



Cornell University

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U.S. could feed 800 million people with grain that livestock eat, Cornell ecologist advises animal scientists

MONTREAL -- From one ecologist's perspective, the American system of farming grain-fed livestock consumes resources far out of proportion to the yield, accelerates soil erosion, affects world food supply and will be changing in the future.

"If all the grain currently fed to livestock in the United States were consumed directly by people, the number of people who could be fed would be nearly 800 million," David Pimentel, professor of ecology in Cornell University's College of Agriculture and Life Sciences, reported at the July 24-26 meeting of the Canadian Society of Animal Science in Montreal. Or, if those grains were exported, it would boost the U.S. trade balance by \$80 billion a year, Pimentel estimated.

With only grass-fed livestock, individual Americans would still get more than the recommended daily allowance (RDA) of meat and dairy protein, according to Pimentel's report, "Livestock Production: Energy Inputs and the Environment."

An environmental analyst and longtime critic of waste and inefficiency in agricultural practices, Pimentel depicted grain-fed livestock farming as a costly and nonsustainable way to produce animal protein. He distinguished grain-fed meat production from pasture-raised livestock, calling cattle-grazing a more reasonable use of marginal land.

Animal protein production requires more than eight times as much fossil-fuel energy than production of plant protein while yielding animal protein that is only 1.4 times more nutritious for humans than the comparable amount of plant protein, according to the Cornell ecologist's analysis.

Tracking food animal production from the feed trough to the dinner table, Pimentel found broiler chickens to be the most efficient use of fossil energy, and beef, the least. Chicken meat production consumes energy in a 4:1 ratio to protein output; beef cattle production requires an energy input to protein output ratio of 54:1. (Lamb meat production is nearly as inefficient at 50:1, according to the ecologist's analysis of U.S. Department of Agriculture statistics. Other

ratios range from 13:1 for turkey meat and 14:1 for milk protein to 17:1 for pork and 26:1 for eggs.)

Animal agriculture is a leading consumer of water resources in the United States, Pimentel noted. Grain-fed beef production takes 100,000 liters of water for every kilogram of food. Raising broiler chickens takes 3,500 liters of water to make a kilogram of meat. In comparison, soybean production uses 2,000 liters for kilogram of food produced; rice, 1,912; wheat, 900; and potatoes, 500 liters. "Water shortages already are severe in the Western and Southern United States and the situation is quickly becoming worse because of a rapidly growing U.S. population that requires more water for all of its needs, especially agriculture," Pimentel observed.

Livestock are directly or indirectly responsible for much of the soil erosion in the United States, the ecologist determined. On lands where feed grain is produced, soil loss averages 13 tons per hectare per year. Pasture lands are eroding at a slower pace, at an average of 6 tons per hectare per year. But erosion may exceed 100 tons on severely overgrazed pastures, and 54 percent of U.S. pasture land is being overgrazed.

"More than half the U.S. grain and nearly 40 percent of world grain is being fed to livestock rather than being consumed directly by humans," Pimentel said. "Although grain production is increasing in total, the per capita supply has been decreasing for more than a decade. Clearly, there is reason for concern in the future."

EIGHT MEATY FACTS ABOUT ANIMAL FOOD

From "Livestock Production: Energy Inputs and the Environment"

By David Pimentel

-- WHERE'S THE GRAIN? The 7 billion livestock animals in the United States consume five times as much grain as is consumed directly by the entire American population.

-- HERBIVORES ON THE HOOF. Each year an estimated 41 million tons of plant protein is fed to U.S. livestock to produce an estimated 7 million tons of animal protein for human consumption. About 26 million tons of the livestock feed comes from grains and 15 million tons from forage crops. For every kilogram of high-quality animal protein produced, livestock are fed nearly 6 kg of plant protein.

-- FOSSIL FUEL TO FOOD FUEL. On average, animal protein production in the U.S. requires 28 kilocalories (kcal) for every kcal of protein produced for human consumption. Beef and lamb are the most costly, in terms of fossil fuel energy input to protein output at 54:1 and 50:1, respectively. Turkey and chicken meat production are the most efficient (13:1 and 4:1, respectively). Grain production, on average, requires 3.3 kcal of fossil fuel for every kcal of protein produced. The U.S. now imports about 54 percent of its oil; by the year 2015, that import figure is expected to rise to 100 percent.

-- THIRSTY PRODUCTION SYSTEMS. U.S. agriculture accounts for 87 percent of all the fresh water consumed each year. Livestock directly use only 1.3 percent of that water. But when the water required for forage and grain production is included, livestock's water usage rises dramatically. Every kilogram of beef produced takes 100,000 liters of water. Some 900 liters of water go into producing a kilogram of wheat. Potatoes are even less "thirsty," at 500 liters per kilogram.

-- HOME ON THE RANGE. More than 302 million hectares of land are devoted to producing feed for the U.S. livestock population -- about 272 million hectares in pasture and about 30 million hectares for cultivated feed grains.

-- DISAPPEARING SOIL. About 90 percent of U.S. cropland is losing soil -- to wind and water erosion -- at 13 times above the sustainable rate. Soil loss is most severe in some of the richest farming areas; Iowa loses topsoil at 30 times the rate of soil formation. Iowa has lost one-half its topsoil in only 150 years of farming -- soil that took thousands of years to form.

-- PLENTY OF PROTEIN: Nearly 7 million tons (metric) of animal protein is produced annually in the U.S. -- enough to supply every American man, woman and child with 75 grams of animal protein a day. With the addition of 34 grams of available plant protein, a total of 109 grams of protein is available per capita. The RDA (recommended daily allowance) per adult per day is 56 grams of protein for a mixed diet.

-- OUT TO PASTURE. If all the U.S. grain now fed to livestock were exported and if cattlemen switched to grass-fed production systems, less beef would be available and animal protein in the average American diet would drop from 75 grams to 29 grams per day. That, plus current levels of plant-protein consumption, would still yield more than the RDA for protein.

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