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# cLCA of European biodiesel – estimation of key drivers for iLUC and identification of mitigation options

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**IEA Bioenergy workshop:**
**Quantifying and managing land use impacts of bioenergy**
**19-21 September 2011, Campinas, Brazil**

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# Overview

1. Background & objectives
2. Methodology
3. Results
4. iLUC mitigation options
5. Next steps

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# Background

- LCAworks and E4tech assessment of GHG emissions of EU oilseed rape (OSR) biodiesel due to iLUC
- First project of its kind specifically dedicated to modelling EU OSR biodiesel *indirect* impacts
- Aims to address concerns of European biodiesel industry that OSR biodiesel has received less attention than ethanol in recent iLUC modelling studies
- Build interactive model based on E4tech / DfT methodology to allow testing of sensitivities to key inputs
- Use range of balanced, conservative inputs
- Work in progress

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# Objectives

- Understand key factors impacting iLUC for OSR biodiesel
  - Many different studies giving a wide range of results (due to significant uncertainty of inputs, key underlying hypotheses and the modelling of market responses)
  - No definitive study / result
  - Results of current work seen as illuminating thinking, rather than identifying a definitive quantification of the iLUC impacts
- Update and improve existing model to take into account the findings and the latest developments in research around the iLUC topic
- Identify potential iLUC mitigation options

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# Methodology

- Causal-descriptive approach:
  - Application of consequential LCA methodology
  - Aims to identify all significant impacts via a chain of events, ending with either a land use change, or an increase in output from other means (eg., yield increase)
  - Microsoft Excel based interactive model.

- Data sources:
  - **Industry:** provided information on growth areas, agricultural management practices, processing
  - **Literature:** publically available, peer-reviewed datasets & publications (eg., EUROSTATA, FAOSTAT, JRC, IEA, USDA, USEPA, ADEME, etc.)
  - **Expert panel:** advise on key data inputs, assumptions and hypotheses used in the model

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# Methodology (cont.)

- A key hypothesis, supported by historic trends, is that: additional OSR oil required for OSR biodiesel needed to meet RED/FQD targets will come primarily, or exclusively from additional OSR production and NOT from existing markets.
- 4 impacts of increased OSR demand:
  1. Increased OSR yields in EU-27 (no iLUC impacts)
  2. Larger area of OSR is grown for biodiesel in EU-27 (iLUC impacts – eg., reduced reversion)
  3. Increased yields for OSR grown outside EU-27 (no iLUC impacts)
  4. Larger area of OSR is grown outside the EU-27 (iLUC impacts – eg., reduced reversion, conversion to new cropland, displacement of other crops)
- Other indirect impacts:
  - More OSR meal available (for use as animal feed, resulting in reduced expansion of soy)
  - New production of other vegetable oils needed to replace soy oil which would have been co-produced as a result of animal feed production (iLUC impacts –expansion of a mix of other vegetable oils)
- Identification of key modelling sensitivities for further research
- Key sensitivities (ie, significant impact on overall GHG balance and environmental impact of biodiesel) -> iLUC mitigation potential

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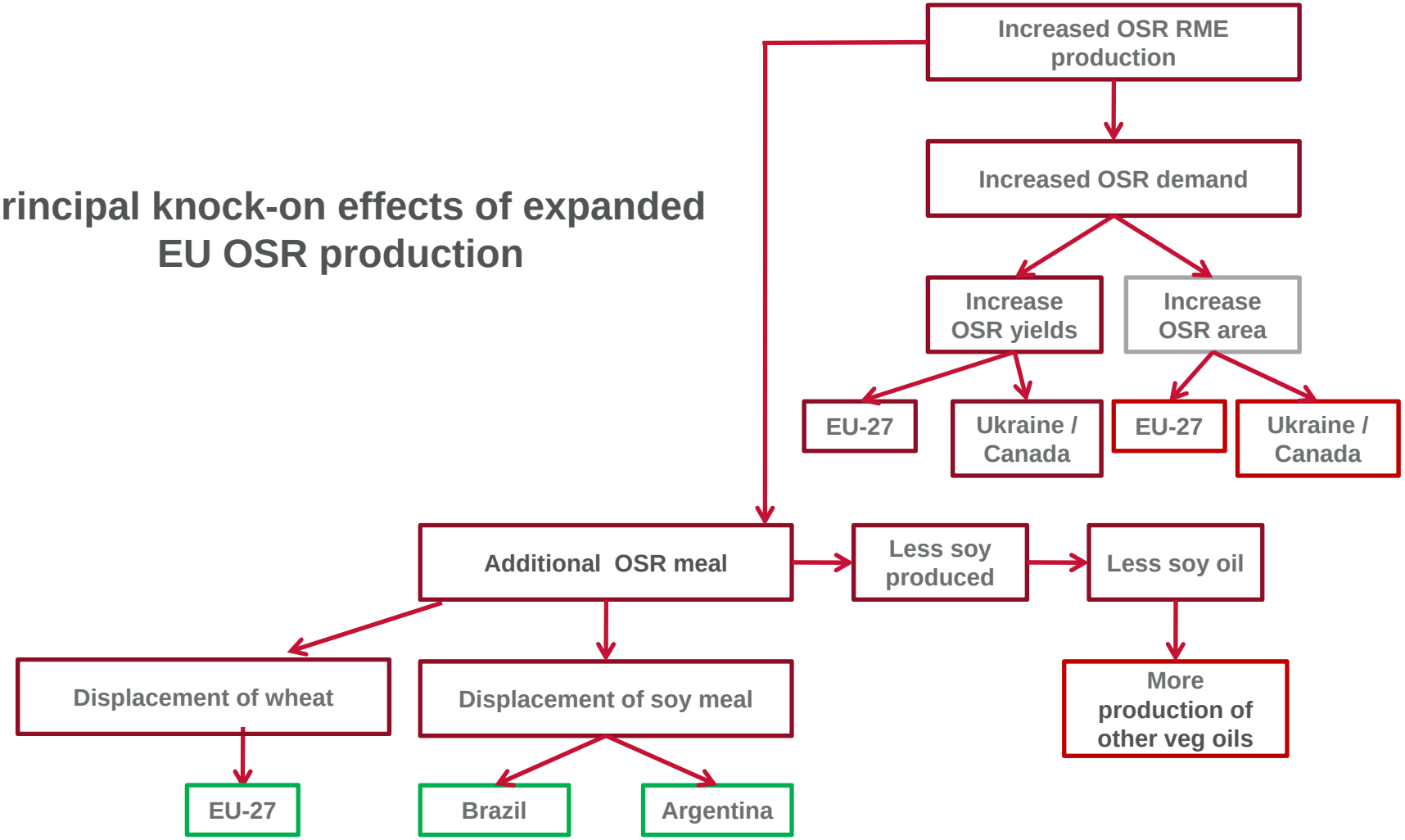
# Methodology (cont.)

## Principal knock-on effects of expanded EU OSR production



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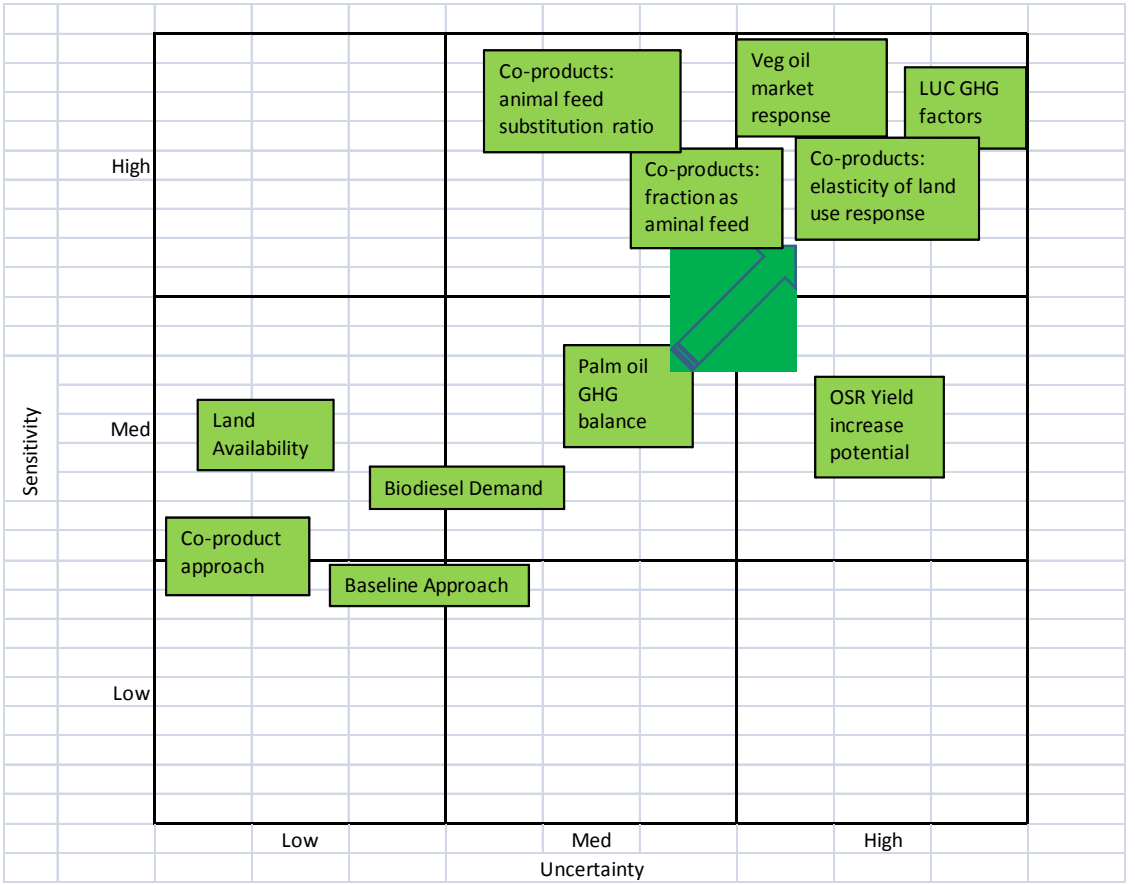
# Methodology (cont.)

- Evaluation and sensitivity analysis of assumptions underlying C-D model
- Ranking:
  - Uncertainty (strength of underlying data)
  - Sensitivity (impact on modelling results)



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# Preliminary results

- Identification of 4 key uncertainties:
  1. Vegetable oil market response
  2. Area and yield assumptions
  3. Co-products
  4. LUC GHG
- Vegetable oil market response:
  - To quantify how much of the EU's additional demand for OSR for biodiesel production will come from additional production or imports of OSR, and how much from the displacement of OSR or rapeseed oil out of the food market and need to be replaced by other oils : historic trends support the important hypothesis that 100% will be from additional OSR production, not from expansion of other vegetable oils
  - To forecast which vegetable oils would replace OSR or rapeseed oil in the EU's food market : the key hypothesis above would suggest though that impacts of other oils will not be significant.
- Co-products:
  - To establish that oilseed rape (OSR) biodiesel co-products (OSR meal) will displace soy and wheat from animal feed markets in Europe.: industry experts believe that100% of OSR meal will be used as animal feed and will cause a strong displacement of soymeal from EU animal feed markets.
  - To quantify how much land area expansion of soy and wheat cultivation will be avoided as a result of oilseed rape (OSR) biodiesel co-products (OSR meal) displacing soy and wheat from animal feed markets in Europe.

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# iLUC mitigation options

**Potential mitigation options:**

1. Vegetable oil market response
    - Ensure any additional vegetable oils required to replace OSR from the market have low GHG impacts
2. Area and yield assumptions
    - Enhancement of yields on existing land to limit growth area expansion (intensification: agricultural management practices, increased rotation, etc.)
3. Co-products
    - Maximise utilisation of co-products (eg., animal feeds, energy, feedstocks for chemical industry)
4. LUC GHG
    - EU RED sustainability criteria

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# Next steps

- **Further research needed on:**
  - Yield and area assumptions
  - LUC GHG
  - Quantification of effects of specific mitigation actions across supply chain

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