

Meat production's environmental toll

Wilderness destruction, soil erosion, energy waste, and pollution

By Stephen Leckie

The world is experiencing a population explosion of farm animals. Between 1950 and 1994, global meat production increased nearly fourfold, rising faster than the human population. During this period, production rates jumped from 18 to 35.4 kilograms per person.^{1,2} The combined weight of the world's 15 billion farm animals now surpasses the weight of the human population by over one and a half times (see table below).

Overpopulation puts pressure on the earth's resources. Each person has needs for food, water, shelter, heating/cooling and transportation. To a large extent domesticated animals have the same needs. In Canada, farm animals outweigh their human brethren by a factor of four to one, effectively making our "population" balloon from 30 million to 150 million.

On a given day there are approximately 14.6 million beef and dairy cattle, 13 million pigs, 8 million turkeys, and 96 million chickens alive in Canada.³ These multitudes strain resources due to their increasing appetite for feed crops and grazing land. Meat (excluding poultry) is the largest food industry in Canada with shipments of \$9.5 billion in 1994, and is third largest overall, being surpassed only by the motor vehicle and oil industries.⁴

A meat-based diet requires 7 times more land than a plant-based diet

The average agricultural land area in North America is 1.6 hectares per person (1.4 hectares after adjusting for the export of grain). Yet there are many countries in the world that use as little

as 0.2 hectares (half acre) of farmland per person. These are the countries with plant-based diets.

0.2 hectares is the equivalent of having 5.5 square metres of land available to produce each day's worth of food. The average yield worldwide, for cereal crops in 1994 was 2,814 kilograms per hectare, an amount equivalent to getting 1.5 kilograms (14 cups of cooked grain) per day from 0.2 hectares. For root crops the average global yield in that year would have provided 6.8 kilograms of food per day from 0.2 hectares.²

Countries with cold winter climates also have summers with long days of sunlight, ideal for producing high yields. Grains, legumes and roots can be easily stored for use during off seasons.

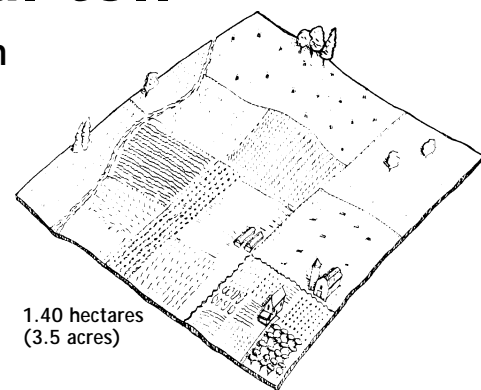
Farm animals naturally inefficient

Farm animals are inefficient converters of plants to edible flesh. In 1993, US farm animals were fed 192.7 million tonnes of feed concentrates, the bulk of it corn, in order to produce 31.2 million tonnes of carcass meat – making for a ratio of 6.2 to 1. Additional feed was also provided in the form of roughage and pasture.^{5, 2} In terms of feed utilization, broiler chickens are the most efficient requiring 3.4 kilograms of feed (expressed in equivalent feeding value of corn) to produce one kilogram of ready-to-cook meat. Pigs are the least efficient, with a feed to meat ratio of 8.4 to 1. For eggs expressed as weight, the ratio is 3.8 to 1. For cheese the ratio is 7.9 to 1.⁵

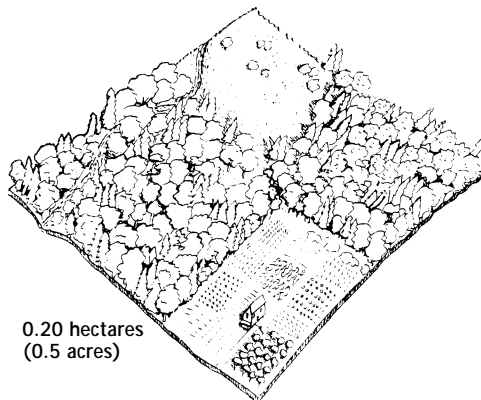
Like us, animals are naturally inefficient because much of their food is converted into energy for movement, excreted as manure, or used for the growth of body parts not eaten by people. Very little can become direct edible weight gain. For example, cattle excrete 40 kilograms of manure for every kilogram of edible beef produced.⁶

The meat industry makes an effort to utilize some of the byproducts, but because of the huge numbers of animals slaughtered, this can be a challenge. Farmers prefer to use easy-to-spread chemical fertilizers instead of trucking manure over long distances from factory-style animal farms. On hog-raising operations in the U.S., only about one sixth of manure is utilized. Excess animal waste often ends up in rivers and groundwater where it contributes to nitrogen, phosphorus and nitrate pollution.⁷

Meat that is unfit or unsuitable for human consumption is sold to the pet food industry, or processed and fed back to farm animals. Currently in Canada as much as



1.40 hectares
(3.5 acres)



0.20 hectares
(0.5 acres)

The average agricultural land area in North America is 1.4 hectares per capita after adjusting for the export of grain. With a big cut in meat production, this area could easily be reduced to 0.2 hectares, the rate in many Asian countries. This huge savings in land could be used for reestablishing wilderness.

20% of cattle feed is made up of what is termed "mammalian protein additives" and other animal waste products.⁸

Many countries are curtailing this practice in light of the rise of mad cow disease (BSE). In the U.K., the feeding of infected sheep to cattle has caused several cases of a deadly human dementia among beef consumers.

Agriculture vs wilderness

Devoting large amounts of land to feeding animals magnifies serious environmental problems associated with modern agriculture.

Each farm and pasture has a history of being a natural ecosystem of forest, wetlands or grassland. As wilderness is destroyed for agriculture, wild plants and animals are displaced – pushing many species to the brink of extinction. Twenty million hectares (50 million acres) of tropical forest in Latin America have been cut down for livestock production since 1970.⁷

Much of the prairies in central Canada have been lost to agriculture. Of the four principle ecoregions, less than 24% of mixed prairie, 30% of fescue prairie, 20% of aspen parkland and 1% of tall-grass prairie remain in a natural, undisturbed state. According to the Committee on the Status of Endangered Wildlife in Canada, the Black-footed Ferret and Prairie Swift Fox have become extirpated (extinct within a country) and 14 other prairie species are classified as endangered or threatened.⁹

Land use per person in selected countries (1994)

	Agricultural land (HA) per person	Amount as pasture	Percent of cereal crop fed to animals ^a	Farm animal to human weight ratio ^b
Bangladesh	0.08	0%	0%	0.4 to 1
India	0.20	5%	1.6%	0.65 to 1
Indonesia	0.22	27%	10%	0.5 to 1
China	0.41	80%	25%	1.1 to 1
Mexico	1.13	77%	38%	3.4 to 1
Russian Fed	1.48	40%	55%	2.1 to 1
USA	1.64	56%	69%	4.0 to 1
Canada	2.51	38%	77%	4.3 to 1
World	0.87	69%	33%	1.7 to 1

Notes: a. Cereal crop totals have been adjusted for importing and exporting. b. The animal to human weight ratio is based on a total of the live weights of farm animals alive on any given day. The fact that the average weight of a cow or pig differs in each country has been taken into account. For people, the average weight is assumed to be 60 kilograms.

Sources: FAO [footnote 2]. Conversion factors between production weights (carcass weights) and live weights are from the USDA [footnote 5].

With exports taken into account, North America uses seven times more land on a per capita basis than many countries in Asia. This discrepancy can be explained by the fact that large areas of land are used for grazing, and significant amounts of domestic grain supplies are fed to farm animals.

In dry areas, many farms depend on irrigation water that is pumped from limited aquifers (underground lakes) and dammed rivers. In Alberta most of the large rivers have been dammed for the main purpose of collecting water for irrigation. The cost of these dams are paid for with tax dollars.¹⁰

Farms tend to be treated with chemical fertilizers, herbicides and pesticides. In 1990, 64% of Canadian cropland was treated with commercial fertilizer and 55% was treated with herbicide.¹¹ Pesticides can adversely affect non-target organisms such as birds and bees.

Erosion of precious topsoil from ploughed fields and over-grazed pastures is another serious agricultural problem. A permanent cover of vegetation is required to hold soil in place; once this is weakened or removed, soil can be easily washed or blown away by wind or rain. Soil mixed with agricultural chemicals and manure runs into streams and groundwater where it can cause extensive water pollution.

Organic farming can lessen some of the problems associated with agriculture – chemical dependency, erosion and pollution. But a shift in society toward plant-based diets would ease these problems simply by reducing the need for land.

Excessive use of energy & water

Animal foods demand the lion's share of energy and water used in agriculture. According to one study, meat production requires 10 to 20 times more energy per edible tonne than grain production.⁶ Growing feed crops requires extensive energy for ploughing, harvesting, pumping irrigation water, transportation, and producing fertilizer and pesticides. Once grown, the crops are processed using additional energy. For instance, corn is heated in order to dry the grain from 29% to 15% moisture content.¹²

Furthermore, the housing of pigs and chickens in huge windowless sheds requires energy for artificial ventilation, conveyor belts and electric lighting. Slaughterhouses are also energy and water intensive.

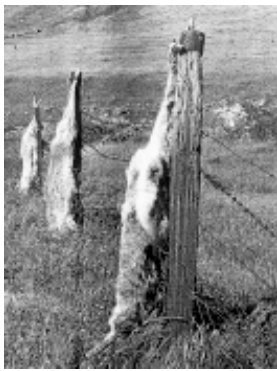
For harvesting fish, extensive energy and resources go into building, maintaining and fueling fleets of trawlers.

Finally, animal products tend to require more energy for processing, packaging, and refrigeration than plant-based foods. In contrast, many vegetables, fruit, grains and tubers require no refrigeration and little or no processing.

Livestock grazing

Roughly one fifth of the world's land area is used for grazing, twice the area used for growing crops.² Much of this land was once wild grassland supporting a diverse range of plants, birds, rodents and wild grazing animals. Forests are also cleared for grazing. Central America has seen over one-third of its forests cut since the early 1960's, while pasture land has increased by 50%.⁷

Grassland is often unsuited for cultivation, but with care it can generally be used sustainably for livestock grazing. Cattle, sheep and goats are ruminant animals that fare best on a diet of grass.



Wild animals considered a threat to livestock are often poisoned, shot or trapped.

In dryland regions, cattle can overgraze perennial grasses, allowing annual weeds and shrubs to proliferate. The new weeds lack extensive root systems to guard soil against erosion. As the former diversity of plant species is lost, wildlife also declines.⁷ According to a UN study titled "Global Assessment of Soil Degradation," about 10.5% of the world's fertile land suffers from moderate to extreme degradation. Overgrazing by livestock and current farming practices are the principle causes.¹³

Livestock displace natural grazing animals such as deer, antelope, bighorn sheep and bison. They also displace small animals and birds dependent on tall grasses for cover and nesting. Encroaching networks of fences and roads are a further impediment to wildlife.

Fish – plundering the oceans

Current seafood harvest levels are so high that they are straining marine ecosystems in many areas. Of the 200 top marine fish resources in the world in 1994, about 35% were in decline and 25% were fully exploited.¹⁴

Aquaculture (farmed fish), which accounted for 17% of the world seafood harvest in 1994,¹⁴ has so far been making up for the decline in wild fish stocks. A tightening world grain supply may curtail growth as fish production requires large inputs of feed.

The world's fishing industry is also causing harm to wildlife. Farming operations located along shorelines are made up of submerged floating cages. Disease pathogens can spread easily among the high densities of fish, and concentrated fecal wastes and drugs can contaminate adjacent waters. Fish that escape can spread disease and inbreeding to wild stocks. At least 140 distinct salmon stocks in British Columbia are already extinct.¹⁵ On the open seas, nets used to catch fish reel in a great number of non-targeted species including seabirds, turtles, seals and dolphins. Biologist Lee Alverson calculates that around 27 million tonnes of fish are wasted per year because they are the wrong kind or size. Shrimp boats that drag the bottom are the most wasteful, scooping up 10 kilograms of other marine life for every one kilogram of shrimp.¹⁶

Facing food scarcity

As the human population expands to nine billion hungry people in the coming decades, it is not hard to imagine every last forest, wetland and grassland being leveled for agriculture.

On existing farmland, methods used to increase yields are causing environmental problems. Rivers are being dammed for additional irrigation. Applications of pesticides, herbicides, and chemical fertilizers are being increased.

A shift in society toward plant-based diets would ease these problems simply by reducing

livestock populations and their demand for land and other resources. Fewer animals to feed could lead to a rebuilding of world grain reserves, ensuring dependable supplies for direct human consumption in countries facing food scarcity.

In Canada, fewer animals to feed could free up land for conversion to wilderness. Wilderness is crucial for biological diversity, wildlife habitat, preventing soil erosion, climate control, and as a store for carbon dioxide. Natural ecosystems also clean the air and water of pollutants.

Solutions

Eating low on the food chain is a powerful way to reduce the amount of land needed to support your existence (your ecological footprint). Less farmland means more wilderness. It also means less soil erosion, less dams, less pesticides, and less energy use.

Plant-based cuisine is also healthy for the body. Numerous studies show that vegetarian foods greatly help in the prevention of heart disease, cancer, and many other diet-related diseases.

As the earth's human population continues to expand, two things are critical for our survival: adequate food resources and intact wilderness areas. One sure way to achieve both is a dramatic shift in food choices, away from animal products toward plant-based foods.

Excerpted from a paper presented at the 1997 International Conference on Sustainable Urban Food Systems, held at Ryerson University.

1 Lester Brown and Hal Kane, *Full House: Reassessing the Earth's Population Carrying Capacity* (New York: Norton, 1994), pp. 31, 76-77, 85, 95

2 FAOSTAT Statistics Database," *FAO Web Page* (Food and Agriculture Organization of the United Nations (FAO), June 1997), <http://apps.fao.org/cgi-bin/nph-db.pl?subset=agriculture>

3 Statistics Canada: www.statcan.ca/english/Pgdb/Economy/primar.htm#agr. Cattle and pig inventories are from 2001. Bird populations are from 2000 and have been adjusted for lifespan. Assumptions for average lifespan: broilers 6 1/2 weeks, layers one year, turkeys 20 weeks.

4 "All About Canada's Red Meat Industry," *Agriculture and agri-food in Canada fact sheet series* (Agriculture Canada, October 1995).

5 *Agricultural Statistics 1997* (Washington, United States Department of Agriculture, 1997), Table 1-71, p. 8.

Note: Beware of inflated animal efficiency claims. For example the industry boasts that it takes only 2 kg of feed to produce 1 kg of chicken. This is for the whole weight of the animal – even though only 72% of a chicken, 56% of a cow, and 58% of a pig is ready-to-cook meat.

6 "Connections: Canadian Lifestyle Choices and the Environment," *A State of the Environment fact sheet. No 95-1* (Ottawa: Environment Canada, 1995), p. 7.

7 Alan Durning, and Holly Brough, *Taking Stock: Animal Farming and the Environment* (Washington: Worldwatch Institute, 1991), pp. 18-20, 25.

8 Stephen Strauss, "Ottawa Acts To Reduce Mad-Cow Disease Risk," *Globe and Mail* (January 23, 1997), A1, A9

9 "The Praire Grasslands," *Fact sheet* (Ottawa, Canadian Nature Federation, 1990)

10 Kevin Tighem, "Last Ditch Effort," *Nature Canada*, 20:2 (1991), pp. 40-45.

11 *Trends and Highlights of Canadian Agriculture and its People, Catalogue No. 96-303E* (Ottawa: Statistics Canada, 1991), p. 4.

12 "Agricultural Energy Research in Ontario: Part 2 Energy Efficiency and Conservation," *Highlights of Agricultural Research in Ontario*, 8:3 (1985).

13 Associated Press, "Soil Deterioration Threatens World Food Supply," *Globe and Mail* (April 3, 1992).

14 "The State Of World Fisheries And Aquaculture 1996 Summary," *FAO Web Page*, June 1997), <http://www.fao.org/waicent/foinfo/fishery/publ/sofia/sofflye.htm>

15 "Salmon Farming Industry Threatens BC's Wild Fish Stocks," *press release* (David Suzuki Foundation, www.davidsuzuki.org, Oct.24, 1996); and Catherine Stewart, "Is Fish Farming the Solution?" *Greenlink*, 4:1(1996), pp.7,10.

16 Dan Westell, "Fish Wasted on a Massive Scale," *Globe and Mail* (March 17, 1995), A8.

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