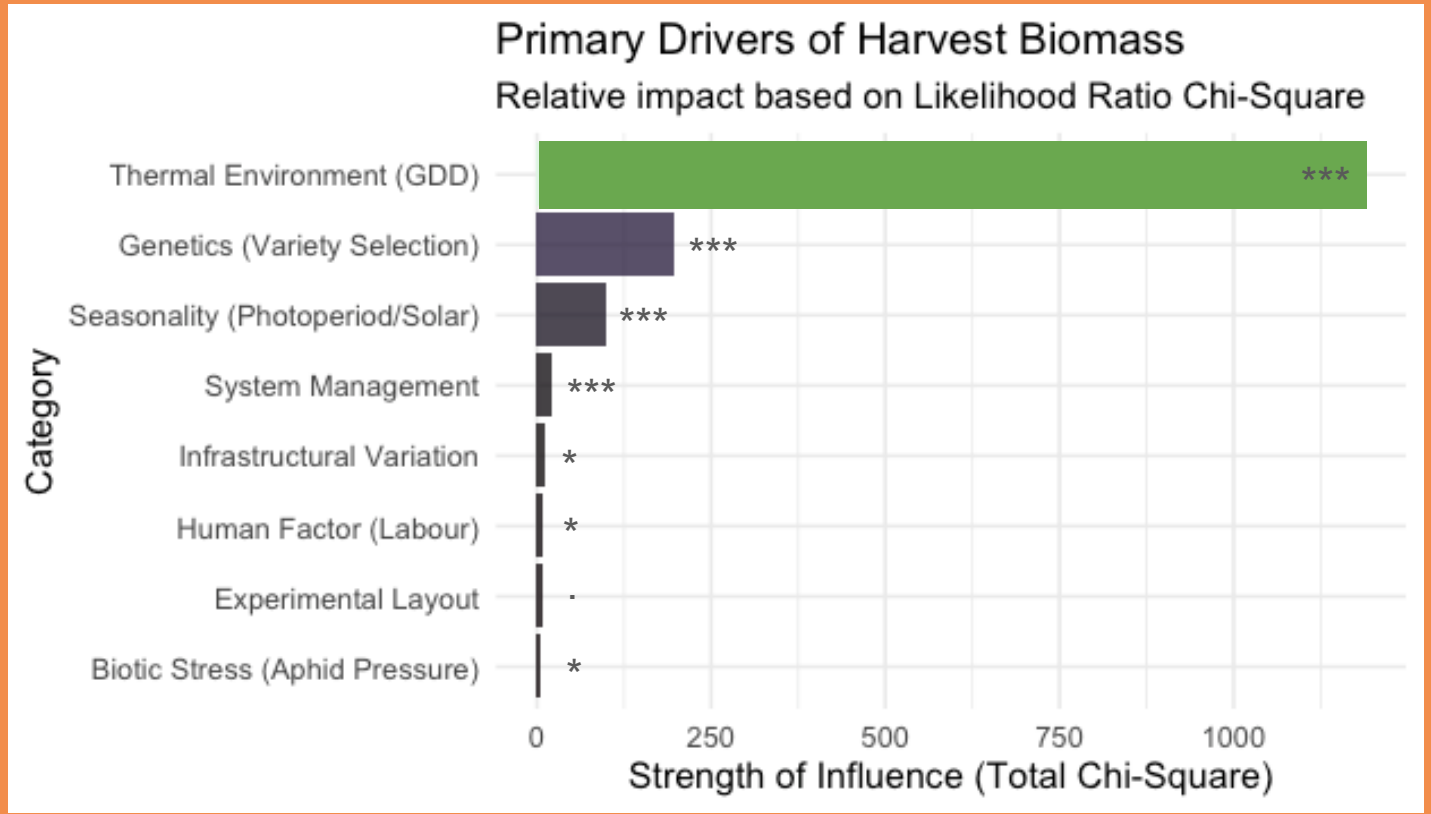
Exaudio

Kalat

Influences on Growth Rates

Only minor variations were found outside of temperature,
other seasonal effects and variety

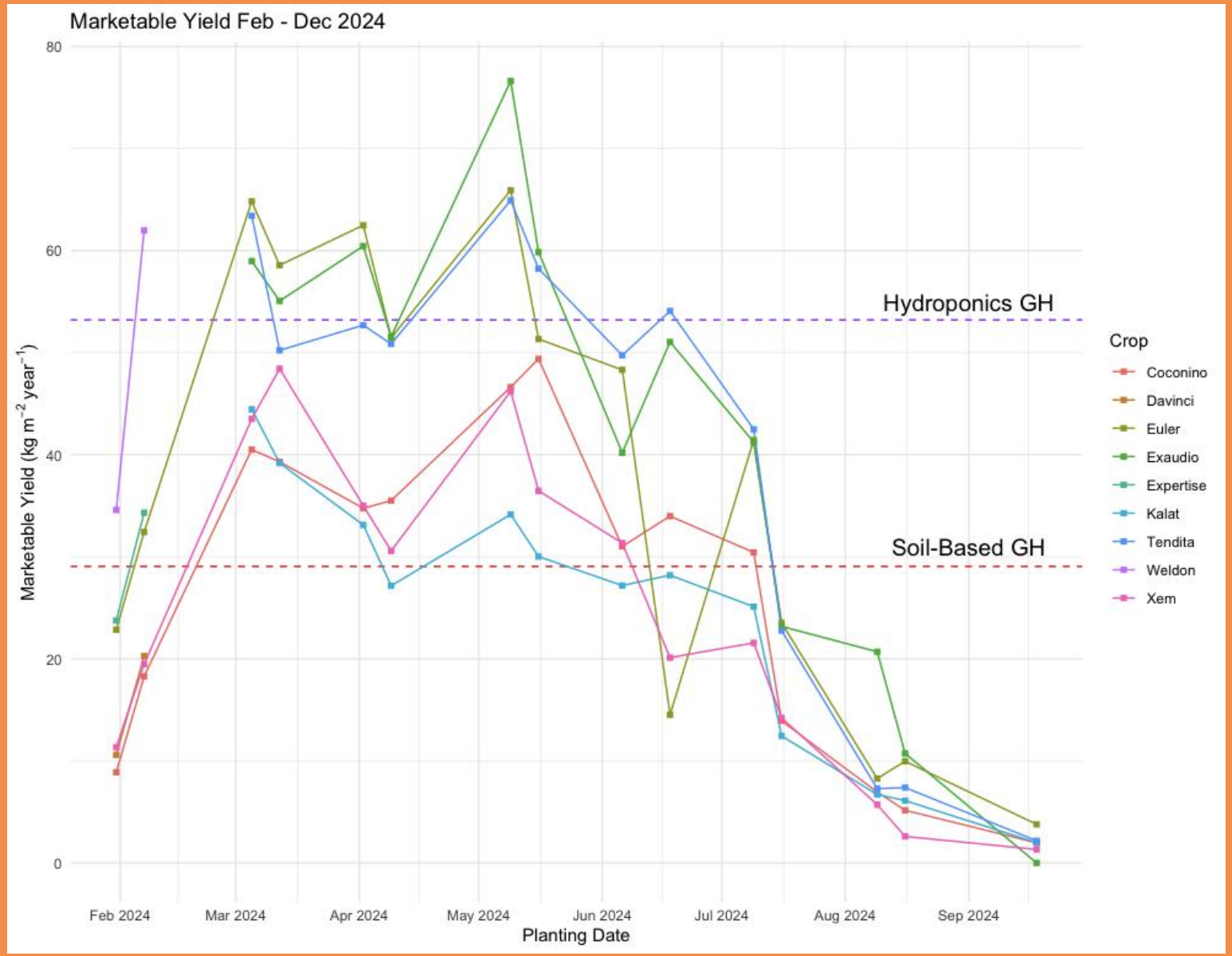
Terms assessed using Type II Anova



Significance: $p < 0.1$ (.), $p < 0.05$ (*), $p < 0.01$ (**), $p < 0.001$ (***)

Compared to Industry

Lettuce performance was comparable to Dutch glasshouses on planting dates from March - July



Could This be a Viable Business?

Our Actual Costs

Cost of each NFT system - **£1,826**

Total capital cost of 6 polytunnels with NFT - **£71,361**

Total operational cost of 6 polytunnels for 1 year - **£45,360**

Return on Investment Over 15 Years

Two Model Farms

Low-Cost: 1 Tunnel (211 m^2), Minimal Processing (Wash before use)
Higher-Cost: 3 Tunnels (211 m^2), High Processing (Ready to Eat)

- Created a combined schedule of high performing varieties
- 321 day growing window (Feb-Dec)
- 244 days of lettuce supply (2/3 of the year)

Ran 100,000 simulations modulating key variables

Yields: 75% (Disease and Pests) - 110% (Crop selection or Optimisation)

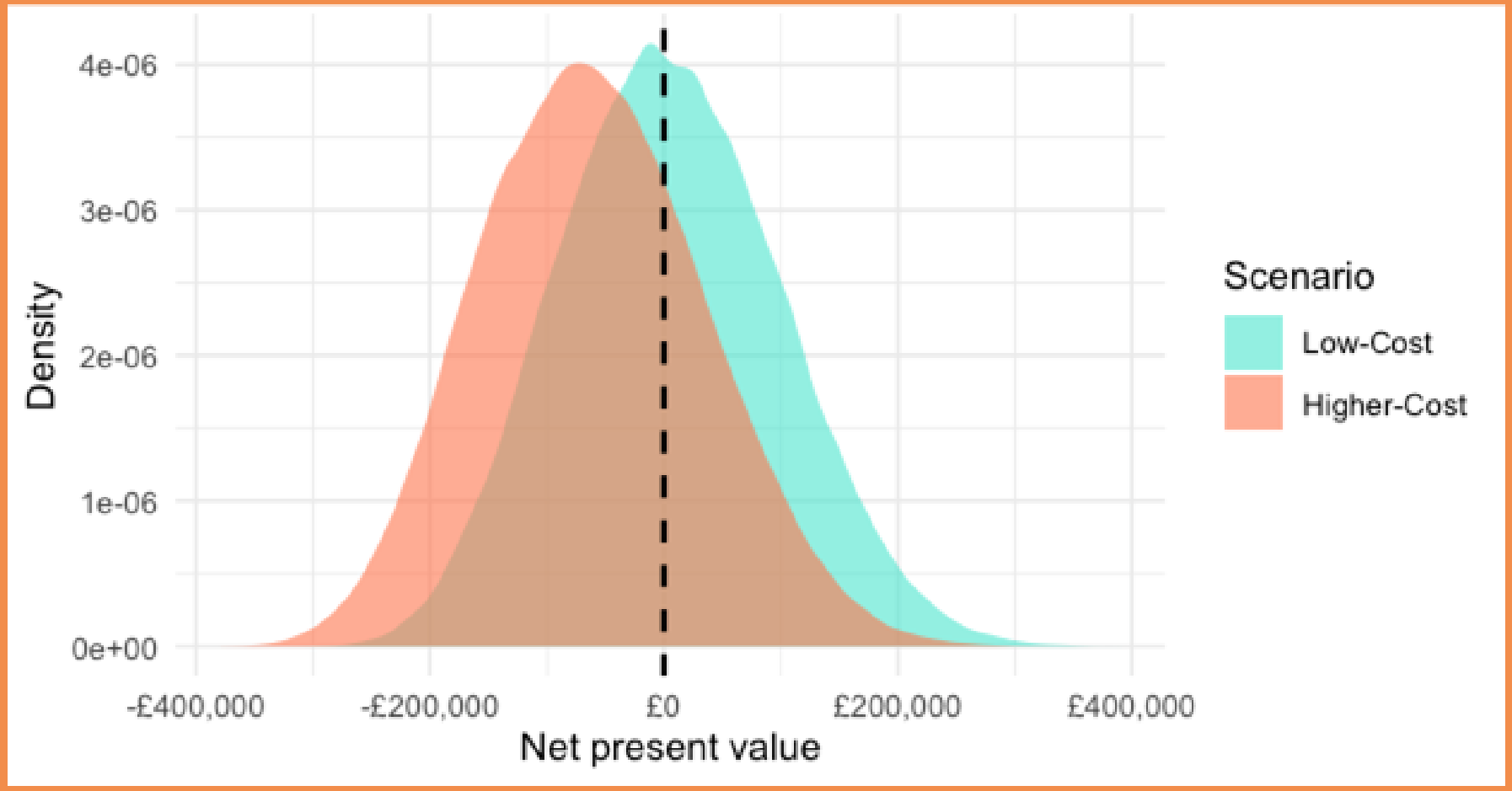
Sales Price: £14.78 kg^{-1} (Retail-Avg) - £24.00 kg^{-1} (Premium), Mode = £20.62^{-1} (Retail-Max)

Sell through rate: 60% - 100%, Mode = 90%

Electricity: 1x - 1.5x baseline

Labour: 1x - 1.2 x baseline

Return on Investment Over 15 Years



Net Present Value takes into account the cost of money over time

Discounts at 8% per year

How much you would expect to get back in real terms

How to Facilitate Low-Tech Hydroponic Production

Current models are marginal

Optimal variety choice and management is required to boost yields

Alternative business models may be needed for reliable demand and high price points

- Community Supported Agriculture
- Non-profit Cooperatives or food-hubs
- Public Procurement

Capital Expenditure is still a hurdle and unattractive for investors

- Grant funding
- Blended Finance (Government guarantees on private investment)
- A good deal as it can provide other societal benefits
    - Training, primary education, community growing

Thank You

Supervisory Team:

Jonathan Leake
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H3 Hydroponics Team

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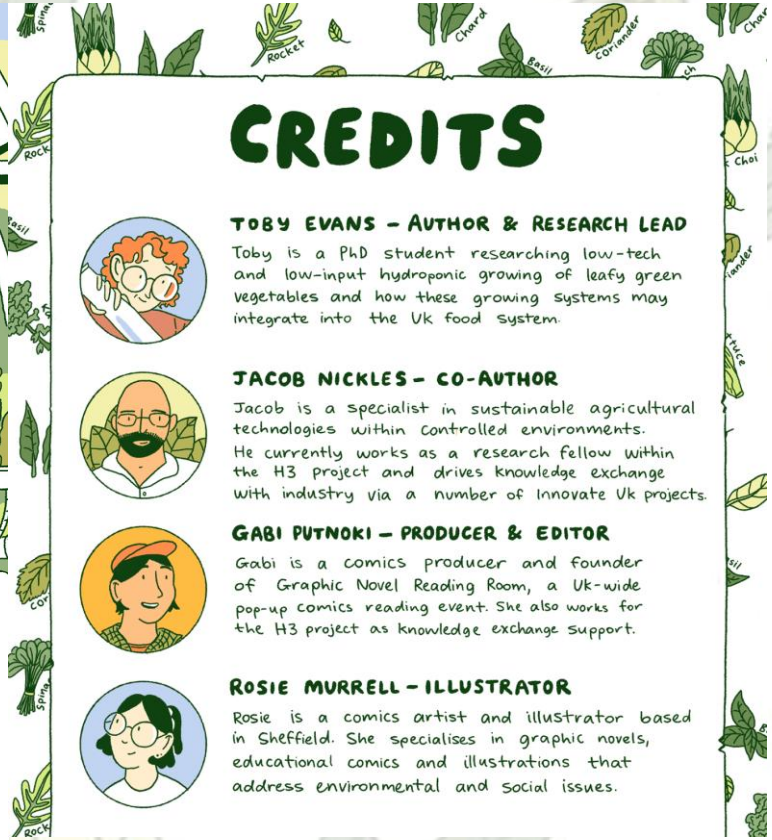

H3 HEALTHY SOIL HEALTHY FOOD HEALTHY PEOPLE

TRANSFORMING UK FOOD SYSTEMS Strategic Priorities Fund

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