

Ricardo-AEA

Research Gaps for UK bioenergy feedstocks identified by a Rapid Evidence Assessment

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This research was sponsored by the UK Department for Environment Food & Rural Affairs (Defra).

- The aim of the work was to produce an agreed common evidence base of research on agricultural bioenergy feedstocks in the UK.
- The outputs of the project are:
 - a synthesis of the evidence, with a thematic summary for each different aspect of bioenergy reviewed.
 - A series of spreadsheets giving details of the research reviewed.

Scope and methodology

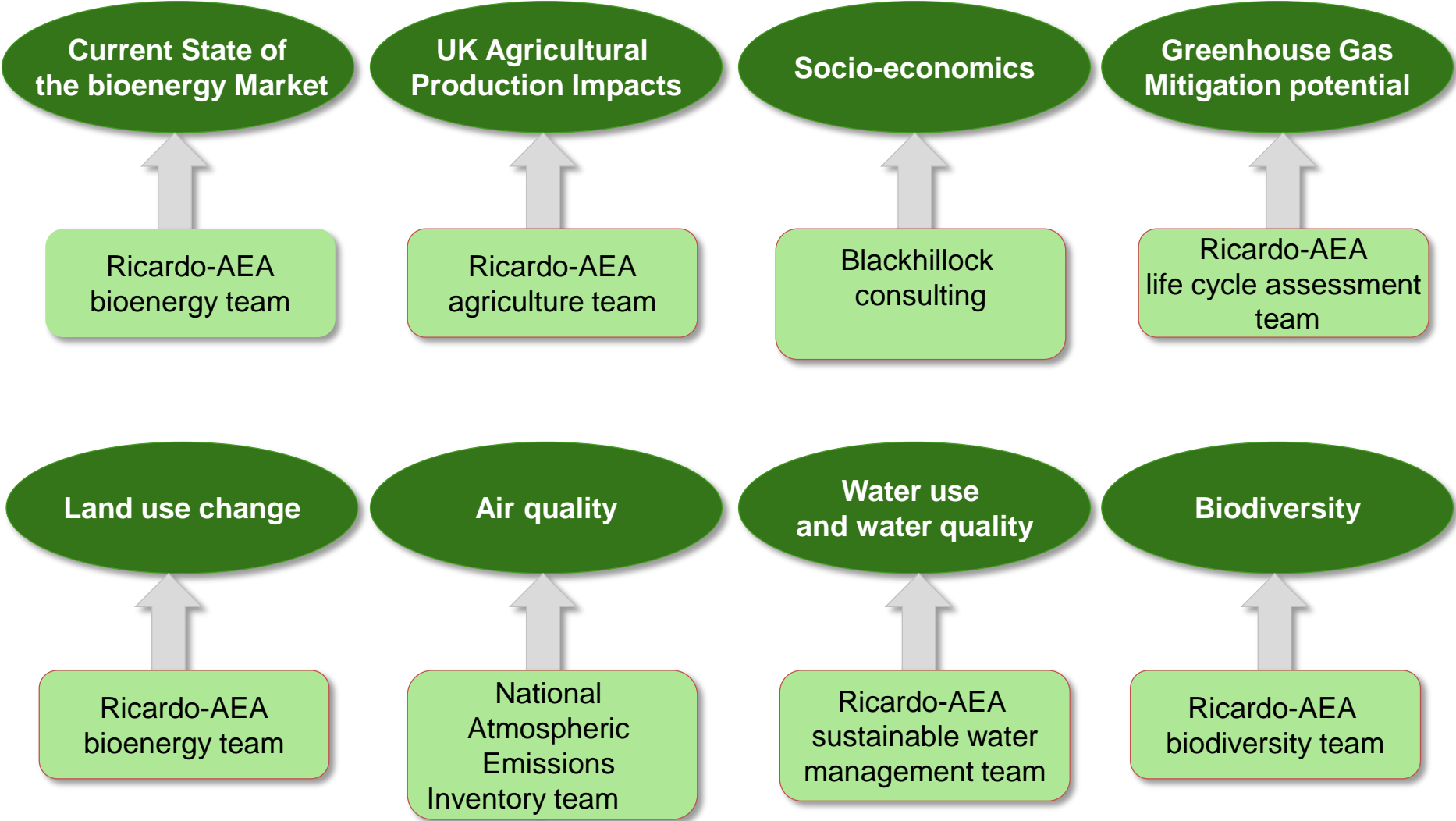
Scope of Assessment

UK agricultural feedstocks

- Dedicated perennial energy crops
- Crops grown for food and energy
- Agricultural residues

Rapid Evidence Assessment Process





Each thematic summary comprises

- current issues
- information in the literature
- confidence in the information reviewed
- trends
- **evidence gaps**
- current research
- **suggestions for further research.**

UK bioenergy market and agricultural production

Evidence gaps

- Economic performance of perennial energy crops in commercial situations on lower quality land
- Integrated production of bioenergy/ arable crops and livestock

Suggestions for research

- Developing cultivars of perennial crops for marginal soils
- Investigate alternative annual crops for bioenergy production and increased crop rotation options.
- **Look at integrated bioenergy/ arable/ livestock farming to see how this effects yields and economics.**

Socio-economics

Evidence gaps

- The net contribution to employment, including the impact of displacement of the previous land use.
- The opportunity cost for bioenergy subsidy policies.

Suggestions for research

- **Research to quantify the net contribution of bioenergy on employment, income and rural development.**
- Include social adoption barriers into estimates of rates of bioenergy uptake.
- Synergies and trade-offs between social, economic and environmental objectives.

Biodiversity

Evidence gaps

- Impact of planting bioenergy crops on land not in agricultural production.
- Impact of mature energy grass plantations
- Landscape scale impact of agricultural biomass production

Suggestions for research

- Long term monitoring of impact on species.
- **Projected impact of land use change on habitat area, particularly in relation to marginal land in the UK.**
- Landscape scale impacts of bioenergy production.
- Invasiveness of energy grasses in a UK context.

Greenhouse gas mitigation and land use change

Evidence gaps

- Long term measurements of impacts on soil carbon of energy crop production.
- Assessment of potential Indirect Land Use Change (ILUC) impacts from cultivation of perennial energy crops.
- Methodology for proper consideration of uncertainty in ILUC assessments.
- Assessment of GHG emissions from reed canary grass and switchgrass production, including LUC emissions, in the UK.

Water use and water quality

Evidence gaps

- Interaction of bioenergy water use and other water abstractions
- Whether SRC could provide benefits for flood risk
- Long term assessment of phosphorus leaching from application of sewage sludge to SRC.
- Whether nitrogen uptake of SRC is sufficient to enable use of organic wastes on the crop in NVZ.

Suggestions for research

- Consider bioenergy within the context of wider water use and water quality planning within the UK, especially at catchment scale.
- Compare water use modelling approaches with industry to ensure research results can be readily transferred.

Air quality

Evidence gaps

- Black carbon emissions from small scale biomass combustion
- Realistic testing protocols for domestic appliances, to take into account variability of appliances and way they are operated.

Suggestions for research

- NO_x control for high nitrogen fuels such as miscanthus and straw at the medium scale (1-50MWe).
- Emissions test data for biomass pyrolysis up to 20MWe.

Gaps identified for specific sub-themes and crops

Cross cutting issues identified in several themes

- **Impacts of bioenergy crop production on marginal soils** using consistent and relevant data sets for biodiversity impacts, yields and economic performance, water use and water quality
- **Up to date growers guidelines** covering husbandry, economics and environmental impact mitigation.

Need for research on bioenergy production in a wider context.

- The possible role of **bioenergy crops in integrated farming**,
- Integrating assessment in terms of food and fuel with water impacts (**the food/ fuel/ water nexus**).
- Consideration of bioenergy **opportunities and impacts at the landscape or catchment scale**, in particular as part of biodiversity initiatives and water planning.

Further information about the project

Full report and appendices are published and can be accessed at <http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=19177>

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