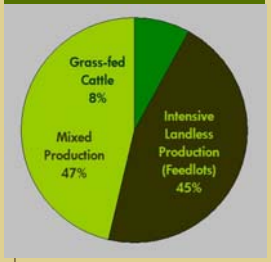
Catastrophic Cattle

Livestock's Contribution to Climate Change and Environmental Devastation

Jamie Marie Wagner, Honors 295: Population, Environment, and Sustainability—Ethics for Living into the Future. Denison University, Fall 2007. References can be obtained by contacting the author: wagner_jm@denison.edu

Global Beef Sources



World's Surface Area Dedicated to Beef Cattle: 26%

World's Surface Area Dedicated to Feedcrop Production: 4%

World's Arable Land Dedicated to Feedcrop Production: 33%

Global Grain Fed to Livestock: 37%

U.S. Grain Fed to Livestock: 66%

Feedcrop Production

The practice of adding grain as a significant portion of livestock feed emerged in the United States in the 1950s, where the development of efficient synthetic, soluble fertilizers and new farm machinery encouraged unprecedented volumes of harvested corn. As a result of federal subsidies, low fuel prices, and resulting corn surpluses, the price of one bushel of corn (currently about $2.25 in) is actually 50 cents less than the cost of producing it. The large volumes and high caloric content of grain used as animal feed have inspired the pervasive development of feedlots with capacities in excess of one hundred thousand head, not only in North America, but Europe, the former Soviet Union, Japan, East Asia, and Latin America.

However, because a significant amount of energy is lost as livestock convert grain into the meat we consume, a food supply based on grain fed animals is a great deal more resource-intensive than the direct consumption of grain. In fact, land planted in cereal grain produces 2-10 times more protein for human consumption than land devoted to feedcrops. For legumes, this ratio is anywhere from 10:1 to 20:1.

In the United States, farms that were producing 20 bushels of corn in 1920 are now compelled to average about 134 bushels per acre, an increase of almost 350%. This intensive monoculture of grain to supply feedlots leads to a number of exacerbating environmental affects, including **soil erosion, biodiversity loss, the promotion of pesticide resistance in insects, and water pollution from herbicides, pesticides, and chemical fertilizers.**

Water and Pollution

The process of beef production requires an enormous amount of water, as much as 100 times that required to produce equivalent amounts of protein energy from grains. Additionally, a startling amount of water pollution results from the **seepage of animal waste, hormones, pathogens, and antibiotics from feedlots** and the runoff of nitrogen and other chemicals from feedcrop fertilizer and pesticides.

US nitrogen water pollution attributed to animal manure: 37%

US phosphorous water pollution attributed to animal manure: 65%

Waste and Manure

Although American livestock confinement operations generate approximately 128 billion pounds of manure each year and large grain farms require an enormous amount of fertilizer to keep up with demand for animal feed, the manure produced by feedlot cattle is treated as a waste rather than a valuable source of fertilizer. Loosely stored in manmade open-pit "lagoons" on industrial farms, liquid manure in enormous volumes runs off into ground and surface water systems, contaminating both water and soil with bacteria and excess nutrients like nitrogen and phosphorous, as well as the heavy metals such as arsenic, copper, selenium, and zinc routinely added to animal feed to promote growth. The resulting disruption of aquatic ecosystems is often deadly for fish and shellfish populations.

Percentage of antibiotics produced in the United States used in livestock production: 40-70%

Pesticides

Intensified monoculture of feedcrops diminishes biodiversity, decreasing bird and beneficial insect populations. As a result, crops are more vulnerable to pests, and the necessity for herbicide, insecticide, and fungicide application is overwhelmingly increased. It is estimated that about 0.1% of applied pesticides reach their target pests. Not only can runoff from these chemicals contaminate ground and surface water, but pest populations are often adversely augmented by the application of pesticide, since they have a tendency to recover faster than the predators that normally keep them under control. Similarly, many parasitacides administered to feedlot cattle are not biodegradable and may be transferred via manure to the pasture environment, killing dung beetles and other advantageous insects.

Antibiotics

Because ruminants are naturally disposed to eat grass and not grain, the digestive disruption of livestock raised on a corn diet necessitates the pervasive administration of antibiotics to avoid illness and infection. While the natural living conditions of pastures decrease animal stress and remove unnecessary burdens on the immune system, the close quarters and poor waste management of intensive feedlots require even more medication to prevent the spread of disease. Still, about 80% of the 13-20 million pounds of antibiotics administered to livestock in America every year is intended solely to promote growth.

Because 80% of the orally-administered antibiotics are excreted from an animal's body unchanged, much of these medications pass into bacteria-ridden waste lagoons, which increases opportunities for bacteria to develop resistance to antibiotics, including those used to treat tuberculosis, pneumonia, staph infections and other infectious diseases. When animal manure is applied as fertilizer to agricultural land, antibiotics and drug-resistant bacteria is afforded access to human food crops and may easily contaminate ground and surface waters.

Total nitrogen consumption in the United States attributed to chemical fertilizer for animal feed and pastures: 51%

Global nitrogen fertilizer consumption used in the animal food chain: 20-25%

Fertilizer

Sustainable agricultural practices allow compost, manure, and naturally deposited nutrients to replenish soil after crops are harvested. The intensive practices required by pervasive feedcrop production use chemical fertilizers to supply only the necessary nutrients for each round of crops, contributing nothing to long-term soil development and maintenance. In fact, chemical fertilizers are charged with the depletion of organic matter, the compaction of soil, and the degradation of overall soil quality.

Because crops actually absorb a low percentage of the nitrogen applied as fertilizer (about 40-60%), an exorbitant amount of runoff can occur, contaminating both drinking water and ground and surface water systems. By stimulating the growth of algae, which, upon decomposition, monopolizes the dissolved oxygen needed to support aquatic life, this nitrogen can disrupt and destroy entire marine ecosystems.

The Committee on Environmental and Natural Resources of the White House Office of Science and Technology Policy reports that 90% of the nitrogen deposited in the Gulf of Mexico is a result of fertilizer and manure runoff from Minnesota, Iowa, Illinois, Indiana, and Ohio. The resulting Dead Zone now spans about 12,000 square miles – an area the size of Massachusetts.

Steroids

About 80% of American feedlot cattle is administered testosterone, estrogen, or progestin to increase growth-rate and beefiness. Traces of many agricultural steroids have been detected in contaminated waters, and there have been common reports of fish with diminished sex characteristics as a result of hormones in feedlot runoff. For this reason, the European Union prohibits the use of steroids in livestock production and has banned the importation of meat from hormone-treated animals.

Gulf of Mexico Dead Zone
Photo: Networks for New Energy Sources

Hidden Costs of Conventional Beef Production

Organic and grass-fed beef appears to be more expensive to the conventional consumer, but this price does not reflect the hidden environmental costs of industrialized meat production. Many of these costs even fall to the American taxpayer. Intensive feedcrop cultivation requires an exorbitant amount of chemical pesticide and nitrogen fertilizer, which demand large volumes of oil and natural gas to produce. Sustainable beef-production eliminates these costs, as well as the pervasive cost of administering preventative antibiotics to feedlot cattle. Factory farms pollute soil and water, and the affect of this pollution on public health increases the medical costs of people in surrounding communities. Additionally, taxpayers fund an enormous percentage of the government subsidies that encourage overproduction of feedcrops. **In 1996, for example, the United States government spent $68.7 billion on agricultural subsidies, which translates into $259 per consumer and even more per taxpayer.**

Greenhouse Gases

Total Anthropogenic GHG Emissions attributed to Livestock Activities: 18%

Percentage of Global Anthropogenic GHG Emissions attributed to Livestock Activities:
- **Carbon Dioxide: 9%**
- **Methane: 35-40%**
- **Nitrous Oxide: 65%**
- **Ammonia: 64%**

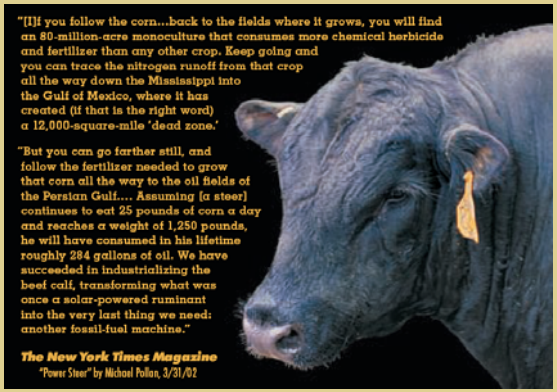
Percentage of Global Agricultural GHG Emissions attributed to Livestock Activities:
- **Methane: 80%**
- **Nitrous Oxide: 75-80%**
- **Ammonia: 68%**

A high percentage of global carbon emissions – the gas most commonly associated with anthropogenic climate change – results from the production of fertilizer, herbicides, and pesticides for feedcrops, the use of machine diesel for harvesting and transport, and the generation of electricity for irrigation pumps. Additionally, deforestation caused by expanding pasture and agricultural land prevents the necessary process of carbon sequestration. Methane and nitrous oxide are both released in the breakdown of fertilizers and livestock manure, especially when it's left to fester in waste lagoons. Although these gases are relatively rare compared with carbon dioxide, they are far more powerful in the process of global warming. **Methane gas has about 50 times the greenhouse effect as carbon dioxide, and nitrous oxide has nearly 300 times.**

Energy

Feedlot beef production in America requires an enormous amount of fossil fuel energy, most of which is burned to produce mineral fertilizer for the production of feedcrops. While the average farm in America producing crops for direct human consumption uses 3 times the fossil energy in production than the food energy produced, in feedlot beef production, this ratio is 35:1 – not including the energy used to process and transport the food.

It takes an estimated 4.8 pounds of grain, 390 gallons of water, and 0.25 gallons of gasoline to produce a pound of beef.

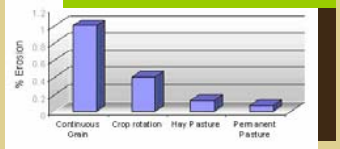


Try Vegetarian!
Vegan Outreach, 2006

Sustainable Alternatives

The process of cattle production can be rendered more sustainable through a number of successfully employed practices. The integration of animal and plant cultivation maintains a higher level of biotic diversity, decreasing the necessity for pesticides and fertilizers, and the planting of cover crops prevents soil erosion and can provide nutrients without the administration of synthetic chemicals. The intensive management of rotational grazing decreases the necessity for antibiotics and parasiticides by boosting animal immune systems through reintroduction of natural biotic symbioses.

Comparative Soil Erosion Sources



Also known as planned or controlled grazing, this process rations forage according to animal requirements and allows proper land and plant recovery time after grazing, which prevents soil erosion. Allowing manure to be deposited naturally over a large area of grassland prevents the development of waste lagoons and the resulting soil and water pollution. The enormous amount of fossil fuel energy required to produce and transport feed for conventional livestock is conserved when the animal is able to harvest food itself, and gasses and legumes found in pasture may be vital to the process of carbon sequestration. **Overall, pasture or grass-based livestock production makes use of ecological complexity to maintain production while reducing both the economically expensive inputs and the environmentally costly results of conventional feedlot production.**

Useful resources: SustainableTable.org, Michael Pollan's *The Omnivore's Dilemma* (2006), EatWild.com, ATTRA.org – The National Sustainable Agriculture Information Service