Like Driving a Cadillac[*]

FRANCES MOORE LAPPÉ

A few months ago a Brazilian friend, Mauro, passed through town. As he sat down to eat at a friend's house, his friend lifted a sizzling piece of prime beef off the stove. "You're eating that today," Mauro remarked, "but you won't be in ten years. Would you drive a Cadillac? Ten years from now you'll realize that eating that chunk of meat is as crazy as driving a Cadillac."

Mauro is right: a grain-fed-meat-centered diet *is* like driving a Cadillac. Yet many Americans who have reluctantly given up their gas-guzzling cars would never think of questioning the resource costs of their grain-fed-meat diet. So let me try to give you some sense of the enormity of the resources flowing into livestock production in the United States. The consequences of a grain-fed-meat diet may be as severe as those of a nation of Cadillac drivers. A detailed 1978 study sponsored by the Departments of Interior and Commerce produced startling figures showing that *the value of raw materials consumed to produce food from livestock is greater than the value of all oil, gas, and coal consumed in this country.*[1] Expressed another way, one-third of the value of *all* raw materials consumed for all purposes in the United States is consumed in livestock foods.[2] How can this be?

The Protein Factory in Reverse

Excluding exports, about one-half of our harvested acreage goes to feed livestock. Over the last forty years the amount of grain, soybeans, and special feeds going to American livestock has doubled. Now supposing 200 million tons, it is equal in volume to all the grain that is now imported throughout the world.[3] Today our livestock consume ten times the grain that we Americans eat directly[4] and they outweigh the human population of our country four to one.[5]

These staggering estimates reflect the revolution that has taken place in meat and poultry production and consumption since about 1950.

First, beef. Because cattle are ruminants, they don't need to consume protein sources like grain or soybeans to produce protein for us. Ruminants have the simplest nutritional requirements of any animal because of the unique fermentation "vat" in front of their true stomach. This vat, the rumen, is a protein factory. With the help of billions of bacteria and protozoa, the rumen produces microbial protein, which then passes on to the true stomach, where it is treated just like any other protein. Not only does the rumen enable the ruminant to thrive without dietary protein, B vitamins, or essential fatty acids, it also enables the animal to digest large quantities of fibrous foodstuffs inedible by humans.[6]

The ruminant can recycle a wide variety of waste products into high-protein foods. Successful animal feeds have come from orange juice squeeze remainders in Florida, cocoa residue in Ghana, coffee processing residue in Britain, and bananas (too ripe to export) in the Caribbean. Ruminants will thrive on single-celled protein, such as bacteria or yeast produced in special

---

[*] Excerpted from *Diet for a Small Planet*. New York, Ballantine Books, 1982, pp. 66-69, 71, 76, 78-79, 84, 462-465, 468.

[1] *Raw Materials in the United States Economy 1900-1977;* Technical paper 47, prepared under contract by Vivian Eberle Spencer, U.S. Department of Commerce, U.S. Department of Interior Bureau of Mines, p. 3.

[2] Ibid. Table 2, p. 86.

[3] U.S. Department of Agriculture, *Livestock Production Units, 1910-1961,* Statistical Bulletin No. 325, p. 18, *and Agricultural Statistics, 1980,* p. 56. Current world imports from *FAO at Work,* newsletter of the liaison office for North America of the Food and Agricultural Organization of the United Nations, May 1981.

[4] David Pimentel et al., "The Potential for Grass-Fed Livestock: Resource Constraints," *Science,* February 22, 1980, volume 207, pp. 843 ff.

[5] David Pimentel, "Energy and Land Constraints in Food Protein Production," *Science,* November 21, 1975, pp. 754 ff.

[6] Robert R. Oltjen, "Tommorrow's Diets for Beef Cattle," *The Science Teacher,* vol. 38, no. 3, March 1970.

factories, and they can utilize some of the cellulose in waste products such as wood pulp, newsprint, and bark. In Marin County, near my home in San Francisco, ranchers are feeding apple pulp and cottonseed to their cattle. Such is the "hidden talent" of livestock.

Because of this "hidden talent," cattle have been prized for millennia as a means of transforming grazing land unsuited for cropping into a source of highly usable protein, meat. But in the last 40 years we in the United States have turned that equation on its head. Instead of just protein factories, we have turned cattle into protein disposal systems, too.

Yes, our cattle still graze. In fact, from one-third to one-half of the continental land mass is used for grazing. But since the 1940s we have developed a system of feeding grain to cattle that is unique in human history. Instead of going from pasture to slaughter, most cattle in the United States now first pass through feedlots where they are each fed over 2,500 pounds of grain and soybean products (about 22 pounds a day) plus hormones and antibiotics.[7]

Before 1950 relatively few cattle were fed grain before slaughter,[8] but by the early 1970s about three-quarters were grain-fed.[9] During this time, the number of cattle more than doubled. And we now feed one-third more grain to produce each pound of beef than we did in the early 1960s.[10] With grain cheap, more animals have been fed to heavier weights, at which it takes increasingly more grain to put on each additional pound.

In addition to cattle, poultry have also become a big consumer of our harvested crops. Poultry can't eat grass. Unlike cows, they need a source of protein. But it doesn't have to be grain. Although prepared feed played an important role in the past, chickens also scratched the barnyard for seeds, worms, and bits of organic matter. They also got scraps from the kitchen. But after 1950, when poultry moved from the barnyard into huge factorylike compounds, production leaped more than threefold, and the volume of grain fed to poultry climbed almost as much.

Hogs, too, are big grain consumers in the United States, taking almost a third of the total fed to livestock. Many countries, however, raise hogs exclusively on waste products and on plants which humans don't eat. When Nobel Prize winner Norman Borlaug heard that China had 250 million pigs, about four times the number here, he could hardly believe it. What could they possibly eat? He went to China and saw "pretty scrawny pigs." Their growth was slow, but by the time they reached maturity they were decent-looking hogs, he admitted in awe. And all on cotton leaves, corn stalks, rice husks, water hyacinths, and peanut shells.[11] In the United States, hogs are now fed about as much grain as is fed to cattle.

All told, each grain-consuming animal "unit" (as the Department of Agriculture calls our livestock) eats almost two and a half tons of grain, soy, and other feeds each year.[12]

What Do We Get Back?

For every 16 pounds of grain and soy fed to beef cattle in the United States we only get 1 pound back in meat on our plates.[13] The other 15 pounds are inaccessible to us, either used by

---

[7] The amount varies depending on the price of grain, but 2,200 to 2,500 pounds is typical. See note 13 for more detailed explanation of grain feeding.
[8] U.S. Department of Agriculture, Economic Research Service, *Cattle Feeding in the United States,* Agricultural Economics, Report No. 186, 1970, p. 5.
[9] Ibid. p. iv.
[10] U.S. Department of Agriculture, *Agricultural Statistics, 1979 and 1980,* Tables 76 and 77.
[11] Norman Borlaug in conversation with Frances Moore Lappe, April 1974.
[12] U.S. Department of Agriculture, *Agricultural Statistics, 1980,* Table 76.
[13] How many pounds of grain and soy are consumed by the American steer to get 1 pound of edible meat?
(a) The total forage (hay, silage, grass) consumed: 12,000 pounds (10,000 pre-feedlot and 2,000 in feedlot). The total grain- and soy-type concentrate consumed: about 2,850 pounds (300 pounds grain and 50 pounds soy before feedlot,

the animal to produce energy or to make some part of its own body that we do not eat (like hair or bones) or excreted.

To give you some basis of comparison, 16 pounds of grain has twenty-one times more calories and eight times more protein—but only three times more fat—than a pound of hamburger.

Livestock other than cattle are markedly more efficient in converting grain to meat[…]; hogs consume 6, turkeys 4, and chickens 3 pounds of grain and soy to produce 1 pound of meat.[14] Milk production is even more efficient, with less than 1 pound of grain fed for every pint of milk produced. (This is partly because we don't have to grow a new cow every time we milk one.)

Now let us put these two factors together: the large quantities of humanly edible plants fed to animals and their inefficient conversion into meat for us to eat. Some very startling statistics result. If we exclude dairy cows, the average ratio of all U.S. livestock is 7 pounds of grain and soy fed to produce 1 pound of edible food.[15] Thus, of the 145 million tons of grain and soy fed to our beef cattle, poultry, and hogs in 1979, only 21 million tons were returned to us in meat, poultry and eggs. *The rest, about 124 million tons of grain and soybeans, became inaccessible to human consumption.* (We also feed considerable quantities of wheat germ, milk products, and fish-meal to livestock, but here I am including only grain and soybeans.) To put this enormous quantity in some perspective, consider that 120 million tons is worth over $20 billion. If cooked, it is the equivalent of 1 cup of grain for every single human being on earth every day for a year[…].[16]

Enough Water to Float a Destroyer

"We are in a crisis over our water that is every bit as important and deep as our energy crisis," says Fred Powledge, who has just written the first in-depth book on our national water crisis.[17]

---

plus 2,200 pounds grain and 300 pounds soy in feedlot). Therefore, the actual percent of total feed units from grain and soy is about 25 percent.

(b) But experts estimate that the grain and soy contribute more to weight gain (and, therefore, to ultimate meat produced) than their actual proportion in the diet. They estimate that grain and soy contribute (instead of 25 percent) about 40 percent of weight put on over the life of the steer.

(c) To estimate what percent of edible meat is due to the grain and soy consumed, multiply that 40 percent (weight gain due to grain and soy) times the edible meat produced at slaughter, or 432 pounds: .4 x 432 = 172.8 pounds of edible portion contributed by grain and soy. (Those who state a 7:1 ratio use the entire 432 pounds edible meat in their computation.)

(d) To determine how many pounds of grain and soy it took to get this 172.8 pounds of edible meat, divide total grain and soy consumed, 2850 pounds, by 172.8 pounds of edible meat: 2850 divided by 172.8 = 16-17 pounds. (I have taken the lower figure, since the amount of grain being fed may be going down a small amount.) These estimates are based on several consultations with the USDA Economic Research Service and the USDA Agricultural Research Service, Northeastern Division, plus current newspaper reports of actual grain and soy currently being fed.

[14] U.S. Department of Agriculture, Economic Research Service and Agriculture Research Service, Northeastern Division, consultations with staff economists.

[15] In 1975 I calculated this average ratio and the return to us in meat from *Livestock-Feed Relationships,* National and State Statistical Bulletin #530, June 1974, pp. 175-77. In 1980 I approached it differently and came out with the same answer. I took the total grain and soy fed to livestock (excluding dairy) from *Agricultural Statistics, 1980.* The total was about 145 million tons in 1979. I then took the meat and poultry and eggs consumed that year from *Food Consumption, Prices, and Expenditures,* USDA-ESS, Statistical Bulletin 656. (I excluded only the portion of total beef consumed that was put on by grain feeding, about 40 percent, and reduced the total poultry consumed to its edible portion; i.e., minus bones.) The total consumption was about 183.5 pounds per person or 20 million tons for the whole country. I then divided the 145 million tons of grain and soy fed by the 20 million tons of meat, poultry, and eggs produced by this feeding and came up with the ratio of 7 to 1. (Imports of meat are not large enough to affect this calculation appreciably.)

[16] Calculated as follows: 124 million tons of grain "lost" annually in the United States x 2,000 pounds of grain in a ton = 248 billion pounds "lost" divided by 4.4 billion people = 56 pounds per capita divided by 365 days equals .153 pound per capita per day x 16 ounces in a pound—2.5 ounces per capita per day—1/3 cup of dry grain, or 1 cup cooked volume.

[17] *Water: The Nature, Uses and Future of Our Most Precious and Abused Resource* (New York: Farrar, Straus & Giroux, 1981).

According to food geographer Georg Borgstrom, to produce a 1-pound steak requires 2,500 gallons of water![18] The average U.S. diet requires 4,200 gallons of water a day for each person, and of this he estimates animal products account for over 80 percent.[19]

"The water that goes into a 1,000-pound steer would float a destroyer," *Newsweek* recently reported.[20] When I sat down with my calculator, I realized that the water used to produce just 10 pounds of steak equals the household consumption of my family for the entire year[…].

Mining Our Water

Irrigation to grow food for livestock, including hay, corn, sorghum, and pasture, uses 50 out of every 100 gallons of water "consumed" in the United States. (Some of this production is exported, but not the major share, since close to half of the irrigated land used for livestock is for pasture and hay.[21]) Other farm uses—daily irrigation for food crops—add another 35 gallons, so agriculture's total use of water equals 85 out of every 100 gallons consumed. (Water is "consumed" when it doesn't return to our rivers and streams.)

Over the past fifteen years grain-fed-beef production has been shifting from the rain-fed Corn Belt to newly irrigated acres in the Great Plains. Just four Great Plains states, Nebraska, Kansas Oklahoma, and Texas, have accounted for over three-fourths of the new irrigation since 1964, and most of that irrigation has been used to grow more feed. Today half of the grain-fed beef in the United States is produced in states that depend for irrigation on an enormous underground lake called the Ogallala Aquifer.[22] But most of this irrigation just can't last. Rainwater seeps into this underground lake *so* slowly in some areas that scientists consider parts of the aquifer a virtually non-renewable resource, much like oil deposits. With all the new irrigation, farmers now withdraw more water each year from the Ogallala Aquifer than the entire annual flow of the Colorado River. Pumping water at this rate is causing water tables to drop six inches a year in some areas, six feet a year in others. And lower water tables mean higher and higher costs to pump water. The Department of Agriculture predicts that in 40 years the number of irrigated acres in the Great Plains will have shrunk by 30 percent.[23] In only two decades Texans have used up one-quarter of their groundwater.[24] Already some wells in northern Texas are running dry, and with rising fuel costs, farmers are unable to afford pumping from deeper wells. Why is this water being mined in Texas? Mostly to grow sorghum for the feedlots which have sprung up in the last decade.

When most of us think of California's irrigated acres, we visualize lush fields, growing tomatoes, artichokes, strawberries, and grapes. But in California, the biggest user of underground water, more irrigation water is used for feed crops and pasture than for all these

---

[18] Georg Borgstrom, Michigan State University, presentation to the Annual Meeting of the American Association for the Advancement of Science (AAAS), 1981.
[19] Ibid.
[20] "The Browning of America," *Newsweek,* February 22, 1981, pp. 26ff.
[21] To arrive at an estimate of 50 percent, I used *Soil Degradation: Effects on Agricultural Productivity,* Interim Report Number Four of the National Agricultural Lands Study, 1980, which estimates that 81 percent of all water consumed in the United States is for irrigation. And I used the *Fact Book of U.S. Agriculture,* U.S. Department of Agriculture, Misc. Publication No. 1065, November 1979, Table 3, which shows that about 64 percent of irrigated land is used for feed crops, hay, and pasture. Sixty-four percent of 81 percent is 52 percent.
[22] Philip M. Raup, "Competition for Land and the Future of American Agriculture," in *The Future of American Agriculture as a Strategic Resource,* edited by Sandra S. Batie and Robert G. Healy, A Conservation Foundation Conference, July 14, 1980, Washington, D.C., pp. 36-43. Also see William Franklin Lagrone, "The Great Plains," in *Another Revolution in U.S. Farming?,* Lyle Schertz and others, U.S. Department of Agriculture, ESCS, Agricultural Economic Report No. 441, December 1979, pp. 335-61. The estimate of grain-fed beefs dependence on the Ogallala is from a telephone interview with resource economist Joe Harris of the consulting firm Camp, Dresser, McKee (Austin, Texas), part of a four-year government-sponsored study: "The Six State High Plains Ogallala Aquifer Agricultural Regional Resource Study," May 1980.
[23] William Franklin Lagrone, "The Great Plains," op. cit, pp. 356ff.
[24] "Report: Nebraska's Water Wealth is Deceptive," *Omaha World-Herald,* May 28, 1981.

specialty crops combined. In fact, 42 percent of California's irrigation goes to produce livestock.[25] Not only are water tables dropping, but in some parts of California the earth itself is sinking as groundwater is drawn out. According to a 1980 government survey, 5,000 square miles of the rich San Joaquin valley have already sunk, in some areas as much as 29 feet.[26]

The fact that water is free encourages this mammoth waste. Whoever has the $450 an acre needed to level the land and install pumping equipment can take groundwater for nothing. The replacement cost—the cost of an equal amount of water when present wells have run dry—is not taken into consideration. This no-price, no-plan policy leads to the rapid depletion of our resources, bringing the day closer when alternatives must be found—but at the same time postponing any search for alternatives.

Ironically, our tax laws actually entice farmers to mine groundwater. In Texas, Kansas, and New Mexico, landowners get a depletion allowance on the groundwater to compensate for the fact that their pumping costs rise as their groundwater mining lowers the water table. Moreover, the costs of buying the equipment and sinking the well are tax-deductible. Irrigation increases the value of the land enormously, but when the land is sold the profits from the sale are taxed according to the capital gains provisions; that is, only 40 percent of the difference between the original cost of the farm and its sale price is taxed as ordinary income. The rest is not taxed at all.

Few of us—and certainly not those whose wealth depends on the mining of nonrenewable resources—can face the fact that soon we will suffer for this waste of water. Donald Worster, author of *Dust Bowl: The Southern Plains in the 193ffs* (New York: Oxford University Press, 1979), interviewed a landowner in Haskell County, Kansas, where $27.4 million in corn for feed is produced on about 100,000 acres of land irrigated with groundwater. He asked one of the groundwater-made millionaires, "What happens when the irrigation water runs out?"

"I don't think that in our time it can," the woman replied. "And if it does, we'll get more from someplace else. The Lord never intended us to do without water."[27]

Livestock Pollution

Some people believe that although we feed enormous quantities of high-grade plant food to livestock with relatively little return to us as food, there is really no loss. After all, we live in a closed system, don't we? Animal waste returns to the soil, providing nutrients for the crops that the animals themselves will eventually eat, thus completing a natural ecological cycle.

Unfortunately, it doesn't work that way anymore. Most manure is not returned to the land. Animal waste in the United States amounts to 2 billion annually, equivalent to the waste of almost half of the world's human population.[28] Much of the nitrogen-containing waste from livestock is converted into ammonia and into nitrates, which leach into the groundwater beneath the soil or run directly into surface water, thus contributing to high nitrate levels in the rural wells which tap the groundwater. In streams and lakes, high levels of waste runoff contribute to oxygen depletion and algae overgrowth.[29] American livestock contribute five times more harmful organic waste to water pollution than do people, and twice that of

---

[25] Giannini Foundation of Agricultural Economics, *Trends in California Livestock and Poultry Production, Consumption, and Feed Use: 1961-1978,* Information Series 80-5, Division of Agricultural Sciences, University of California Bulletin 1899, November 1980, pp. 30-33.
[26] General Accounting Office, *Groundwater Overdrafting Must Be Controlled,* Report to the Congress of the United States by the Comptroller General, CED 80-96, September 12, 1980, p. 3.
[27] Donald Worster, *Dust Bowl: The Southern Plains in the 193ffs* (New York: Oxford University Press, 1979), p. 236.
[28] Environmental Science and Technology, vol. 4, no. 12, 1970, p. 1098.
[29] Barry Commoner, *The Closing Circle* (Knopf, 1971), p. 148.

industry, estimates food geographer Georg Borgstrom.[30]

A Fatal Blindness

[O]ur [meat] production system is ultimately self-destructive because it is self-deceptive; it can't incorporate the many costs I've outlined here. It can't look to the future. And it blinds those closest to it from even seeing what is happening. Thus, the task of opening our eyes lies more heavily with the rest of us—those less committed to protecting the status quo. *As* awakening stewards of this small planet, we have a lot to learn—and fast.

[30] Georg Borgstrom, *The Food and People Dilemma* (Duxberg Press, 1973), p. 103.