



The Argument for a Vegetarian Diet

Part Two

by Gary Null, PhD, and Martin Feldman, MD

In Part 1 of this three-part series, we examined some of the misconceptions about protein that may dissuade people from a vegetarian diet. We also discussed the functions of protein, the body's protein requirements, the assessment of protein quality, and the negative aspects of meat consumption. In Part 2, we will discuss the ecological benefits of vegetarian eating that make a strong case for adopting this diet.

From an ecological point of view, a vegetarian lifestyle makes good sense. Our finite natural resources – including land, water, and energy – can be used much more efficiently to grow vegetables and grain for people to eat directly than to raise livestock. When we finally eat the animal produced with these resources, we get no more nutrients than the plant itself could have supplied. By eliminating the middle process of feeding, raising, slaughtering, and marketing animals for food, we can create a more peaceful coexistence between man and animal, and reduce the drain on natural resources.

The livestock sector's effect on the environment is "so significant that it needs to be addressed with urgency," according to a 2007 report by the Food and Agriculture Organization (FAO) of the United Nations. The report, titled *Livestock's Long Shadow*, states "The livestock sector emerges as one of the top two or three most significant contributors to the most serious environmental problems, at every scale from local to global. The findings of this report suggest that it should be a major policy focus when dealing with problems of land degradation, climate change and air pollution, water shortage and water pollution and loss of biodiversity."¹

The FAO notes that global demand for livestock products is growing rapidly as populations and incomes increase and food preferences change. According to projections, the production of meat worldwide will grow to 465 million tonnes in 2050, more than double the 229 million tonnes of 1999–2001. The production of milk will increase from 580 million tonnes to 1,043 million. "The environmental impact per unit of livestock production must be cut by half, just to avoid increasing the level of damage beyond its present level," states the FAO report.²

Impact on the Environment

Here, we take a closer look at the ecological effects of meat and dairy production:

Inefficient Use of Land

In a world where malnutrition and starvation are prevalent, we should be doing everything possible to eliminate any inefficient and outmoded use of land. Animal agriculture has co-opted land resources on a large scale for grazing and the production of feed.

According to the FAO, the livestock sector is "by far the single largest anthropogenic user of land." Grazing occupies a total area equivalent to 26% of the earth's ice-free terrestrial surface. Feed-crop production accounts for 33% of total arable land. "In all, livestock production accounts for 70% of all agricultural land and 30% of the land surface of the planet," says the report. And the sector is a major contributor to deforestation. The FAO offers the example of the Amazon, where pastures now occupy 70% of previously forested land and feed-crops occupy a large share of the remainder.³

In the US, 26% of the land is used for animal grazing on pasture and range, and another 20% is cropland.⁴ Large shares of the grain, corn, and soy crops grown in the US are used to produce livestock rather than to feed people directly. In 2005, the Worldwatch Institute noted that a calorie of beef, pork, or poultry requires 11 to 17 calories of feed.⁵ Ecologist David Pimentel of Cornell University reported in 1997 that all of the grain fed to livestock in the US could feed nearly 800 million people if it were consumed directly. According to Pimentel, livestock consume nearly 6 kilograms (kg) of plant protein for every 1 kg of high-quality animal protein produced.⁶

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➤ In terms of land use, a single acre of farmland can yield 800,000 calories when it grows vegetable food. If we feed the same vegetables to animals, however, the meat and dairy products produced yield only 200,000 calories. That's a 75% loss of healthful calories. What's more, there is not enough fertile land to sustain the world's population on meat. There is approximately 1 acre of fertile land per person in the world. Although research has shown that only one-third of an acre is needed to supply enough protein for one person for one year, that estimate holds true only if the protein is derived from vegetable sources. Once we begin using animals as our source of protein, 3.5 acres are required.⁷

Because Americans are willing to pay more for animal foods, agribusiness can see nothing but increased profits from increased production. However, in the 1980s the founder of the Worldwatch Institute concluded that the whole system is "creating an illusion of progress and a false sense of security."⁸ The cost of agribusiness's immediate profits is the gross waste of natural resources and compromised integrity of arable land for future use. When we buy steak or cheese, we reward these industries with profits that encourage them to continue their pursuit of illusory progress. Without our money, they would be forced either to find more efficient ways to use the land or to convert to vegetable and grain production for people.

Reduction of Biodiversity

The growth of the meat industry has pushed out and even extirpated much of our wildlife. Vast tracts of forestland and grassland have been appropriated for use as livestock grazing grounds, leaving large numbers of wildlife homeless. As they scatter in search of new shelter and hunting grounds, a high percentage are trapped or poisoned.

The FAO reports that "livestock now account for about 20% of the total terrestrial animal biomass." What's more, 30% of the land surface now occupied by livestock was previously home to wildlife. Livestock were deemed a threat by 306 of the 825 terrestrial ecoregions identified by the Worldwide Fund for Nature. The FAO states: "Indeed, the livestock sector may well be the leading player in the reduction of biodiversity, since it is the major driver of deforestation, as well as one of the leading drivers of land degradation, pollution, climate change, overfishing, sedimentation of coastal areas, and facilitation of invasions by alien species."⁹

Soil Erosion

Our desire for meat permits agribusiness to use technological methods that may yield unprecedented profits but also are causing unprecedented erosion of the topsoil. Feed crops – primarily corn, soybeans, and alfalfa – are among the villains in the soil erosion story.

David Montgomery, a geologist at the University of Washington, told the *Seattle Post-Intelligencer* in 2008 that we are losing an estimated 1% of the topsoil to erosion each year, and that agriculture accounts for most of the loss.¹⁰ Pimentel noted in 1997 that the production of grain-fed livestock contributes to soil erosion. He said that about 90% of US cropland was losing soil, and that Iowa had lost one-half of its topsoil – which took thousands of years to develop – in only 150 years of farming.¹¹

Statistics on soil erosion from Cornell University are cause for concern^{12,13}:

- In the US, soil is being lost 10 times faster than the rate of replenishment (the rate is 30 to 40 times faster in China and India).
- Soil erosion costs the US about \$37.6 billion a year in productivity losses.
- Annual damage from soil erosion is estimated at \$400 billion worldwide.
- Over the past four decades, 30% of arable land in the world has become unproductive due to erosion.

Most of us do not experience the effects of soil erosion directly, as we do when the cost of a resource such as oil or gas increases. In that case, we recognize the problem, demand to know why, and do what we can to reduce our own usage. But when was the last time you heard someone complain about the rapid rate of soil erosion? This process constitutes "a quiet crisis that could lead to famines in some parts of the world."¹⁴

Depletion of the Water Supply

Water is an essential natural resource that has long been taken for granted. Although consumers may recognize the importance of water conservation, they may not know that agribusiness uses such a large share of water resources. Worldwide, the agricultural sector was responsible for 70% of water use and 93% of water depletion in 2000, according to the FAO report.¹⁵

In the coming decades, an increasing demand for water may lead to conflicts among usages and users of this natural resource, says the FAO. Researchers have estimated that 64% of the global population will live in water-stressed basins by 2025, compared with 38% today, due to the projected growth in water demand.¹⁶

"Increasing water scarcity is likely to compromise food production, as water will have to be diverted from agricultural use to environmental, industrial and domestic purposes," states the FAO. The organization notes that "one of the major challenges in agricultural development today is to maintain food security and alleviate poverty without further depleting water resources and damaging ecosystems."¹⁷

In the US, agriculture accounts for the largest share of "freshwater withdrawals," according to a 2006 report by the USDA's Economic Research Service. Agriculture was responsible for 41% of freshwater withdrawals in 2000, a decline of 5 percentage points from 1960. But the sector accounted for more than 80% of the "consumptive use" of

water – that which is not returned to the immediate water environment – due to the evapotranspiration of a large portion of irrigation water. The US had approximately 55 million acres of irrigated farmland in 2002, and the amount of irrigated farmland has grown about a half million acres a year, on average, in the past three decades.¹⁸

The use of water for livestock production, and the sector's contribution to water depletion trends, are "high and growing," says the FAO. "An increasing amount of water is needed to meet growing water requirements in the livestock production process, from feed production to product supply." On a global scale, the livestock sector accounts for 8% of water use. Most of this (7%) is used in the production of livestock feed.¹⁹

People who want to help conserve water can begin by eating more vegetarian foods and less meat. It takes 15 times more water to produce a 16-ounce T-bone steak than a vegetarian alternative with the same protein content.²⁰ According to Pimentel, every kilogram of grain-fed beef produced requires 100,000 liters of water, and every kilogram of broiler chicken meat requires 3,500 liters. Those figures compare with 2,000 liters for a kilogram of soybeans produced; 1,912 for rice; 900 for wheat; and 500 for potatoes.²¹ If we passively allow the meat industry to use our limited water supply for livestock, we may not be able to find a glass of pure water in the near future.

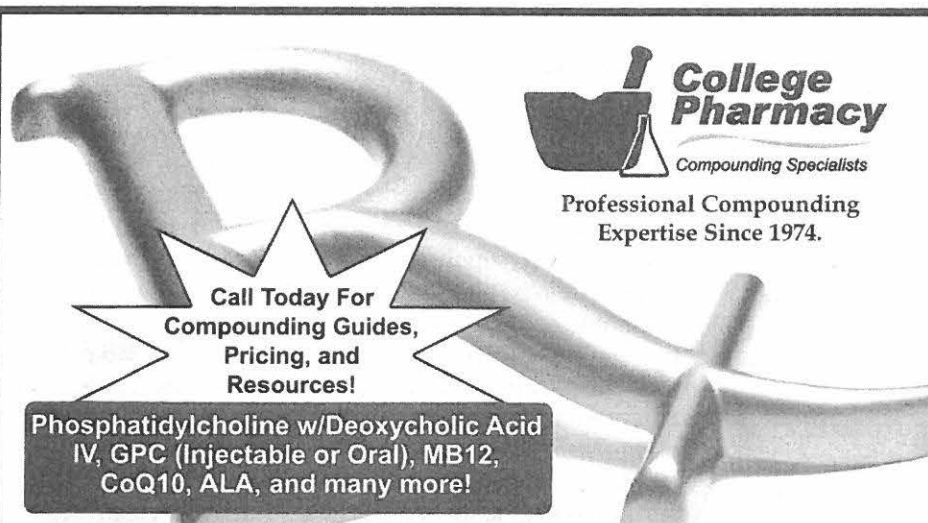
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Water Pollution

Livestock production is a major source of water pollution. According to *Livestock's Long Shadow*, the FAO report, this pollution comes from animal wastes, antibiotics and hormones, tannery chemicals, feed-crop fertilizers and pesticides, and sediments from eroded pastures. Livestock "is probably the largest sectoral source of water pollution, contributing to eutrophication, 'dead' zones in coastal areas, degradation of coral reefs, human health problems, emergence of antibiotic resistance and many others," says the FAO. In the US, adds the organization, livestock account for an estimated 55% of soil erosion and sediment, 50% of antibiotic use, 37% of pesticide use, and 32%–33% of phosphorus and nitrogen loads in water.²²

Agriculture is the main source of impairments in US rivers and lakes, according to the Economic Research Service. Based on an assessment of water quality in 2000 by the Environmental Protection Agency (EPA), agriculture is the primary source of pollution in 48% of river miles, 41% of lake acres (excluding the Great Lakes), and 18% of estuaries that are water-quality impaired.²³

The Economic Research Service identifies the major agricultural pollutants in our water as:



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1. sediment that results from soil erosion;
 2. nitrogen and phosphorus, nutrients used on croplands that can run off or leach into water and promote the growth of algae, leading to decreased oxygen levels and fish kills;
 3. pesticides used on farmlands (with more than 500 million pounds of active ingredient applied per year since the 1980s);
 4. dissolved salts carried by irrigation water into ditches and to surface or groundwater; and
 5. pathogens from animal feeding operations and livestock waste that may potentially be transmitted to humans through contaminated water.²⁴

Dwindling Energy Supply.

The production of animal foods places greater demands on the nation's energy supply than does the production of plant protein. According to the Worldwatch Institute, a calorie of energy from beef requires 33% more fossil-fuel energy to produce than does a calorie of potatoes.²⁵

Pimentel has explained that the production of animal protein in the US requires 28 kilocalories (kcal) of fossil-fuel energy, on average, for 1 kcal of protein produced. For beef and lamb, the ratio of fossil-fuel energy input to protein output is 54:1 and 50:1, respectively. The ratio for turkey is 13:1 and for chicken meat 4:1. The production of grain requires an average of 3.3 kcal of fossil fuel for every kcal of protein produced. It requires more than eight times as much fossil-fuel energy to produce animal protein than plant protein, Pimentel reported, but the resulting animal protein is only 1.4 times more nutritious than a comparable amount of plant protein.²⁶

Why does meat require such a depletion of our energy supply? The greater the number of stages needed to process a product, the more energy that is required to get the item to the consumer. Meat requires many more stages of processing than do vegetables and grains, and therefore much more energy is used in its production. Simple products that can be used in their natural state help conserve energy.

Climate Change

Once again, the livestock sector is a major player in climate change, which the FAO report calls "the most serious challenge facing the human race." This sector accounts for 18% of total greenhouse gas emissions (measured in CO₂ equivalent) from five major sectors. As the FAO points out, this share is higher than the contribution of transport. Within the agricultural sector alone, livestock are responsible for nearly 80% of all emissions.²⁷

Livestock production contributes to the emission of three major greenhouse gases that have a direct impact on global warming: carbon dioxide, methane, and nitrous oxide. The sector accounts for 9% of global anthropogenic emissions

of carbon dioxide, largely due to its role in deforestation of land for pastures and feed-crop production.²⁸

According to the FAO report, the livestock sector plays a major role in the emission of methane from enteric fermentation and animal manure. Livestock account for 35% to 40% of all anthropogenic emissions and about 80% of agricultural emissions of methane, which traps heat in the atmosphere even more effectively than does carbon dioxide. As for nitrous oxide, the "most potent of the three major greenhouse gases," livestock contribute 65% of global anthropogenic emissions and 75% to 80% of agricultural emissions.²⁹

Waste of Raw Materials.

One government study has indicated that the livestock industry uses one-third of the value of all raw materials consumed in the US just for feed. Plastic wrap, aluminum foil, Styrofoam and cardboard containers, paper labels, ink, preservatives, artificial flavors, and color additives – all used by the meat-packing industry – further deplete our raw-material supplies. These raw materials include aluminum, copper, iron, steel, tin, zinc, rubber, wood, and petroleum products.

Animal Foods and World Hunger

Even as Americans struggle to stay on diets, a significant portion of the world's population faces a life of hunger and eventual starvation. More than 900 million people worldwide – most of them in developing countries – were undernourished in 2007.³⁰ People suffering from malnutrition receive such inadequate amounts of nutrients that even their basic physiological functions are impaired.³¹

A common explanation for such hunger is that overpopulation places an undue strain on the already tenuous food supply of an underdeveloped nation. A closely related presumption is that underdeveloped countries are "backward," having failed to obtain the updated machinery and technology needed to keep pace with modern population growth and food demands. It is also presumed that widespread ignorance in these countries plays a major role. For one thing, the argument goes, there is little understanding of modern agricultural techniques that could help farmers increase their product yield.

These observations tend to be somewhat culturally prejudiced, assuming that modern ways of doing things are superior to traditional ways in many of these societies. But the most basic problem with this viewpoint is the presumption that world hunger can be overcome with increased agricultural production and more-stringent birth control measures. Obviously, reduced population growth would ease the strain on limited food supplies. It may be that if we continue our present rate of population growth, "700 years from now people would be standing shoulder to shoulder on every foot of the earth's land surface ..."³² Even in the US, there will come a day when we simply cannot feed so large a population. However, population growth

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control cannot be the only solution to world hunger. And while increased agricultural production may be an immediate solution, it could create a lethal drain on natural resources.

The fact is, the demand for animal protein is the single most significant factor that condemns millions to a life of hunger and starvation. It means that humans must compete with animals over grain supplies for their very existence. The animal industry is based on gross misuse of land that would be better used to feed people than cattle. Experience shows us that population increases and food production decreases (due to drought, for example) can be dealt with much more fruitfully when we have an efficient food supply that makes economically sound use of land. What's more, meat products are highly inefficient in terms of nutritional return to the consumer.

We must keep in mind that famine – needless though it be – is a day-to-day reality for millions throughout the world. Americans may not actually be facing food shortages, but their insistence on a meat and dairy diet will create and perpetuate the problem for others – and eventually for themselves. Every time we eat a meal of animal foods, we are supporting an industry that is taking food from the mouths of starving people.

Raising Food Without Feeding People

Increasing agricultural output may sound like a reasonable solution to famine. In recent years, however, the increase in grain production has gone more and more to animals and less and less to people.

Livestock consume our grain supplies in gross amounts and return very little in terms of dietary requirements. So while agricultural output may be going up, our ability to feed people continues to decline. Just how much food do we waste when we eat meat and dairy products? Cattle must consume 16 pounds of feed to produce a single pound of flesh. Therefore, we waste 15 pounds of grain for every pound of beef consumed.

Smaller food animals are more efficient in this regard – pigs consume about 6 pounds of feed to produce a pound of flesh, and poultry need 3 to 4 pounds – but the figures still show how wasteful animal products are.³³ If the grains were eaten by people instead of fed to cattle, we would net greater amounts of calories and protein. As an added benefit, we would consume a more usable unsaturated type of fat instead of the saturated, difficult-to-digest fat contained in animal products.

Agribusiness does try to cut down on this tremendous grain drain, but it is unwilling to take the most obvious and sensible step: produce less meat and advise consumers to balance their diets better by eating more vegetables and grains to replace part of this meat intake. Instead, it works to maintain full weight on cattle while having them eat less by, for example, severely restricting their physical movement. Instead of grazing freely, cattle are lined up in crowded and squalid feedlots. Livestock fed in these mechanized feedlots can attain a target weight and be delivered to the

slaughterhouse in about one-third the normal time.³⁴ This has greatly increased profits for the animal factories that insist on maintaining their hold on the food market, even if it means tolerating gross waste that ultimately leads to world hunger.

Despite the industry's attempt to reduce feed allocation, cattle still require a high caloric intake. And since meat production is rising steadily, so is the overall feed requirement. Use of livestock feed in the US averages about 200 million tons annually, compared with only 100 million tons on the eve of World War II. The number of poultry and livestock being fed grain has doubled in recent decades, with 75% of all livestock being grain-fed.

Reducing meat production is clearly the best solution to the problem of world hunger. Yet industrialized nations tried to circumvent the issue by inventing the so-called Green Revolution in the 1960s. This program has intended to end world hunger by introducing new crops bred specifically for rapid growth and high-yield performance. One problem, however, was that the new strains of crops were very expensive to grow because of the uncommonly large amounts of fertilizer needed. This allowed the wealthiest farmers to outprice their competition, putting many small farmers out of business in countries where farming was the traditional binding socioeconomic force.

An overemphasis on grain production was another weakness of the system. Grains largely replaced many varieties of legumes, and often ended up as livestock feed anyway. In the industrialized countries, high-yield crops created a surplus that needed a market, thereby encouraging even greater animal production, which placed even greater pressure on farmers to produce yet more feed for the oversupply of livestock. It became a vicious cycle of overproduction, yet nutrition was seldom considered. Dr. R. S. Harris, professor of biochemistry and nutrition at the Massachusetts Institute of Technology, found that the indigenous strains of crops being replaced by the new high-yield varieties were actually superior in nutrition.³⁵

The Vegetarian Alternative

While some people believe that underdeveloped countries need more technical assistance in the use of modern farming techniques, it is clear that the most direct and powerful solution to the problem is to adopt a vegetarian lifestyle.

However, many Americans grew up with the "Basic Four Food Groups," which included the milk group, meat group, vegetable-fruit group, and breads-cereals group. The USDA proposed the Basic Four in the 1950s supposedly to help simplify the complexities of nutrition for the public. Along with the American Dietetic Association, however, the USDA proceeded to grossly oversimplify the guidelines to proper nutrition. The plan suggested that a person

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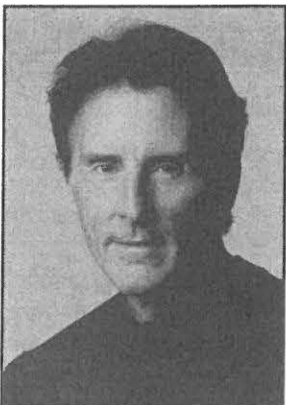
eat from the four basic groups to be sure of receiving a "recommended daily allowance" of all nutrients. (The Basic Four was replaced by the Food Guide Pyramid in 1992, which included groups for grains, vegetables, fruits, dairy, meat, and fats and oils. A revised pyramid was introduced in 2005.)

Since Americans were force-fed the propaganda of the Basic Four, the profits of the meat and dairy industries have increased greatly, and the average consumer has had to dig deeper and deeper into his pocket to pay the rising costs of their products. He also is paying more for health-care services and insurance because of sharp increases in disease and sickness. National health-care costs related to meat consumption amount to tens of billions a year.³⁶

A workable alternative to the food pyramid would be a five-group division that could be used both by the affluent consumer of industrialized society and the average citizen of the underdeveloped world. This transcultural food grouping would comprise three principal dietary staples – grains, legumes, and vegetables – and two smaller groups for raw foods and foods containing vitamin B12.³⁷

The time has come for us to recognize the enormous waste and health dangers related to meat consumption. Food experts agree that eating much more of a vegetarian diet would create more nutritional parity in the world. They note that a simple diet would free up our grain exports and increase global food resources. By decreasing our demand for meat, we are releasing millions of tons of food to be used to nourish starving and malnourished people in underdeveloped parts of the world. And we are becoming healthier for it. But if we refuse to change our wasteful food production amid the starving millions, the devastation will continue and no one – not even us – will be spared the disease, hunger, economic chaos, and struggle for dwindling food supplies that ensue.

Coming in Part 3: The health benefits of vegetarianism.



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