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# Updating a Soybean Life Cycle Database

Int'l. Palm Oil Life Cycle  
Assessment Conference  
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Presented by  
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# Project Purpose

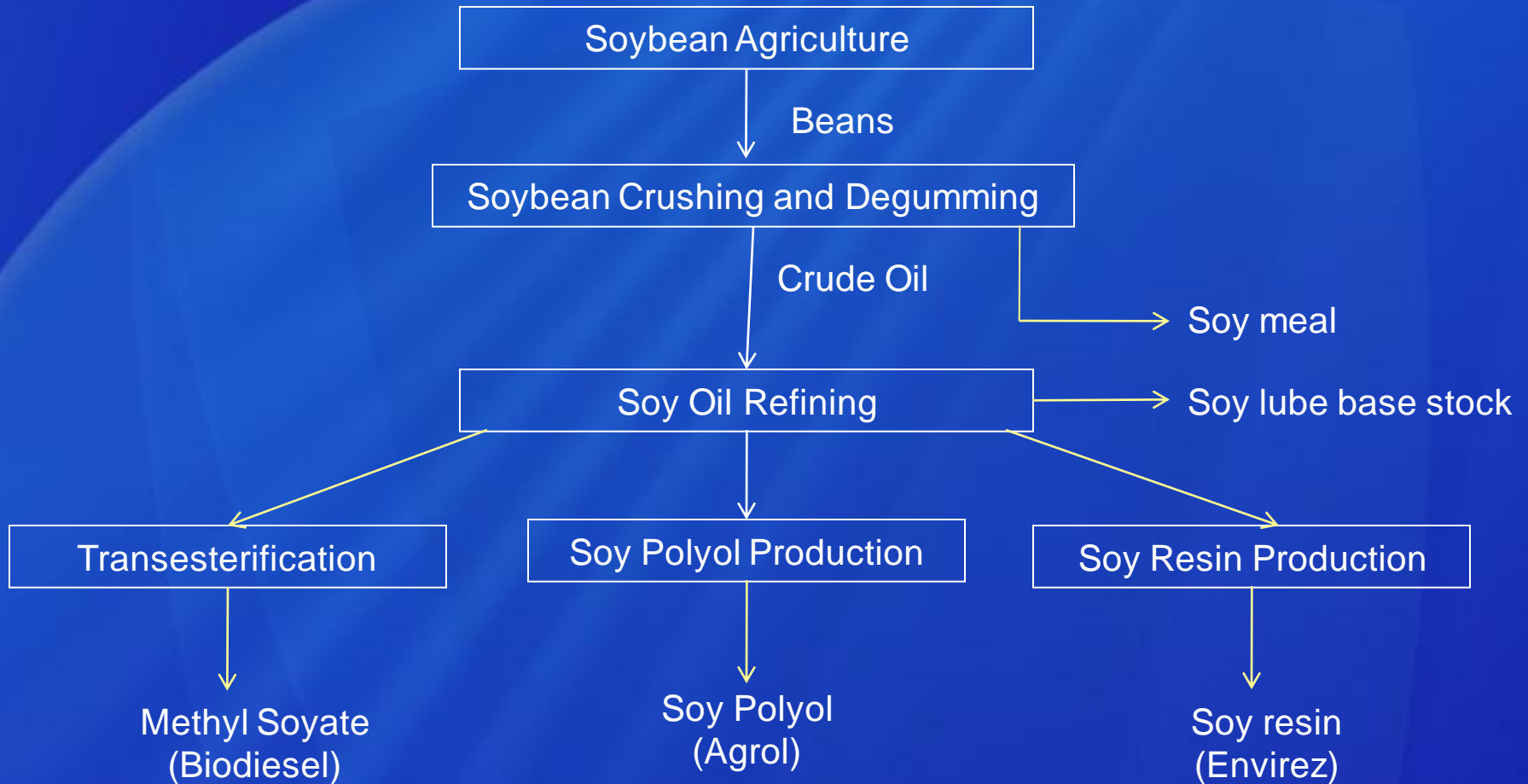
- Update life cycle inventory (LCI) databases (soybean production through four key feedstocks)
- Perform life cycle impact assessments (LCIAs) on four feedstocks vs. petroleum counterparts

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## Project Purpose (con't)

- Highlight carbon footprint, greenhouse gases (GHG) and global warming potential (GWP) differences
- Communicate findings and results with interested stakeholders

# Modeled Unit Processes



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# Target audiences

- LCA Practitioners (modelers)
- Soy product developers
- Retailers
- Trade groups
- Farmers

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## Target audiences (con't)

- US EPA – Setting federal Renewable Fuel Standards (RFS)
- California Air Resources Board (CARB) – Setting state level RFS
- Argonne National Lab – Creator of the Greenhouse Gases, Regulated Emissions and Energy Use in Transportation (GREET) model)

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## Target audiences (Con't)

- Joint Research Centre (Europe) – Provides life cycle modeling to support EU Biofuel Directive (2009) requiring renewable fuels to achieve a 35% GHG reduction. EU modeling showed only a 31% GHG reduction for soy biodiesel making product ineligible for use.

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## Initial findings

- Some life cycle data was old
  - Agriculture - 2003
  - Soybean oil refining – 1998
  - Soy biodiesel - 2004
- Other data was based on theoretical models
  - Crushing
  - Transesterification



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## Source of information

- **USDA & Ag Research Service Lab** – agriculture and process data
- **National Oilseed Producers Ass'n (NOPA)** - mass balance for soybean crushing (50/60 plants – 83%)
- **National Biodiesel Board (NBB)** – mass balance for biodiesel production (37% plants reporting)

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# Soybean Agriculture Changes

- Yields increased 11%
- Little change in agricultural chemicals and fertilizer rates per hectare
- Reduced lime application rate
- No change in energy use
- GHG emissions lower as N<sub>2</sub>O rate was reduced by 86% due to new USDA data

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# Soybean crushing changes

- Energy for crushing decreased 45% from previous database
- First time actual data was available for life cycle modeling

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# Transesterification changes

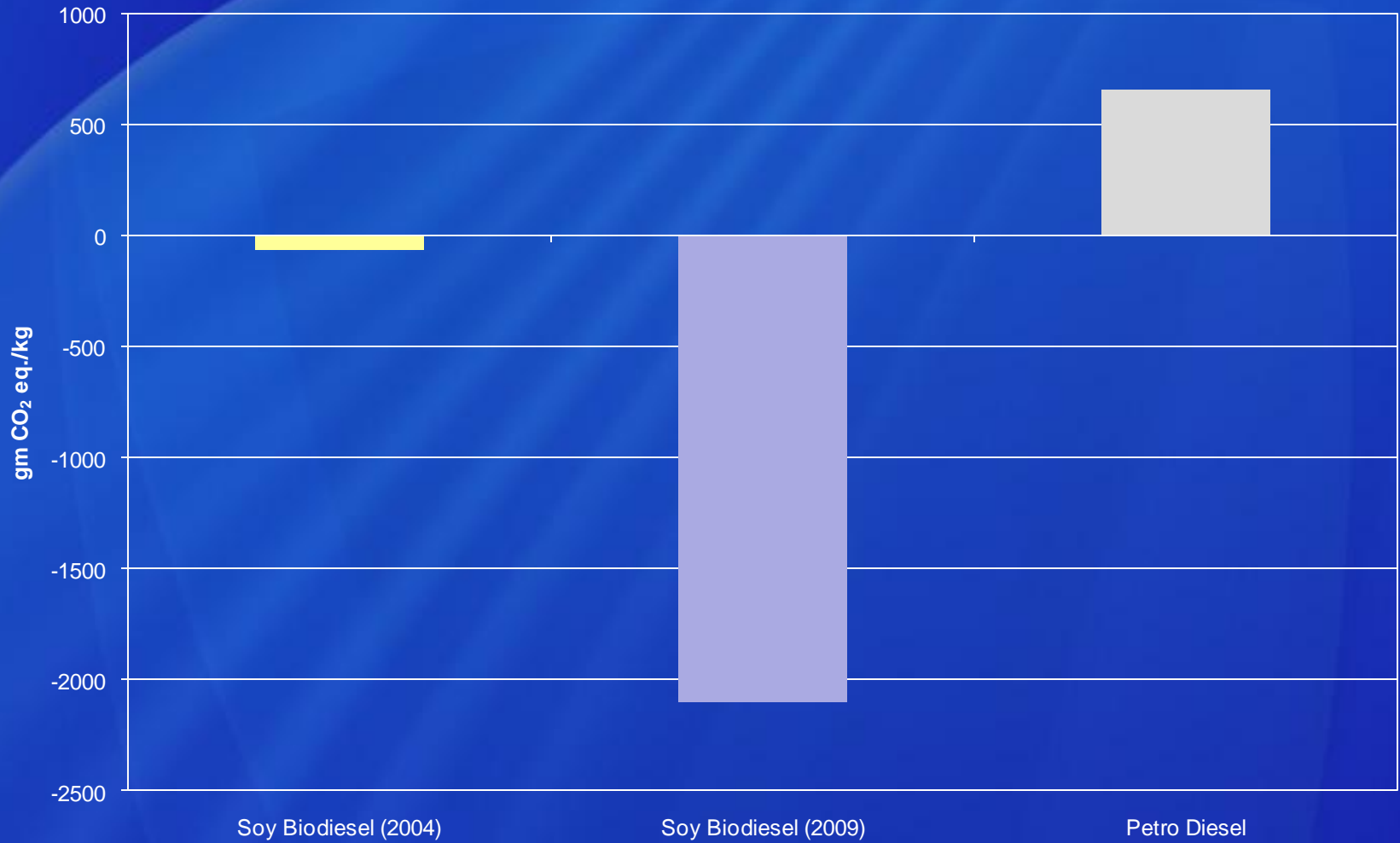
- Energy decreased by 35% compared to previous life cycle inventory (LCI) data

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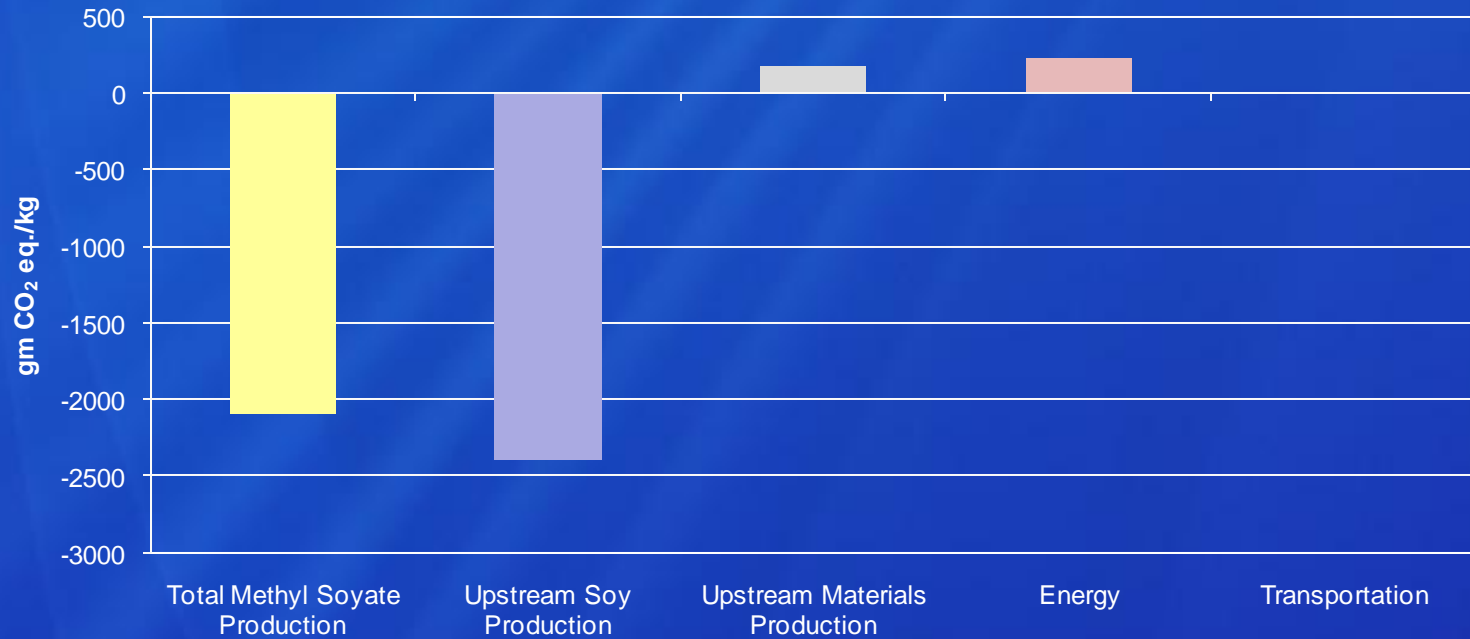
## Carbon & GHG & GWP

- Carbon “footprint” – “total set of GHG emissions caused by an activity or product”
- *Soy feedstocks have a more favorable carbon footprint and global warming profile than petro counterparts*

## SOY BIODIESEL vs. PETROLEM DIESEL (GLOBAL WARMING POTENTIAL)



## METHYL SOYATE (BIODIESEL) CONTRIBUTION ANALYSIS (GLOBAL WARMING POTENTIAL)



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## Peer Review

Entire project has been peer reviewed to ISO 14040 LCA requirements by:

- Dr. Martin Patel – Utrecht University
- Michael Levy – American Chemical Council
  - Dow Chemical
  - BASF
  - Bayer
  - Center for Polyurethane Industry (ACC)



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# Challenges

- The positive GHG advantage could be offset by proposed direct and indirect incremental land use change criteria
- Important that we be involved in how this criteria is developed and insist that credible information be used

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# Recommendations for Palm Oil Life Cycle Modeling

- Verify current life cycle inventories for producing palm oil & biodiesel
- Determine where data could be updated
  - Agricultural phase
  - Oil processing
  - Conversion to biodiesel

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## Recommendations for updating life cycle data

- Enlist agricultural and/or university help on quantifying mass balances for growing palm in your region
  - Energy use and emission balance
  - Land use change criteria
- Collaborate with palm oil and biodiesel producers for process data
- Peer review results to add credibility

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## Recommendation

- Interact with government officials and other interested stakeholders to reach consensus on policy planning for the palm oil industry
  - Credible life cycle data can guide planning and define impacts (environmental and economic)

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Thank you

Questions?