

### Report Released February 2010

A peer-reviewed study funded by the United Soybean Board and conducted by Omni Tech International provides updated data for use in conducting life cycle assessments of industrial products made from domestically produced, renewable soybeans.

### The Study:

- Updates the out-of-date data on soybean agriculture and processing as well as production information for four key soy-based feedstocks, soy polyols, methyl soyate, soy lube base stock and soy resins, used in manufacturing.
- Looks at the production data for Agrol® polyols and compared it to data from five producers of petroleum-based polyols including material and energy inputs for both processes. The soy polyol portion also included the updated data on soybean agriculture and processing and actual soy polyol production.
- Documents the greenhouse gas reduction benefits of soybean agriculture. These benefits carry through to industrial and consumer goods.
- Shows other energy and environmental benefits of soybean-derived feedstocks, especially when compared to their petroleum-based counterparts.
- Provides an important resource for companies to perform LCAs on their specific products made using soy.

### Findings: Agrol® vs Petroleum Polyols

- There is a carbon benefit from using Agrol®. Five and one-half pounds of carbon dioxide equivalents are removed or prevented from entering the atmosphere for every pound of Agrol® that replaces a pound of petroleum-based polyols.
- The production process for Agrol® has a lower global warming potential than the production of petroleum-based polyols. The process emits less formaldehyde, hydrocarbons, methane and nitrous oxide into the atmosphere.
- It takes less fossil fuel to produce a pound of Agrol® versus a pound of petroleum-based polyol.
- The manufacturing process takes less energy (both primary energy and fuel energy) to produce a pound of Agrol® versus a pound of petroleum-based polyol.

### Findings: Food vs Products

A lot of issues have been made about using a food crop for things other than food. But the study has shown that we don't really have to choose one use over the other.

- Soybeans grown in the U.S. provide an abundant supply of food for humans and feed for livestock as well as ingredients for biobased products.
- Soybeans contain both protein and oil. The oil makes up approximately 20% of the soybean by weight. During the

processing step, soybeans are crushed to produce soybean meal (protein) and soybean oil.

- Soybeans are grown primarily for meal, with the oil being a co-product.
- During the period from 1999 to 2008, according to USDA data, surplus end-of-year stocks of soybean oil ranged from 1.1 to 3.1 billion pounds, with the 10-year average being 2.3 billion pounds.
- These surpluses of soybean oil, combined with its chemical and physical properties, make it an attractive feedstock for industrial products.

### Findings: Benefits of Soy Yields Are Up

- The average soybean yield for 2004-2007 (the study period) was 42.3 bushels per acre, an increase of 12% over the data that was previously available from 1998-2000.
- Improved efficiencies at crushing facilities increased soybean oil yield by 11% and meal by 4% compared to 1998 data.

### Land Use is Consistent

- During the last 10 years, the number of soybean acres planted in the U.S. has remained relatively constant (averaging 73.6 million acres).

### Reduces Greenhouse Gases

- Each bushel of soybeans harvested reduces greenhouse gases (carbon dioxide (CO<sub>2</sub>) equivalents) by 32.6 kg.
- For the 3.36 billion bushels of soybeans produced in 2009 this translates into the equivalent of taking 21 million cars off the road.

### Energy Usage is Down

- Approximately 20% less direct energy is used for soybean production now due to reduced diesel and gasoline usage.
- Soybean crushing facilities reduced their energy consumption by 45% compared to the 1998 data.

### Emissions Are Down

- Hexane emissions at crushing facilities decreased over 70% compared to the 1998 data (from 10.15 kilograms per 1,000 kilograms of oil produced to 2.96 kilograms).
- The calculated release of nitrous oxide (N<sub>2</sub>O), a potent greenhouse gas, is 85% less than the data contained in the current U.S. LCI Database due to a corrected emission factor issued by the International Panel on Climate Change (IPCC) in 2006.



Agrol® comes in five functionalities for different uses

Download the full study or a white paper about the study at [soybiobased.org](http://soybiobased.org).