Documentation for zFacts.com

See yellow highlights on the following page(s).

Corrections to a study done at UC Berkeleys Renewable and Appropriate Energy Laboratory, and Published in *Science* magazine, Jan 2006.

Fact: **1. Imported energy inputs to ethanol production are 42% of ethanol's energy inputs.**
2. GHG reduction by corn ethanol is 7.4%
3. GHG reduction by cellulosic ethanol is 88.3%

Source: Supporting Online Material for: Ethanol Can Contribute To Energy and Environmental Goals. Version 1.1, May 12, 2006. Article published in Science 27 January 2006: Vol. 311. no. 5760, pp. 506 - 508. Original Science Article

Notes:

Imported Energy Inputs:

The energy inputs for corn "Ethanol Today" are listed on p.24
Petroleum = 0.04, Natural gas = 0.28, coal = 0.41, other = 0.04.

All additional use of petroleum and gas must counted as increasing imports just as all replacement of gasoline is counted as reducing imports (not reducing US production).

(Petroleum + gas) / (total energy input) = 0.32 / 0.77 = 42%.

This is the percentage of input energy that increases imports.

GHG Reduction for corn ethanol:
From page 25.
The % GHG reduction from ethanol today = (94 - 87) / 94 = 7.4%,

GHG Reduction for cellulosic ethanol:
From page 25.
The % reduction from cellulosic ethanol = (94 - 11) / 94 = 88.3%

Supporting Online Material for:

Ethanol Can Contribute To Energy and Environmental Goals

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Contents

Tables and Figures

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sensitivity analyses above) without being clear about how it was calculated or noting that it is based on obsolete data.

11. In Table 1, numerous reported values lack any citation or explanation, including embodied energy in: phosphorus, potassium, lime, herbicide and insecticide. Several of these values are 20-50% higher than values reported by other sources.

12. In Table 1, (4) is cited, but the values are from (43) (See note 20).

13. In Table 1, the entire column of Nitrogen Fertilizer Production values is incorrectly converted from the English-unit version of the paper to SI, using (x BTU/lb) / (948.45 BTU/MJ) / (2.205 lb/kg) to compute MJ/kg. The correct conversion multiplies, rather than divides, the last term, i.e. (x BTU/lb) / (948.45 BTU/MJ) * (2.205 lb/ kg). So, for example, the N energy value reported by the 2002 version of the paper, 18392 BTU/lb is converted to 8.80 MJ/kg when the correct value is 45.75 MJ/kg. However, it appears that totals were converted directly to SI as totals, rather than by adding up the incorrectly converted values. Thus, the reported final results are correct despite the intermediate error.

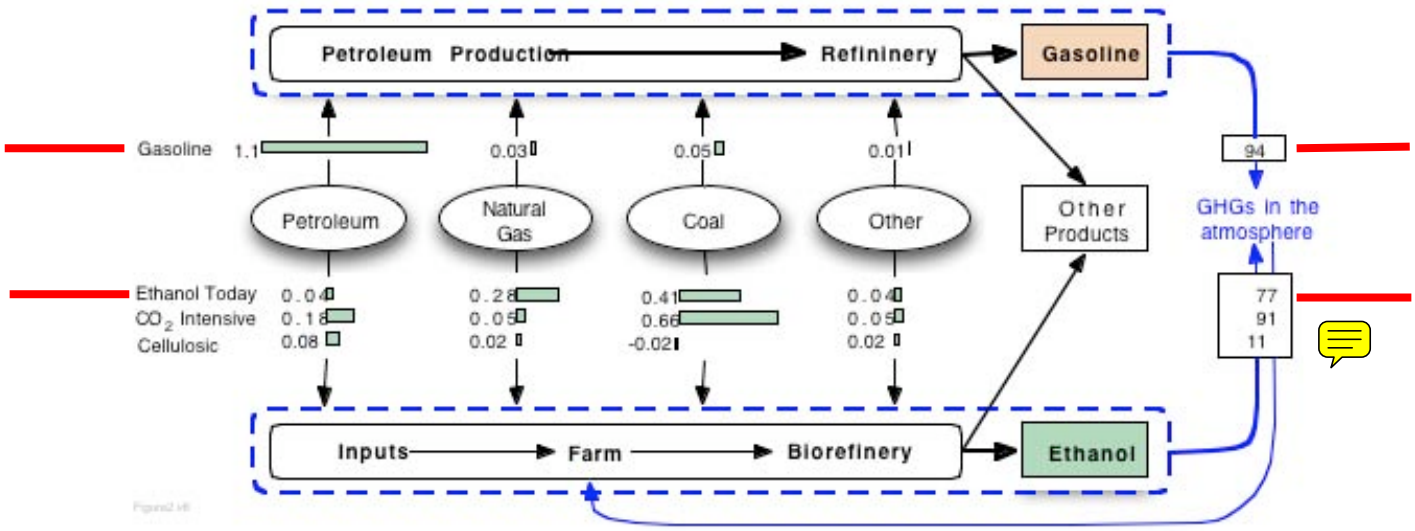

Figure S3. Energy Inputs and GHG Emissions for Gasoline and Ethanol

Alternative metrics for evaluating ethanol based on the intensity of promary energy inputs (MJ) per MJ of fuel and of net greenhouse gas emissions (kg CO_2-equivalent) per MJ of fuel. For gasoline, both petroleum feedstock and petroleum energy inputs are included. “Other” includes nuclear and hydrological electricity generation. Relative to gasoline, ethanol produced today is much less petroleum-intensive but much more natural gas- and coal-intensive. Production of ethanol from lignite-fired biorefineries located farm from where the corn is grown resultls in ethanol with a high coal intensity and a moderate petroleum intensity. Cellulosic ethanol is expected to have an extremely low intensity for all fosisl fuels and a very slightly negative coal intensity due to electricity sales that would displace coal.

Table S3. EBAMM Results

Data for six studies of corn ethanol and three cases using the EBAMM model and published data. Values for gasoline account for coproducts.

	Reference	**EBAMM results for selected studies**						**EBAMM cases**		
	Gasoline	**Patzek 2004**	**Pimentel *et al.* 2005**	**de Oliveira *et al.* 2005**	**Shapouri *et al.* 2004**	**Graboski 2002**	**Wang 2001**	***Ethanol Today***	***CO_2 Intensive***	***Cellulosic***
Petroleum inputs (*MJ/MJ*)										
Original values		0.26	0.25	0.14	0.04	0.05	0.09			
Commensurate values	1.1	0.19	0.19	0.08	0.05	0.07	0.10	0.06	0.20	0.08
Net GHG emissions (*gC/MJ*)										
Original values		121	116	98	61	99	71			
Commensurate values	94	104	97	82	80	107	74	87	101	11
Net energy (MJ/L)										
Original values		-5.0	-6.1	1.6	8.9	3.9	6.9			
Commensurate values	-0.24	-1.6	-3.7	4.8	8.0	3.1	6.1	4.5	1.0	23
Percent of published net energy										
Original values	-	100.0%	99.9%	100.0%	100.0%	100.5%	100.2%	-	-	-
Coproduct credit (MJ/L)										
Original values		0	0	0	7.3	4.1	4.0			
Commensurate values	-	4.1	1.9	4.1	7.3	4.1	4.0	4.1	4.1	4.8