



TSEC-BIOSYS

Theme 2; 2.2 => Theme 4

Modelling biomass supply from Miscanthus

Contributor:

Rothamsted Research

3rd Annual Meeting (M 40/42)

November 2008

Task within TSEC-BIOSYS

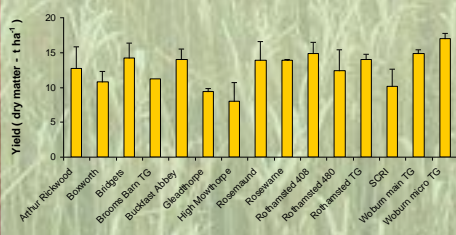
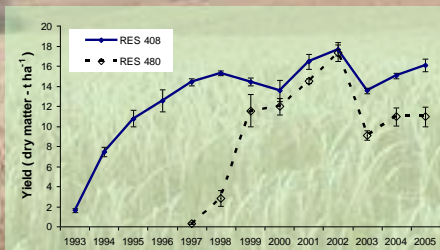
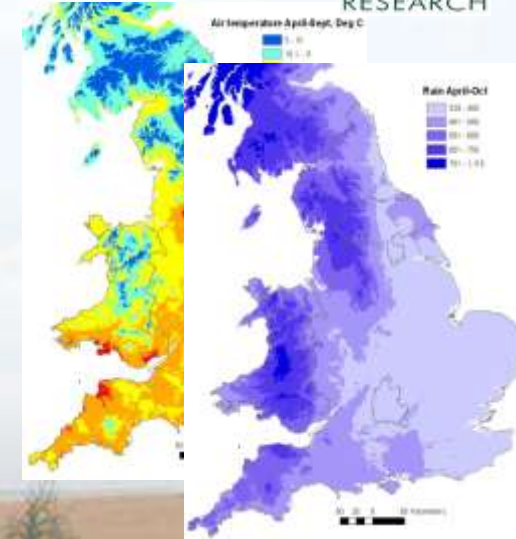
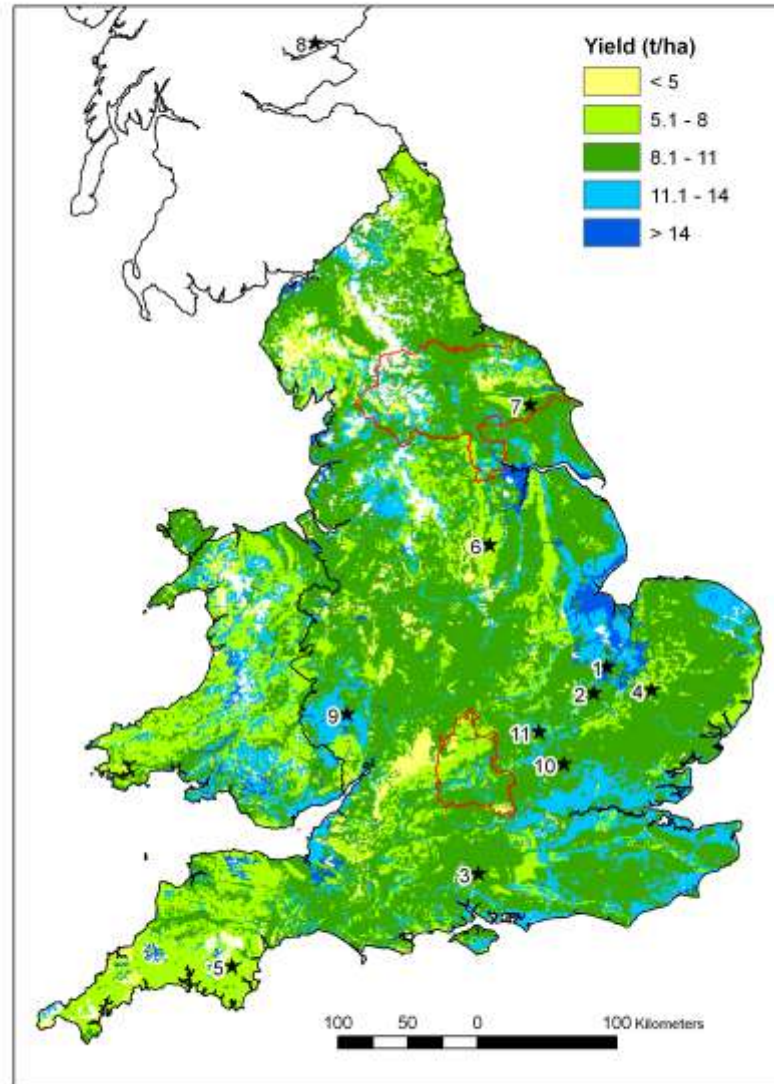


Theme 2: Evolution of UK biomass supply

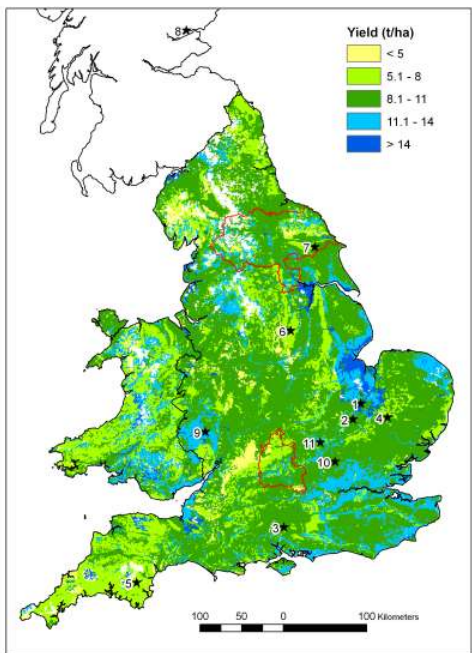
- Topic 2.2: **Bioenergy Models** resources
 - ☑ Biofuel from arable crops – models @ RRES
 - ☑ Winter wheat, [sugar beet](#),
 - ☑ Oilseed rape, maize
 - ☑ Biomass from grasses, mainly Miscanthus
 - ☑ Empirical model for Miscanthus (& switchgrass)
 - ☑ Maps of yield under current climate
 - ☑ Process model for Miscanthus is available; parameterized, calibrated and evaluated;
 - ☑ Ready to be used for predictive purposes

Empirical yield model for Miscanthus

Richter, G. M. et al. (2008) *Soil Use and Management* **24** (3), 235



Application of empirical yield maps



Richter et al., *Soil Use Manage* 24, 235 (2008)

Aide to Producers & LUC planners

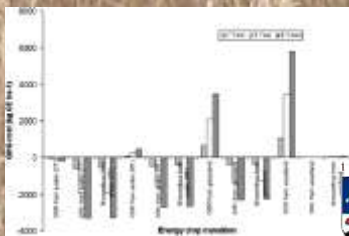
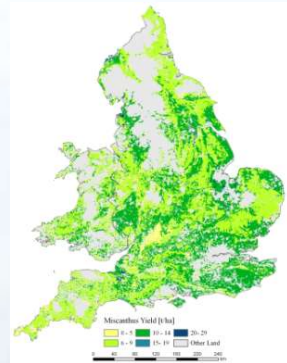
BE Allocation Trade-offs

Economic of BE Supply & Demand

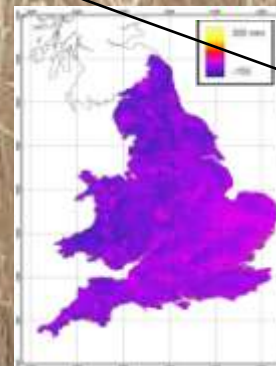
Assess environmental impact/benefit

GHG

H₂O



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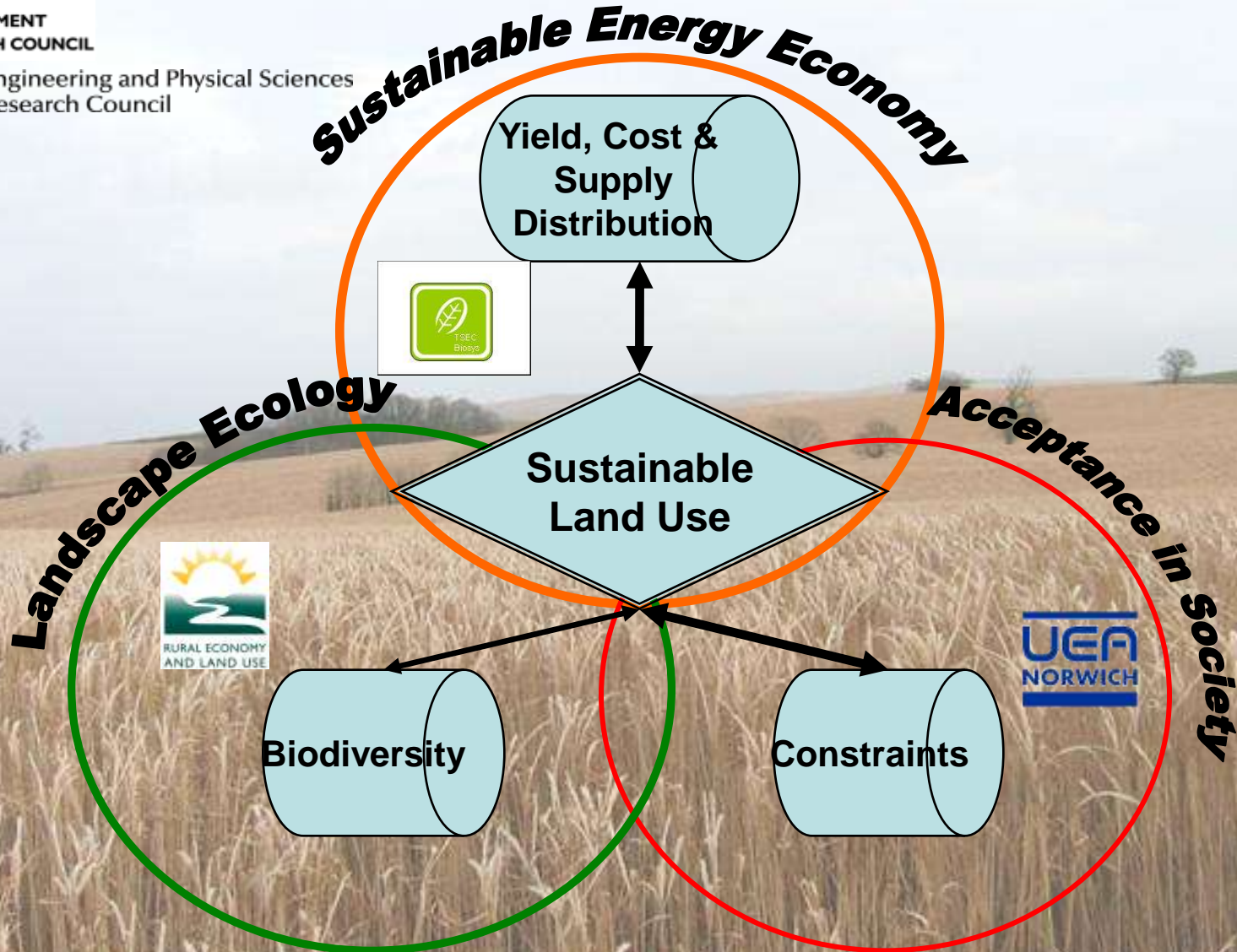
TSEC-Biosys – RELU-Biomass

<http://www.tsec-biosys.ac.uk/>

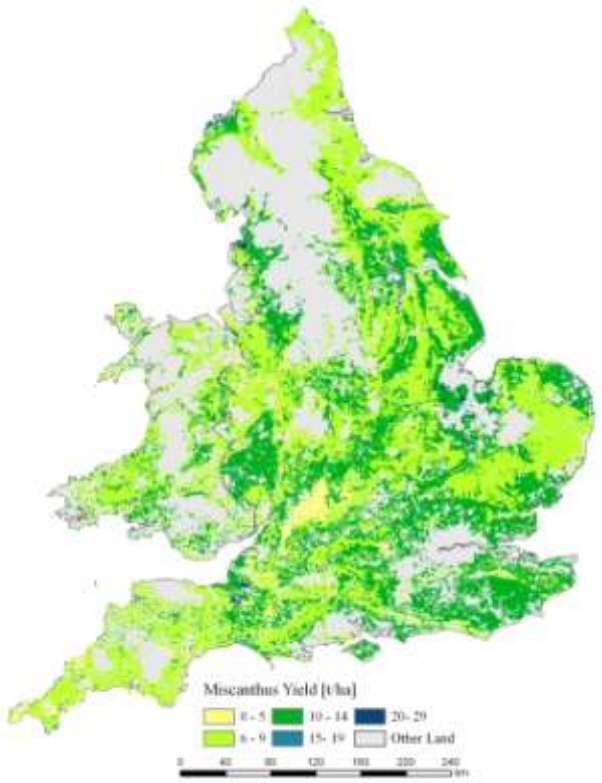
<http://www.relu-biomass.org.uk>



EPSRC Engineering and Physical Sciences Research Council

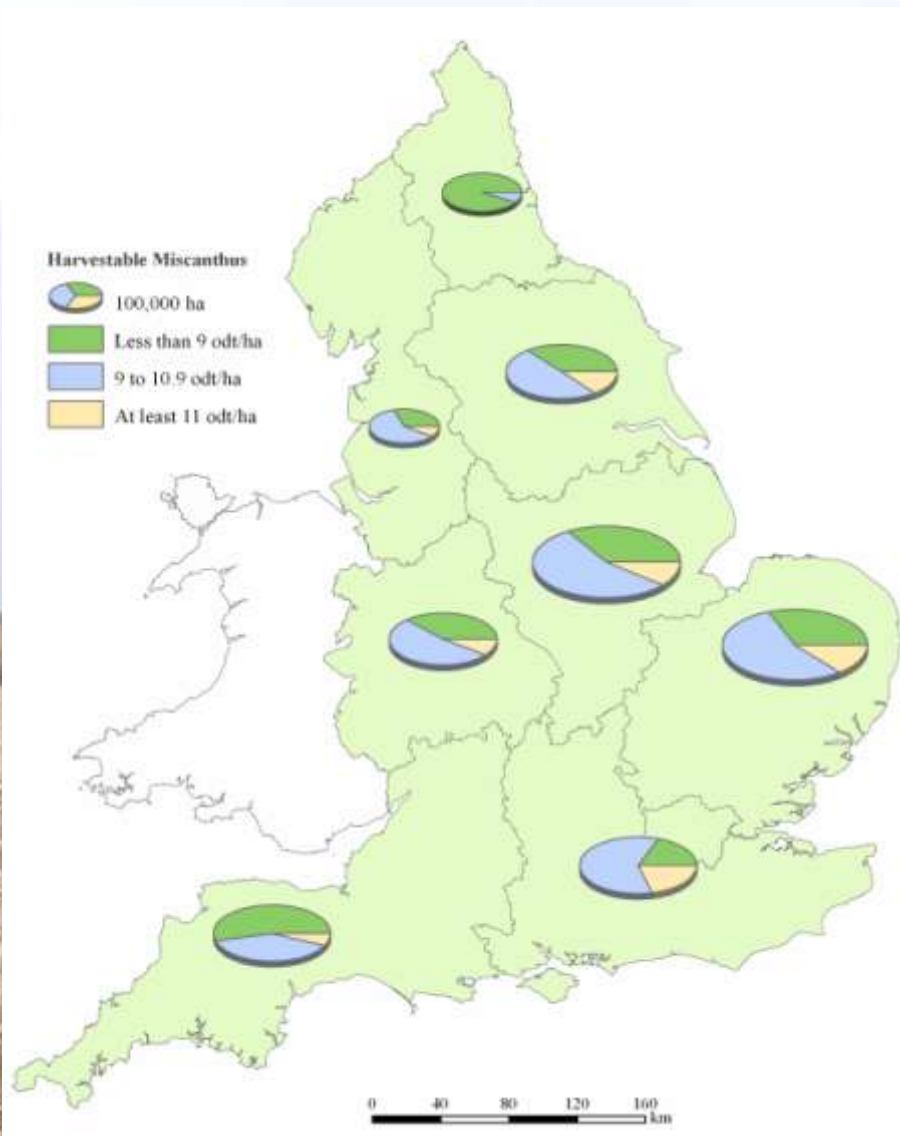


Land use trade-offs - Methods



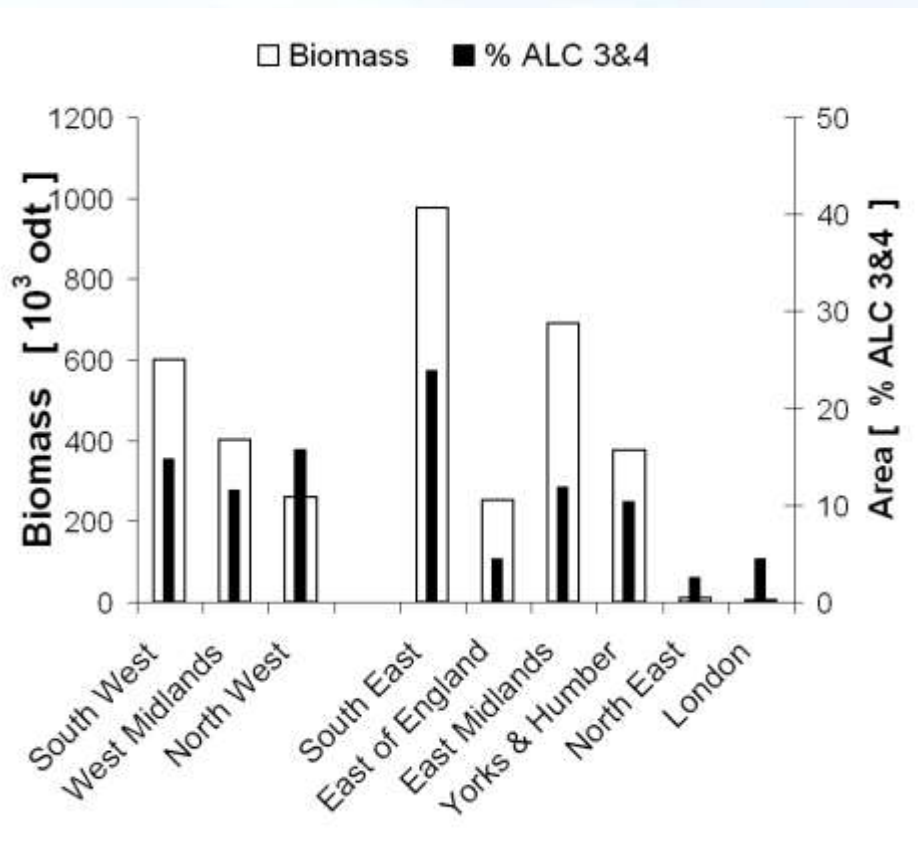
- Incorporated a range of constraints on energy crops
 - environmental, physical
 - agricultural, agronomic
 - socio-economic
- Accounted for currently grown food crops
- Used Miscanthus yield map for England

Land use trade-offs – Results



- Regional contrasts occur in the importance of different constraints
- Between 80 and 20% of are below an economic threshold of 9 t/ha
- Areas with highest yields co-locate with important food producing areas

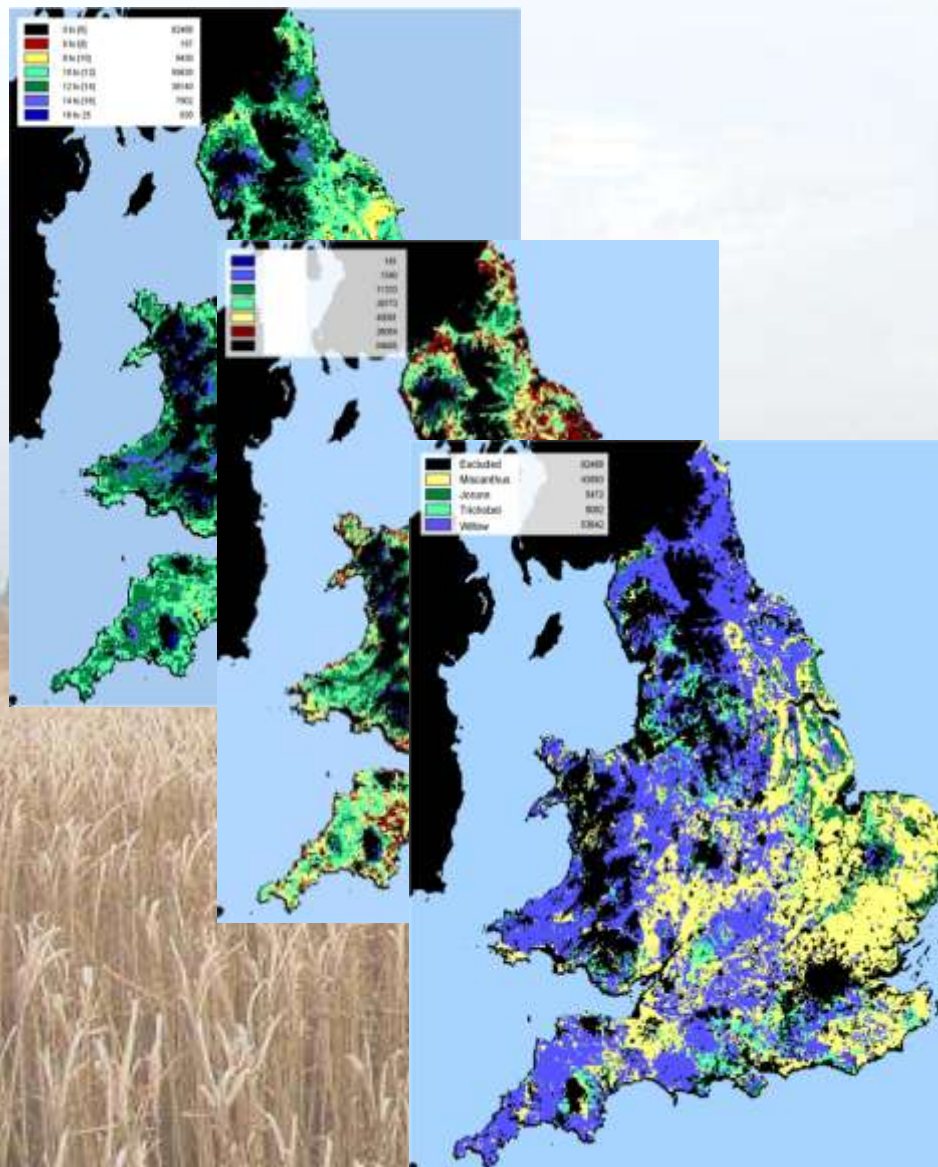
Land use trade-offs – Policy Scenario



Lovett, A. A. et al., *BioEnergy Research* (u.rev.)

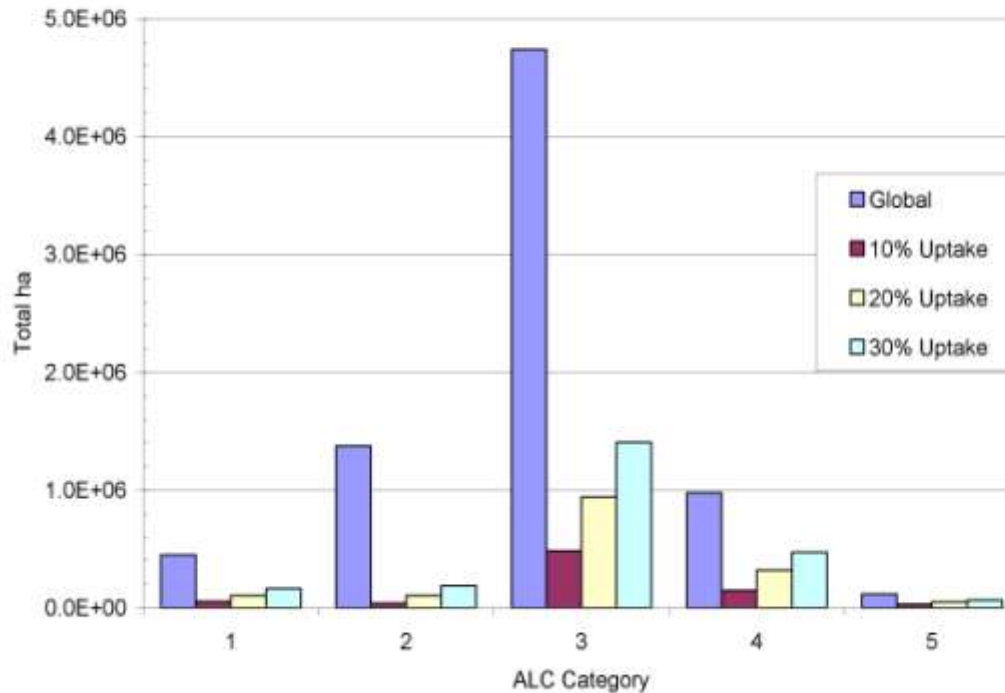
- Avoid high value land
- Increase planting of Miscanthus to 350,000 ha
- Utilize lower grade land (ALC3&4)
- Exclude grassland
- 2-20% of area was used depending on the region
- Scenario would not impact on food security

Supply & Demand Modelling



- Majority of land would yield between 10 - 14 t odm/ha/yr
- Cost map gives annual cost of 20 to 60 £/t odm
- Switch from yield to cost optimal crop affects only a small fraction of land
- Preference map shows 4.4 Mha of Miscanthus and 6 Mha of SRC

Supply & Demand Modelling



Allocation based on opportunity costs (ALC) show that

- Grade 3 and 4 land is preferred
- With higher demand (30%)
 - More marginal than high quality land is assigned
 - About 2 Mha are needed (corresp. to 20 Mt odm/ha)