

Modelling UK agroforestry: Net Zero vs food

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What is the problem?

Net Zero by 2050

Need to plant many more trees to store carbon

- Cheapest and most proven solution
- UK has only 13% forest cover (10% in England)

But we also need to produce our own food

- Less than 50% self sufficient
- Carbon emissions by importing food (“carbon leakage”)

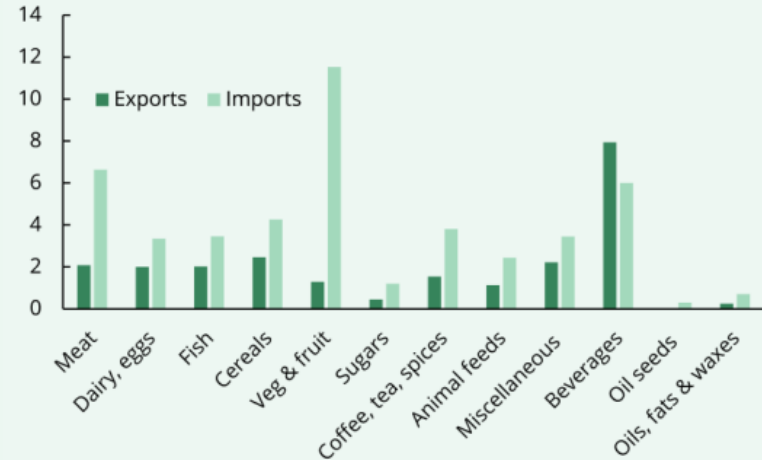
Can we do both?

Net Zero Strategy: Build

The England Trees Action Plan 2021-2024

May 2021

UK trade in food, feed and drink, 2019 (£ billions)



Source: HMRC, UK Trade Info

Agroforestry: A solution?

Integration of trees into agricultural production systems

Store carbon while continue producing food

Many co-benefits:

- Biodiversity
- Hydrology
- Soil management
- Nutrient management
- Climate/weather resilience
- Improved yields
- Income diversification



Research questions

1. How can agroforestry be modelled?

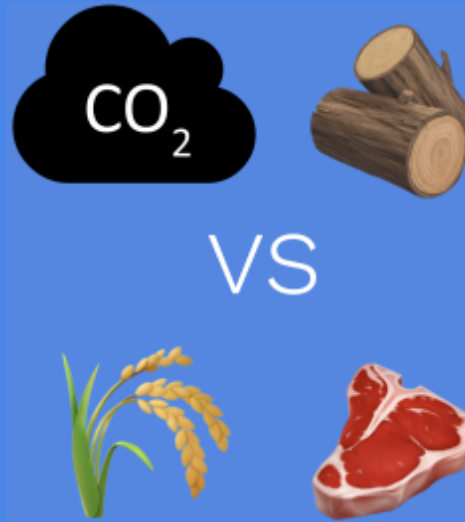


Yield-SAFE:

Farm-SAFE:

Forage-SAFE:

2. What are the tradeoffs for implementing agroforestry?



3. How to incentivise adoption of agroforestry?



VS



Opportunity for AI

- Data is not large so likely route is statistical modelling
- Bayesian statistics to robustly account for uncertainties in yields, economics, weather/climate and land use
- Gaussian Processes to emulate modelling suites of expensive networked models
- History matching to “reverse” network and suggest policies which achieve goals
- Alternative data sources: earth obs, microclimate data?

$$P(H | E) = \frac{P(E | H) \cdot P(H)}{P(E)}$$

