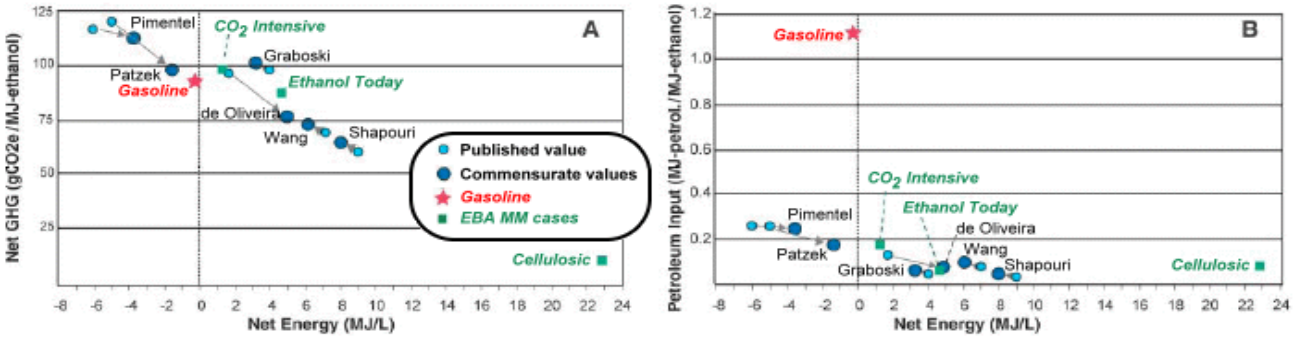
The net energy balance and greenhouse gas emissions associated with ethanol production have been analyzed by multiple groups. Some analysts have shown negative energy input to output balances while others have shown neutral to positive balances. Greenhouse gas emission estimates have also varied accordingly. Some differences can be explained by use of older versus new data, by inclusion or exclusion of co-products and by use of different system boundaries. Alexander Farrell and others in the Energy and Resources Group at the University of California, Berkeley, recently developed the Biofuel Analysis MetaModel (EBAMM) to investigate these issues. The group first replicated the results of six published studies with EBAMM then adjusted all six analyses to (a) add coproduct credit where needed, (b) apply a consistent system boundary, (c) account for different energy types, and (d) calculate policy relevant metrics.

The results shown below in figures A & B show the original and adjusted values for the six studies, EBAMM generated values for 3 cases including CO2 intensive ethanol, ethanol today, and cellulosic ethanol, and a gasoline comparison. Equalizing system boundaries among studies reduces scatter in the results. All studies show that ethanol made from conventionally grown corn can have greenhouse gas emissions that are slightly more or less than gasoline per unit of energy but that conventional corn ethanol requires much less petroleum inputs. The model suggests that ethanol produced from cellulosic materials reduces both GHG's and petroleum inputs substantially.

Section: BIOFUELS
Ethanol Net Energy Balances and Greenhouse Gas Emissions



Source:
A.E. Farrell, R.J. Plevin, B.T. Turner, A.D. Jones, M. O'Hare, D.M. Kammen, 2006. Ethanol Can Contribute To Energy and Environmental Goals. Science, Vol 311, January 27, 2006.

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Note: gCO2e (as shown in figure A above) is grams of CO2 equivalent.