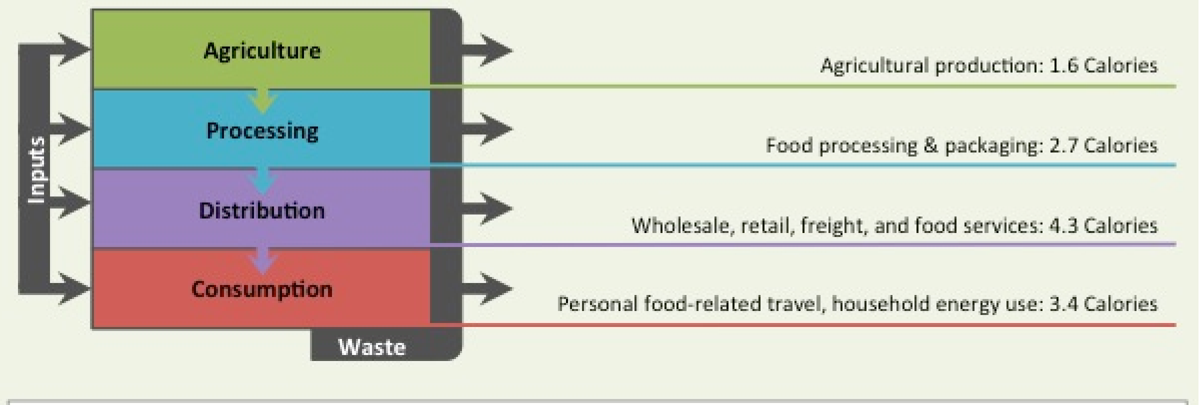
The Energy Cost of Food

by Eric Garza Ph.D, originally published by Aisthetica | Jul 22, 2013

At the grocery cooperative nearest my home I can buy kale from California, grapes from Argentina, olive oil from Italy, miso from Japan, and apples from New Zealand. I can enjoy a diet that's utterly dissociated from Vermont's Champlain Valley where I live, one that renders my local climate, the character of the local soil and geography, and even the passage of seasons irrelevant to my food choices. I can eat as if I lived in a tropical paradise where summer never ends, while living in a temperate paradise where summer lasts just a few short months.

As I walk out of my co-op I'm reminded of the source of this modern food miracle: a nearby service station sells gasoline for $3.67 per gallon, and diesel for 30 cents more. This is pricy compared to what these fuels cost a decade ago, but they still provide astonishingly cheap energy. And it's this cheap energy that powers the globalized, industrial food system that delivers food to my co-op from the four corners of the Earth, regardless of weather, regardless of the season.

Just how much energy does it take to fuel the US food system? A lot. It required just over 12 Calories of fuel to produce one Calorie of food in 2002, once waste and spoilage were accounted for.[1] Of these, 1.6 fuel Calories were used in the agricultural sector, while 2.7 were used to process and package food. Distribution, which includes transportation, wholesale and retail outlets, and food service operations such as restaurants and catering services, used another 4.3 fuel Calories. Finally, food-related household energy use added another 3.4 Calories to the tab. This figure has been on an upward trend; it took just over 14 fuel Calories to deliver a Calorie of consumed food in 2007, and if we extrapolate this trend the US food system requires about 15 Calories of fuel to deliver a Calorie of consumed food in 2013.

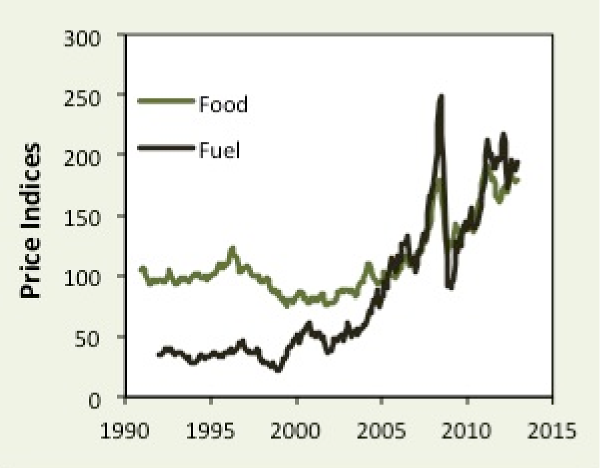


U.S. food system energy use in 2002. Sources: Canning et al. (2010), USDA Economic Research Service.

As high as this 15 Calorie figure might seem, it's surely an underestimate. The report from which these data were drawn left out a number of sectors within the US food system that require energy as a key input to their operations, including research and development, waste disposal, water provision, and food system governance, among others. If we did a more expansive assessment of the energy use in the US food system, the total energy demand would probably be 15-20 Calories of fuel per consumed food Calorie, or more.

To put these statistics into perspective, 15 fuel Calories equates, in energy terms, to 1.2 gallons of gasoline embodied in the average American's daily diet. That's 420 gallons of gasoline per person per year to deliver Americans the food they eat, an amount on par with the 430 gallons the average American burns in their car. The US food system is admittedly more energy intensive than most, but high fuel demand in the service of food procurement is the norm around the world.

So what? Energy use statistics, within food systems and throughout the economy more generally, are just numbers on a page. In the flesh-and-blood world however, there are real consequences to having a food system that requires so much energy to function. First, and perhaps most obviously, heavy demand for energy in the service of producing, processing, distributing and consuming food forges a link between food and fuel prices. When fuel prices rise or become volatile, food prices must follow. When *food* prices rise and become volatile, that challenges the food security of billions of people worldwide, leading to hunger, starvation and social unrest. Only by radically reducing the energy costs associated with procuring food can this link be severed.



Food and fuel prices show a strong correlation, particularly after 2005. Source: International Monetary Fund.

And speaking of rising fuel prices, it's worth noting that much of the energy that fuels the US food system isn't renewable; it comes from coal, natural gas, crude oil, and nuclear fuels. All of these fuels will go through stages of growth, peak, and decline. The peak and decline phases will trigger price increases and, more generally, price volatility for each fuel. In the last decade oil prices have risen substantially and become quite volatile, leading to the relatively high gasoline prices noted above. Some suggest this is because of the onset of a peak in global oil supplies, one eventually followed by a decline in global oil production as oil fields dry up and remaining resources become inaccessible for all manner of financial, technical or political reasons. Acknowledging the non-renewability of key fuels that power the US food system demands that we invest heavily to reduce its energy intensity; otherwise our energy-hungry food system might one day find itself starved of the modestly-priced energy inputs that currently sustain it.

Food activism of all sorts is rising up like a wellspring around the world, creating an enormous opportunity for us to ponder whether our food system's development path is a viable one. How must our diets adapt to changing energy realities, and how large of a role will mechanization, long-distance food distribution and food processing play in the food systems of the future? What types of low-input production, processing, preparation and storage methods will we adopt, and how can we close nutrient cycles and reduce food waste? I hope the facts and figures I've offered here and the questions I've left you with spark discussion, at the dinner table, at farmer's markets, at City Council meetings and perhaps even in legislatures. Only through enquiry and action can we redesign our food systems so as to reduce their energy intensity, and this might just make the local food revolutions blossoming the world over accessible to all.

Notes

1. A calorie (small 'c') is a heat unit commonly used by physicists, while a Calorie (capital 'C') is used to measure the heat content of food and equates to 1,000 Calories. Food system energy use data are from the USDA report *Energy Use in the US Food System* (Canning *et al*, 2010) and from the USDA Food Availability (Per Capita) Data System.

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