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Our oil-laden food chain

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I alluded to this in my previous post, but I want to reiterate that it takes a lot of fossil fuel to produce the food that we eat every day. When I stop to think about this, I get this image of gasoline being poured on my food. Pictured that way, the idea that we use a lot of oil on food is easy to dismiss, but the truth is that there are myriad ways that oil makes it into the food chain. And this is something we must be aware of, since once there are oil shortages, it's not just going to be lines at the pump--there might also be lines at the grocery stores.

I don't claim to be an expert on the food production system from planting to delivery at the Safeway, but I think it's worth highlighting just a few of the areas where oil is crucial to give you a picture.

Just to get started, according to this estimate, the food production system uses 17% of all of the fossil fuel consumed in the US.

1. Fertilizer

We didn't always grow food the way that big agribusiness companies grow it now. In fact, it wasn't until the 1950's, when the Green Revolution came about, that we used anything much more than cow manure and sunlight to grow crops. The Green Revolution led to several new techniques in agriculture, including massive irrigation, the use of heavy machinery like harvesters, widespread introduction of pesticides, and chemical fertilizers. It's the latter that really revolutionized the yield of crops per capita, but it also seriously increased our dependence on fossil fuel. Fossil fuels like oil and natural gas are combined with nitrogen to produce ammonia, which is the major component necessary in fertilizer.

So, how much fertilizer do we use in a year? According to this site, from June 2001 to June 2002, the US used 12,009,300 short tons of nitrogen fertilizer. In order to produce one kg of fertilizer, it takes the energy equivalent of 1.4 liters of diesel fuel. Using this as a conversion factor, we see that in that time period, 96.2 million barrels of oil were necessary just for fertilizer. Let's put this against another landmark. This website estimates that there are about 7 billion barrels of oil in ANWR. (This is a pretty moderate estimate, given the USGS's (probably inflated) estimate of 10.4 billion barrels.) In any case, this would give us 73 years worth of fertilizer, if only we could use all of ANWR for just fertilizer. In fact, it's really more like 3.65 years (since fertilizer accounts for about 31% of the oil used in food production, not including packaging and transport).

2. Cattle feed

70-80% of the grain produced in the US goes to cattle feed. This site claims that "it now takes the equivalent of a gallon of gasoline to produce a pound of grainfed beef in the United States. The annual beef consumption of an average American family of four requires more than 260 gallons of fuel." Another estimate claims that 35 calories of fossil fuel are required to produce one calorie of

beef, and 68 calories for pork.

Keep in mind that "a given quantity of grain eaten directly will feed 5 times as many people as it will if it is first fed to livestock and then is eaten indirectly by humans in the form of livestock products...." (M.E. Ensminger).

Here are even more numbers. By switching from a meat-based diet to a vegetarian diet, each person could reduce energy consumption by at least 25% annually. (Unfortunately, I don't know if these numbers include packaging and transportation in the energy consumption calculation.)

- Average US meat diet = 1.1 gallons of oil/day = 401 gallons/year
- Lacto-ovo vegetarian = .83 gallons of oil/day = 303 gallons/year (25% reduction over meat diet)
- Vegan vegetarian = .60 gallons of oil/day = 219 gallons/year (45% drop over meat diet)

At the very least, we should consider switching to an all-organic diet, but vegetarians consume even less fossil fuels per year.

3. Processing and Transport

I'm not going to discuss packaging in detail, but there are a few numbers that are pretty surprising (see also Horrigan et al. for even higher estimates).

- Processing 1lb of frozen fruits or vegetables: 825 (food) calories, plus 559 calories for packaging, plus energy for refrigeration during transport, at the store, and in homes.
- Processing a 1lb can of fruits or vegetables: 261 calories, plus 1006 calories for packaging.
- Processing breakfast cereals: about 7000 calories per pound, when a 1lb box of cereal only contains ~2000 consumable calories.

Transport is, in a sense, a two-fold problem. First, 34% of the energy dedicated to agricultural production is used for the diesel and gasoline that farm vehicles use. Perhaps more importantly, though, it has been estimated that some fruits and vegetables travel 1200-1500 miles from farm to store. Most of our food is trucked, even though trucking is 10x less efficient than transport by rail or barge. Norman Church says that 127 calories of aviation fuel are needed to transport 1 calorie of lettuce from the US to the UK--similar numbers are given for the transport of asparagus and carrots. (See also Prof Goose's earlier post.) Even worse, the UK imports 75% of its organic produce, thereby nearly negating the benefits gained from organic farming methods which don't use chemical fertilizers and pesticides.

So, what should we do? Well, this post is already getting long, so it's a good thing that I've already laid out some of the answers in my previous post. Eat organic, become vegetarian if you dare, buy foods that have as little packaging as you can find. Don't eat as much processed food (i.e. eat lower on the food chain)--learn to love your kitchen. If you have to pick something up for dinner, get it from a salad bar or a cash-and-carry place, and bring your own containers! Buy from bulk bins. Even one or two of these things will put you on a path toward conservation, which will hopefully play a large role in flattening out the peak.

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