Upscaling UK Miscanthus production: Benefits, challenges and trade-offs

The balanced net-zero pathway of the UK's sixth carbon budget stated a target of planting a minimum of 30,000 hectares of perennial biomass crops a year by 2035, with a view to establishing at least 700,000 hectares by 2050 (CCC, 2020).

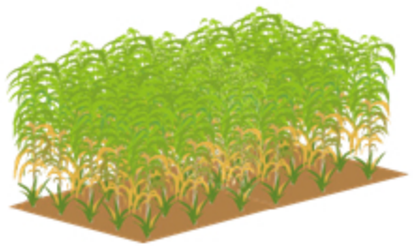
Land use trade-offs – where to upscale and what are the impacts?

Smaller area of more productive land (ALC 1-3a) closer to end use markets

- Higher yield
- Greater profitability
- Higher C sequestration

More likely to:

- Be intensively managed arable land areas.
- Result in higher SOC gains
- Lead to biodiversity gains
- Compete with essential food production



Larger area of less productive (marginal) land (ALC 3b-5) further from end use markets

- Lower yield
- Lower profitability
- Lower C sequestration

More likely to:

- Be extensively managed grassland areas.
- Result in lower SOC gains or losses
- Lead to biodiversity losses
- Not compete with essential food production.

Carbon sequestration – Loss or gain?

Loss

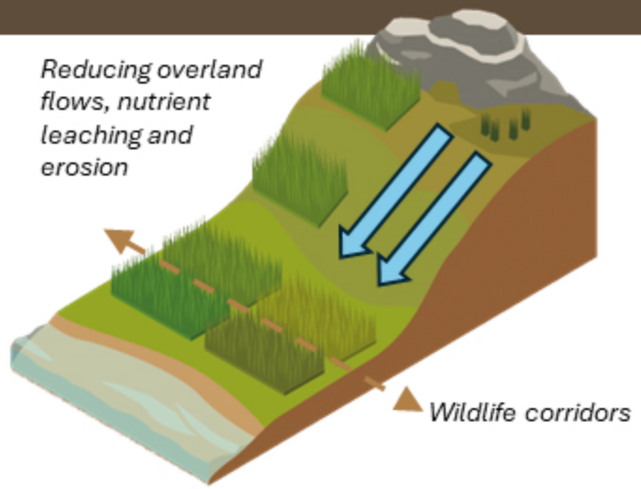
70 Mg C ha

Gain

- Higher above ground yields enable greater carbon capture and storage via BECCS.
- Deeper rooting varieties enable greater carbon sequestration below ground.
- Longer rotation lengths (10+ years) enable greater SOC accumulation compared with annual crops.
- Loss or gain of soil carbon (SOC) following miscanthus establishment is better predicted by initial SOC content than by broad land use classifications of 'arable' or 'grassland'.
- Soils with SOC above 70 Mg C ha in the top 30 cm will likely lose carbon, and those below will likely gain it.

Strategies must complement long-term food security rather than compete with it

- On arable land, a miscanthus rotation can be employed as fallow period for fields experiencing yield decline due to soil fatigue, drought, flooding or persistent weed problems.



- On improved grassland areas, miscanthus presents an option for diversification, flood mitigation and water quality improvement.

What are the main barriers to upscaling UK miscanthus production?

- Sufficient areas of UK land are suitable for upscaling miscanthus cultivation. However, the availability of that land and farmers' inclination to grow the crop depends on land tenure, farmer willingness and confidence in the stability of biomass markets.
- Strategies need to be developed to integrate miscanthus into farming systems in a way that is profitable, sensitive to local demand, climate, and geography, that complements rather than competes with food production by increasing overall farm profitability and resilience.
- Consistent long-term policies, which support the whole supply chain, are required to ensure sufficient upscaling to help the UK to realise its ambition of achieving Net Zero emissions by 2050.