Comparison of the Greenhouse Gas Impact of Three Breakfast Choices

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Project Summary Report

Towards a goal of promoting the plant-based diet as a healthful and environmentally sustainable alternative to the conventional North American diet, Sequel Naturals engaged Conscious Brands™ to examine the greenhouse gas emissions attributable to its Vega™ Whole Food Health Optimizer. The life cycle greenhouse gas emissions of this vegan product would be compared to the life cycle emissions from a "Traditional" North American breakfast and a "Light" North American breakfast. The investigation of Sequel's product required direct contact with the many food companies who supply the ingredients for Vega products, and investigation of the comparison breakfasts required extensive secondary source research in academic journals and government reports.

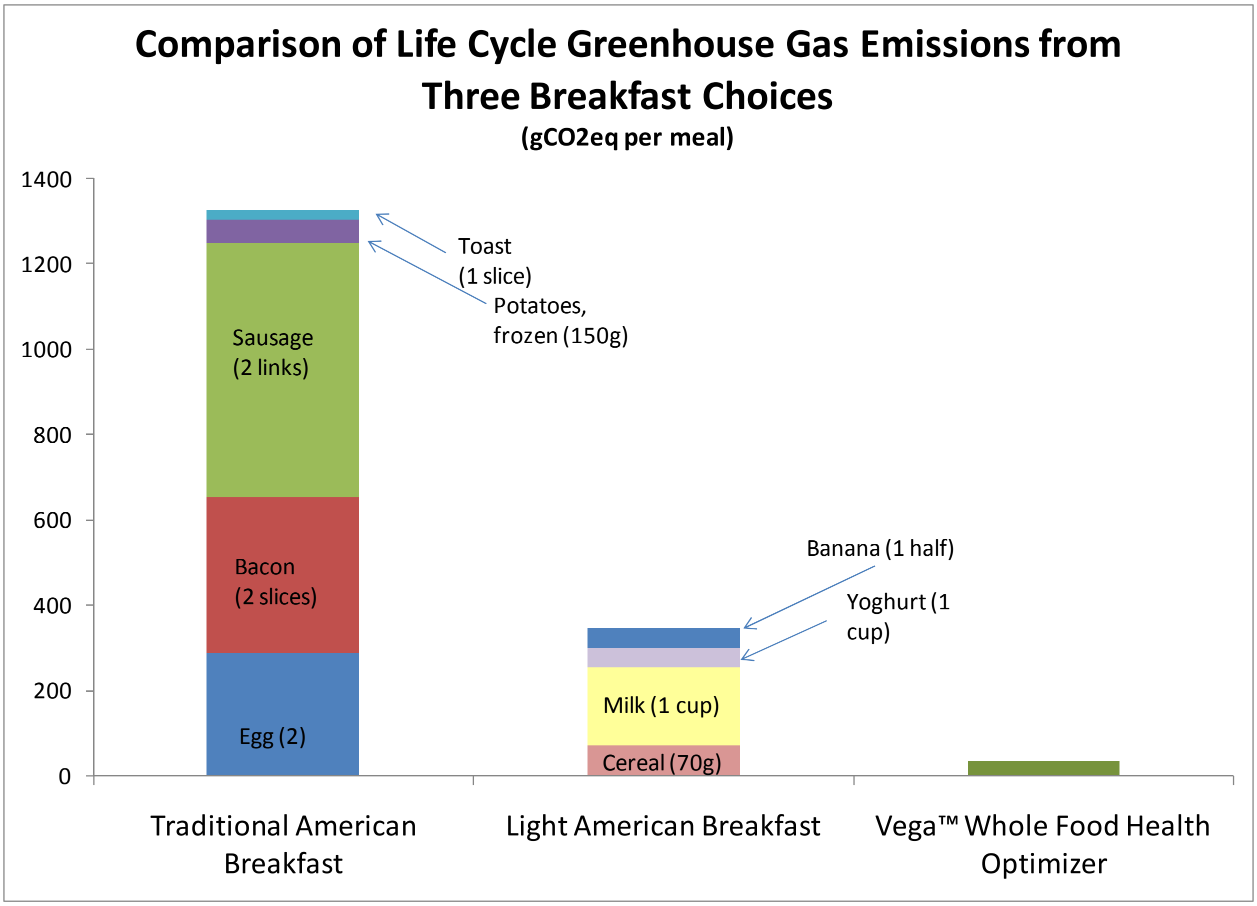
Non-food additives and vitamin enrichments that appear in many packaged food products (including Vega™) were excluded from this analysis. These ingredients add minimally to the overall mass of food products, and data on their life cycle emissions are unavailable in the literature. Due to a higher overall meal mass of the Traditional and Light American breakfasts, it's likely that the sum of food additive masses for these breakfasts is higher than the total for the Vega meal. Therefore, we believe that excluding these additives and enrichments makes the comparison estimate more conservative.

The final ingredients list for the Traditional breakfast included: bacon (60g, 2 slices), eggs (116g, 2), sausage (80g, 2 links), potatoes (150g, frozen), toast (28g, 1 slice); and the Light American breakfast included: cereal flakes (70g), milk (225g, ~1 cup), yoghurt (200g, ~1 cup), banana (100g, ~1 half). The Vega Whole Food Health Optimizer was assumed to have no ingredients beyond the initial list that Sequel supplied (tap water excluded.) All of the comparison breakfast ingredients are non-organic.

We used exclusively secondary source research (see Appendix 1 for a bibliography) to compile an emissions profile of the Traditional and Light American breakfasts. All emissions factors for ingredients in the Traditional and Light breakfasts came from Life Cycle Analysis (LCA) studies published in peer-reviewed journals. While a host of papers regarding the greenhouse gas emissions from food life cycles were reviewed for this project, the following studies were particularly helpful: Wallen, Brandt and Wennersten 2004; Cederberg and Mattsson 2000; Hendrickson 2004; and Berlin 2002.

In performing the greenhouse gas emissions analysis of the Vega™ Whole Food Health Optimizer product, Conscious Brands™ sought to follow the LCA standard that is emerging as the premier Life Cycle Analysis protocol, developed by the Carbon Trust, a British quasi-NGO, in conjunction with the UK's National Standards Body, British Standards Institution, and based on ISO environmental LCA standards. Life cycle greenhouse gas emissions calculations inevitably involve a measure of uncertainty, particularly when agriculture is involved. Conscious Brands™ believes the methods followed in this study are reliable and the overarching conclusions robust. The analysis presented here includes every major emissions source attributable to the ingredients analyzed, in addition to figures from the best scholarly works available on the life cycle greenhouse gas emissions of breakfast foods.

Results



The above figure shows the calculated life cycle greenhouse gas emissions from each breakfast, and the absolute quantity of emissions attributable to each Traditional and Light breakfast ingredient. Animal-based ingredients – sausage, bacon and eggs – make up the overwhelming majority of life cycle emissions from the Traditional breakfast and a majority of emissions from the Light breakfast.

Looking at the entire product life cycle, a Traditional American Breakfast creates about 38 times the greenhouse gas emissions as a serving of Vega Whole Food Health Optimizer™ and a Light American Breakfast creates about 10 times the greenhouse gas emissions.

To give perspective, the equivalent value of switching from a Traditional American Breakfast to Vega Whole Food Health Optimizer™ for a 12 month period would be the equivalent of:

- Switching off a 60 watt light bulb for 12,500 hours, or **521 consecutive days**
- Not flying on two round trip flights from Atlanta to Boston, or **3,870 miles**
- Not driving a midsize combustion engine vehicle from New York to Houston, or **1,335 miles**

Appendix 1

Author	Year	Title
Barron et al	2003	Integrating hemp in organic farming systems: a focus on the UK, France and Denmark
Berlin, J.	2002	Environmental life cycle assessment of Swedish semi-hard cheese
Bruce et al	1997	Vegan, Vegetarian, Omnivore?
Carey, Kyle	2007	Nitrous Oxide Agricultural Inventory Data
Carlsson-Kanyama, A.	1998	Climate change and dietary choices - how can emissions of greenhouse gases from food consumption be reduced
Carlsson-Kanyama, A. and A.D. Gonzalez	2007	Non-CO2 greenhouse gas emissions associated with food production: methane and nitrous oxide
Cederberg, C. and B. Mattsson	2000	Life cycle assessment of milk production - a comparison of conventional and organic farming
Chhinnan et al	1980	Anaylsis of energy utilization in spinach processing
Chochran, M.J., T.E. Windham and B. More	2000	Feasibility of Industrial Hemp Production in Arkansas
Dornburg, Termeer and Faaij	2004	Economic and greenhouse gas emission analysis of bioenergy production using multi-product crops - case studies for the Netherlands and Poland
EPA	2006	Global anthropogenic non-CO2 greenhouse gas emissions: 1990-2020
EPA	2006	Global mitigation of non-CO2 greenhouse gas emissions
Galitsky, C, E. Worrell and M. Ruth	2003	Energy efficiency improvement and cost saving opportunities for the corn wet milling industry
Hanegraaf, M.C.	1998	Environmental performance indicators for nitrogen
Hellebrand, H.J., J. Kern and V. Scholz	2002	Long-term studies on greenhouse gas fluxes during cultivation of energy crops on sandy soils

Hendrickson, J.	2004 Energy use in the U.S. food system: a summary of existing research and analysis
Jarecki, M.K. and R. Lal	2003 Crop management for soil carbon sequestration
Kim, S. and B.E. Dale	2007 Life cycle assessment of fuel ethanol derived from corn grain via dry milling
Kuepper, G.	2003 Manures for Organic Crop Production
Lo, Y., S. Yang and D.B. Min	1996 Ultrafiltration of xanthan gum fermentation broth: process and economic analysis
Ontario Ministry of Agriculture, Food and Rural Affairs	2000 Growing Industrial Hemp in Ontario
Pervaiz, M. and M.M. Sain	2002 Carbon storage potential in natural fiber composites
Sheehan et al	1998 Life cycle inventory of biodiesel and petroleum diesel for use in an urban bus
Smith et al	2007 Agriculture. In Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change
Sokhansanj et al	2006 Production and distribution of cereal straw on the Canadian prairies
Steinhart, J.S. and C.E. Steinhart	1974 Energy use in the US food system
van der Werf, H.M.G.	2004 Life cycle analysis of field production of fibre hemp, the effect of production practices on environmental impacts
Wallen, A., N. Brandt and R. Wennersten	2004 Does the Swedish consumer's choice of food influence greenhouse gas emissions
Wang et al	1997 Fuel-cycle fossil energy use and greenhouse gas emissions of fuel ethanol produced from U.S. Midwest corn
Wilhelm, L.R. et al	2004 Energy Use in Food Processing