Fossil Fuel and Energy Use

Oil, coal, and natural gas are collectively known as fossil fuels. Today, eighty-five percent of all energy produced in the United States comes from burning these fuels. That energy powers almost two-thirds of our electricity and virtually all of our transportation.[1]

There are a number of problems associated with fossil fuels, most of which stem from the by-products created when they are burned to create energy. Chief among those byproducts are carbon dioxide and nitrous oxide, greenhouse gases that are major contributors to global warming. Largely because of coal and petroleum combustion, the amount of carbon dioxide and nitrous oxide in the air today are thirty-five percent and eighteen percent higher, respectively, than they were before the industrial era.[2] Other byproducts of fossil fuel combustion include sulfur oxides and nitrogen oxides, both of which contribute to acid rain, and hydrocarbons, which can react with nitrogen oxides to form smog.[3]

In addition to their environmental harm, the byproducts of burning fossil fuels can cause health problems for humans. Nitrogen oxides, for instance, irritate the lungs.[4] Particulate matter such as soot and dust contribute to respiratory illness and cardiac problems, including arrhythmias and heart attacks.[5]

Fossil fuel dependence also damages the health of our nation. In 2004, almost sixty percent of petroleum products used in the U.S. were imported from other countries.[6] And despite the fact that fossil fuels are limited resources that cannot be replaced, the Department of Energy acknowledges that their usage in the U.S. is likely only to grow over the next century.[7] This means that unless we dramatically change the way the U.S. consumes energy, our dependence on foreign sources of fossil fuels will also grow — and increasingly threaten the stability of American government, business, and daily life.

Fossil Fuels and Industrial Farming

Conventional food production and distribution requires a tremendous amount of energy — one study conducted in 2000 estimated that ten percent of the energy used annually in the U.S. was consumed by the food industry.[8] Yet for all the energy we put into our food system, we don't get very much out. A 2002 study from the John Hopkins Bloomberg School of Public Health estimated that, using our current system, three calories of energy were needed to create one calorie of edible food. And that was on average. Some foods take far more, for instance grain-fed beef, which requires thirty-five calories for every calorie of beef produced.[9] What's more, the John Hopkins study didn't include the energy used in processing and transporting food. Studies that do estimate that it takes an average of 7 to 10 calories of input energy to produce one calorie of food.[10]

Accounting for most of this wasteful equation are the industrial practices upon which our food system is built. These include inefficient growing practices, food processing, and storage, as well as our system of transporting foodstuffs thousands of miles between the field and the end consumer.

Growing Practices

The biggest culprit of fossil fuel usage in industrial farming is not transporting food or fueling machinery; it's chemicals. As much as forty percent of energy used in the food system goes towards the production of artificial fertilizers and pesticides.[11] Fertilizers are synthesized from atmospheric nitrogen and natural gas, a process that takes a significant amount of energy. Producing and distributing them requires an average of 5.5 gallons of fossil fuels per acre.[12]

Manure could be a more energy-efficient alternative to synthetic fertilizers, but because it is heavy this applies only when it can be used a short distance from where it is produced — and our industrial system precludes this option.[13] The problem is over-consolidation: We raise large numbers of livestock in one place and raise the grain they eat in other places. This means that the livestock produce an excess of manure where there's no cropland for it to be spread on, making it a pollutant rather than a tool. Meanwhile, the fields that grow feed must draw their fertility from synthetic sources.[14] We end up with concentrations of unusable manure in one place, and concentrations of chemical fertilizers in the other — and a whole lot of fuel wasted trucking feed and fertilizer around the country.

The extent of this waste is underscored by the fact that it's largely unnecessary. Small, pasture-based livestock farms take advantage of natural cycles: the animals feed themselves on grass and distribute their manure themselves, fertilizing the pasture as they go. Rather than fossil fuels, they need only rain and sun to make the system work.

Packaging, Processing, and Storing Food

Approximately 23 percent of the energy used in our food production system is allocated to processing and packaging food.[15] Another 32 percent is burned in home refrigeration and cooking.[16] While no study has quantified the potential energy savings of buying locally, the practice of eating whole foods generally decreases the use of fossil fuels for processing, packaging, and storing foods. (Compare all the energy and packaging behind say, a can of tomato sauce, to simply buying some tomatoes, basil, and garlic, and making it oneself.) If the consumer chooses to store foods for long periods of time at home, this can often be done in a more energy-efficient manner than commercial packagers choose to use. One estimate suggests that reusing a glass jar five times at home can save about half of the energy a commercial packager uses to make five disposable containers.[17]

Food Transportation

Because industrial farming draws on the economy of scale, our food is increasingly grown in concentration in specific areas of the country. This is so common that it has shaped much of our country's geographic identities — the western Plains are wheat country, the Midwest is the Corn Belt — but it has reached extremes. For instance, approximately ninety percent of all the fresh vegetables consumed in the U.S. are grown in California's San Joaquin Valley.[18]

This national-scale system is possible only because it uses large quantities of fossil fuels to transport food products to the consumer. It is now common practice to ship food not just around the country, but around the world. (In 2005, more than $120 billion of agricultural products crossed U.S. borders as imports and exports.)[19] As a result, the average American foodstuff travels an estimated 1,500 miles before being consumed.[20]

Sustainable Farming and Fossil Fuel Savings

The most obvious way that small, sustainable farms help reduce the nation's dependence on fossil fuels is by selling their products locally. The less food has to travel, the less fuel is needed to transport it. But sustainable farming practices also have the potential to reduce fossil fuel dependence by eliminating wasteful production practices. The USDA estimates that making all our farmland's irrigation systems just ten percent more efficient would annually save 80 million gallons of diesel gasoline spent on pumping and applying the water.[21] Similarly, reducing repetitive fertilizer application on the 250 million acres of major cropland in the U.S. would save approximately one billion dollars worth of petroleum-based fertilizers and pesticides (not to mention prevent soil and water pollution).[22] These kinds of dramatic reductions in resource consumption can be achieved through management-intensive, sustainable farming practices.

Exercising proper soil conservation techniques can also help reduce fossil fuel usage. For example, the USDA estimates that no-till farming can save about 3.9 gallons of diesel fuel per acre of land.[23] As the name suggests, no-till farming means eliminating (or in some cases reducing) the tilling of soil, which decreases the use of diesel-powered heavy equipment.

No-till can even reverse some of the damage caused by fossil fuel use. Plants absorb carbon from the air and bring it down into the soil, but when farmers till, they release the carbon back up into the air. By not tilling, that carbon stays underground. USDA scientists estimate that if proper soil conservation techniques were used, U.S. cropland could store between twelve and fourteen percent of the nation's annual carbon emissions.[24] As pollution from fossil fuels and other sources continues to grow, environmentally friendly practices such as no-till farming are more necessary than ever.

In 2001 the US imported:

68.2% of our fish and shellfish
27.3 percent of confectionary products
21.4 percent of fruits, juices, and nuts
15.5 percent of vegetable oils
9.3 percent of red meat.[26]

Sustainable farms also take advantage of animal power to fuel their operations. When animals graze, they feed themselves and spread their own manure. This eliminates the need to truck feed to the animals and then truck their manure out to fields where it is sprayed. Thus the practice of grazing animals on pasture also decreases the amount of fuel used to produce our food.

What You Can Do

• **Cut back on meat.** As much as Americans love to eat it, meat is the least fuel-efficient food we have. Large quantities of energy are required to cultivate, harvest, and ship animal feed, house, transport and slaughter animals, process and package their meat, and refrigerate it until it's cooked. Visit Meatless Monday at www.meatlessmonday.com.

• **Buy foods grown locally.** The equation is simple: the closer the farm is to you, the less fuel is needed to transport its food to your table. You can find local foods through our Eat Well Guide (www.eatwellguide.org) by visiting a local farmers market, or by joining a food co-op or Community Supported Agriculture (CSA) group. And while you're at it, ask your grocery store to supply locally grown produce.

• **Want to have lettuce that's truly local?** Plant a garden and grow your own fresh produce!

• **Avoid purchasing processed foods.** These foods take more energy to produce (and have less nutritional value than whole foods). In addition, choose foods with minimal packaging. This reduces the energy used to produce the packaging and eliminates these materials from the waste stream.

Did You Know?

• **Nitrogen-based fertilizers contribute directly to global warming:** Making and transporting one kilogram of nitrogen in a fertilizer releases 3.7 kg of carbon dioxide into the atmosphere.[25]

• **As bountiful as our nation's agriculture is, we are hardly self-sufficient.** To supply the American diet, in 2001 we imported 68.2 percent of our fish and shellfish, 27.3 percent of confectionary products, 21.4 percent of fruits, juices, and nuts, 15.5 percent of vegetable oils, and 9.3 percent of red meat.[26]

For More Information

• Check out the Eat Local, Buy Local, Be Local section of Sustainable Table at www.sustainabletable.org/issues/eatlocal.

• Visit GRACE's Network for New Energy Choices site at www.newenergychoices.org.

• Visit the Clean Air and Energy website created by the National Resource Defense Council (NRDC) at www.nrdc.org/air/energy/default.asp.

Sources

1. U.S. Department of Energy. "Fossil Fuels," (accessed August 29, 2006).
2. Ibid: 3-4.
3. The Union of Concerned Scientists. *The Hidden Cost of Fossil Fuels*, August 10, 2005 (accessed September 7, 2006).
4. Ibid.
5. U.S. Environmental Protection Agency. *Latest Findings on National Air Quality*, September, 2002 (accessed October 2, 2006).
6. Clayton, Mark, " Can Hybrids Save US from Foreign Oil?" Christian Science Monitor, May 19, 2005
7. U.S. Department of Energy. "Fossil Fuels," (accessed August 29, 2006).
8. Heller, Martin C., and Gregory A. Keoleian. *Life Cycle-Based Sustainability Indicators for Assessment of the U.S. Food System*. Ann Arbor, MI: Center for Sustainable Systems, University of Michigan, 2000: 42.
9. Horrigan, Leo, Robert S. Lawrence, and Polly Walker. "How Sustainable Agriculture Can Address the Environmental and Human Health Harms of Industrial Agriculture." *Environmental Health Perspectives* 110, no. 5 (May 5, 2002) (accessed August 29, 2006).
10. Heller, Martin C., and Gregory A. Keoleian. Life Cycle-Based Sustainability Indicators for Assessment of the U.S. Food System. Ann Arbor, MI: Center for Sustainable Systems, University of Michigan, 2000: 42.
11. Ibid:40.
12. Manning, Richard. "The Oil We Eat: Following the Food Chain Back to Iraq." *Harper's*, July 23, 2004.
13. Heeter, Chad, "The Oil in Your Oatmeal: A Lot of Fossil Fuel Goes into Producing, Packaging and Shipping Our Breakfast," *San Francisco Chronicle*, March 26, 2006.
14. Clancy, Kate. *Greener Pastures: How Grass-fed Beef and Milk Contribute to Healthy Eating*. Cambridge (MA): Union of Concerned Scientists, 2006: 13.
15. Murray, Danielle. *Oil and Food: A Rising Security Challenge*, May 9, 2005 (accessed September 1, 2006).
16. Ibid.
17. Pimentel, David, and Marcia Pimentel. *Energy use in food processing for nutrition and development* (accessed September 1, 2006).
18. Heller, Martin C., and Gregory A. Keoleian. *Life Cycle-Based Sustainability Indicators for Assessment of the U.S. Food System*. Ann Arbor, MI: Center for Sustainable Systems, University of Michigan, 2000: 40.
19. U.S. Department of Agriculture Economic Research Service. *Foreign Agricultural Trade of the United States (FATUS): Monthly Summary*, July 12, 2006 (accessed August 29, 2006).
20. Heller, Martin C., and Gregory A. Keoleian. Life Cycle-Based Sustainability Indicators for Assessment of the U.S. Food System. Ann Arbor, MI: Center for Sustainable Systems, University of Michigan, 2000: 40.
21. U.S. Department of Agriculture Natural Resources Conservation Service. "Energy Management," Conservation Resource Brief, February 2006: 5.
22. Ibid, p.5.
23. Ibid, p.6.
24. Comis, Don, Hank Becker, and Kathryn Barry Stelljes. "Depositing Carbon in the Bank: The Soil Bank, That Is," *Agricultural Research Magazine* 49 (no. 2), February 2001: 3.
25. Soil Conservation Council of Canada . "Global Warming and Agriculture: Fossil Fuel" Factsheet volume 1, #3. January 2001.
26. Jerardo, Andy. "Import Share of U.S. Food Consumption Stable At 11 percent," Electronic Outlook Report from the U.S. Department of Agriculture Economic Research Service, FAU-79-01, July 2003: 2, 5-6.