RELU Biomass

Social, economic and environmental implications of increasing rural land use under energy crops

RESEARCH COUNCILS UK

RURAL ECONOMY AND LAND USE

General approach:

We will study both SRC willow and miscanthus
We will use two regions as study areas (SW England and E-Midlands)
We will utilise existing data & generate new data to fill knowledge gaps

Background:

- A combination of agricultural and energy drivers has stimulated interest in the growing of biomass crops for renewable energy production.
- Miscanthus, **Fig 1a**, and SRC willow, **Fig 1b**, are the main UK energy crops grown and land use under these is predicted to expand from ≤ 2,500 ha to ≥ 350,00ha.
- Biomass crops differ from current arable crops: perennial (7-25 yrs); long harvesting cycles (1-4yrs); winter/spring harvest, dense plantings of tall crops.
- These factors have potential implications for the visual appearance of landscape; tourist income; farm income; hydrology and biodiversity.
- Expansion of energy crops needs to be planned in ways that will maximise both energy and environmental benefits.

1a

1b

RELU-Biomass aims to:

- Develop an integrated scientific framework for Sustainability Appraisal (SA) of conversion of land to energy crops.
- Evaluate the implementation of the SA framework
- Update Best Practice Guides for planting short rotation coppice (SRC) willow and miscanthus
- Provide the scientific tools for Environmental Impact Assessments (EIAs), Strategic Environmental Assessments (SEAs) or SAs for projects or policies involving increased planting of energy crops

Partners and their roles:

ROTHAMSTED RESEARCH
Coordination
Biodiversity
SA

THE GAME CONSERVANCY TRUST
Biodiversity
SA

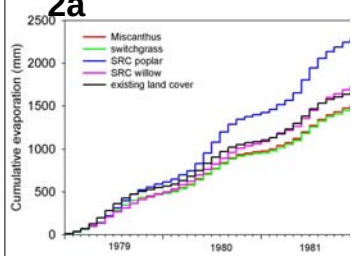
UEA NORWICH
Social acceptance
Landscape character
SA

CEH
Hydrology
SA

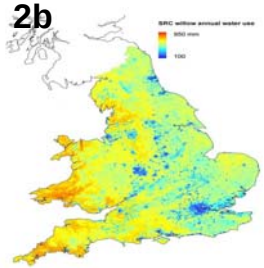
UNIVERSITY OF EXETER
Economics
SA critique
SA

Methodologies:

2a



2b



Hydrology: The spatially distributed numerical model of the energy, water and carbon balance of the land surface (JULES) will be refined to predict impacts. Measurements will provide values for key parameters, calibrate others, and establish the uncertainties in the model predictions. The model will be run for different planting scenarios to predict recharge to groundwater and the flows in rivers. Fig 2 show examples of time series (a) and maps (b) of the water use (i.e. evaporative losses) this model will produce.

3

Social Acceptance: will be assessed through stakeholder consultations, a questionnaire survey and focus groups. We will use GIS-based 3D landscape visualisations to represent different planting scenarios and assess audience's reactions using display devices such as a portable Elumens VisionStation (Fig 3).

5

Rural economics will cover: Production (Fig 5) and resource use requirements; Short and longer term impacts on farm systems and business management; Implications of CAP reform on farmers' attitudes; Dynamics of uptake under different farm system/energy price scenarios; Role of collaborative action, including joint ventures; Impacts on regional economies of wide scale production.

4a

4b

Biodiversity: will be assessed using approaches and techniques modified from those used in the Farm Scale Evaluations of GM herbicide-tolerant crops to contrast invertebrate (Fig 4a) and weed (Fig 4b) abundance and diversity in the two energy crops with those in comparable arable farmland and grassland ecosystems.

Sustainability Appraisal (SA): will be used to provide an integrated assessment. A range of planting scenarios will be defined and evaluated using indicators generated from different aspects of the research. Subsequently, the scenarios will be compared and modified through an iterative process to identify the most appropriate one for each region relative to sustainability objectives. Our findings will be discussed with stakeholders to produce authoritative science-based recommendations for planners and other professionals involved in conducting environmental assessments of energy crop planting schemes. A critique of SA as an analytical policy tool will also be undertaken

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