CAFOs Uncovered

The Untold Costs of Confined Animal Feeding Operations

Doug Gurian-Sherman

UNION OF CONCERNED SCIENTISTS
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Doug Gurian-Sherman is a senior scientist in the Union of Concerned Scientists (UCS) Food and Environment Program.

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EXECUTIVE SUMMARY

The livestock industry (including poultry) is vital to our national economy, supplying meat, milk, eggs, and other animal products and providing meaningful employment in rural communities. Until recently, food animal production was integrated with crop production in a balanced way that was generally beneficial to farmers and society as a whole. But livestock production has undergone a transformation in which a small number of very large CAFOs (confined animal feeding operations) predominate. These CAFOs have imposed significant—but largely unaccounted for—costs on taxpayers and communities throughout the United States.

CAFOs are characterized by large numbers of animals crowded into a confined space—an unnatural and unhealthy condition that concentrates too much manure in too small an area. Many of the costly problems caused by CAFOs can be attributed to the storage and disposal of this manure and the overuse of antibiotics in livestock to stave off disease.

The predominance of CAFOs is not the inevitable result of market forces; it has been fostered by misguided public policy. Alternative production methods can be economically efficient and technologically sophisticated, and can deliver abundant animal products while avoiding most of the problems caused by CAFOs. However, these alternatives are at a competitive disadvantage because CAFOs have reduced their costs through subsidies that come at the public's expense, including (until very recently) low-cost feed. CAFOs have also benefited from taxpayer-supported pollution cleanup programs and technological "fixes" that may be counterproductive, such as the overuse of antibiotics. And by shifting the risks of their production methods onto the public, CAFOs avoid the costs of the harm they cause.

In addition, the fact that the meat processing industry is dominated by a few large and economically powerful companies makes it difficult for alternative producers to slaughter their animals and get their products to market. This excessive market concentration is facilitated by lax enforcement of laws intended to prevent anti-competitive practices.

By describing several of the subsidies and other often hidden costs of CAFOs that are imposed on society (referred to as externalized costs or "externalities"), this report attempts to clarify the real price we pay—and can no longer afford—for this harmful system. These externalities are associated with the damage caused by water and air pollution (along with cleanup and prevention), the costs borne by rural communities (e.g., lower property values), and the costs associated with excessive antibiotic use (e.g., harder-to-treat human diseases). Subsidies have included payments to grain farmers that historically supported unrealistically low animal feed prices, and payments to CAFOs to prevent water pollution.

The United States can do better. In fact, there is a new and growing movement among U.S. farmers to produce food efficiently by working with nature rather than against it. More and more meat and dairy farmers are successfully shifting away from massive, overcrowded CAFOs in favor of modern production practices. We offer a number of policy recommendations that would level the playing field for these smart, sophisticated alternatives by reducing CAFO subsidies and requiring CAFOs to pay a fair share of their costs.

CAFOs—Too Big for Our Own Good

Most of the problems caused by CAFOs result from their excessive size and crowded conditions. CAFOs contain at least 1,000 large animals such as beef cows, or tens of thousands of smaller animals such as chickens, and many are much larger—with tens of thousands of beef cows or hogs, and hundreds of thousands of chickens.

The problems that arise from excessive size and density (e.g., air and water pollution from manure, overuse of antibiotics) are exacerbated by the parallel trend of geographic concentration, whereby CAFOs for particular types of livestock have become concentrated in certain parts of the country. For example, large numbers of swine CAFOs are now located in Iowa and North Carolina, dairy CAFOs in California, and broiler chicken CAFOs in Arkansas and Georgia.

We need to be concerned about these excessively large feeding operations because they have become the predominant means of producing meat and dairy products in this country over the past few decades. Although they comprise only about 5 percent of all U.S. animal operations, CAFOs now produce more than 50 percent of our food animals. They also produce about 65 percent of the manure from U.S. animal operations, or about 300 million tons per year—more than double the amount generated by this country's entire human population. For the purposes of this report, there are approximately 9,900 U.S. CAFOs producing hogs, dairy cows, beef cows, broiler chickens, or laying hens.

Better Options Exist

CAFOs do not represent the only way of ensuring the availability of food at reasonable prices. Recent studies by the U.S. Department of Agriculture (USDA) show that almost 40 percent of medium-sized animal feeding operations are about as cost-effective as the average large hog CAFO, and many other studies have provided similar results. Medium-sized and smaller operations also avoid or reduce many of the external costs that stem from CAFOs.

If CAFOs are not appreciably more efficient than small and mid-sized operations, why are they supplanting smaller farms? The answers lie largely in farm policies that have favored large operations. CAFOs have relied on cheap inputs (water, energy, and especially feed) to support the high animal densities that offset these operations' high fixed costs (such as buildings). Feed accounts for about 60 percent of the costs of producing hogs and chickens and is also an important cost for dairy and beef cows, and federal policies have encouraged the production of inexpensive grain that benefits CAFOs.

Perhaps even more important has been the concentration of market power in the processing industry upon which animal farmers depend. This concentration allows meat processors to exert considerable economic control over livestock producers, often in the form of production contracts and animal ownership. The resulting "captive supply" can limit market access for independent smaller producers, since the large majority of livestock are either owned by processors or acquired under contract—and processors typically do not contract with smaller producers. Federal government watchdogs have stated that the agency responsible for ensuring that markets function properly for smaller producers is not up to the task.

Hoop barns and smart pasture operations

Although there is evidence that confinement operations smaller than CAFOs can be cost-effective and produce ample animal products, studies also suggest that sophisticated alternative means of producing animal products hold even greater promise. For example, hog hoop barns, which are healthier for the animals and much smaller than CAFOs, can produce comparable or even higher profits per unit at close to the same price.

Research in Iowa (the major hog-producing state) has also found that raising hogs on pasture may produce animals at a lower cost than CAFOs. Other studies have shown that "smart" pasture oper-

ations such as managed intensive rotational grazing (MIRG) can produce milk at a cost similar to confined dairy operations, but with added environmental benefits.

Properly managed pastures, for example, require less maintenance and energy than the feed crops (such as corn and soybeans) on which CAFOs rely. Healthy pastures are also less susceptible to erosion, can capture more heat-trapping carbon dioxide than feed crops, and absorb more of the nutrients applied to them, thereby contributing less to water pollution. Furthermore, the manure deposited by animals onto pasture produces about six to nine times less volatilized ammonia—an important air pollutant—than surface-applied manure from CAFOs.

The Many Hidden Costs of CAFOs

Feed grain subsidies

CAFOs have been indirectly supported by huge taxpayer-funded subsidies that compensated grain farmers for excessively low prices. Because feed makes up such a large part of CAFOs' costs, lower grain prices can have a big impact on the total cost of production.

Over the past few decades, federal farm bills have progressively moved toward policies that let grain prices fall—often below the cost of production—and compensated farmers for much of the difference. Without such subsidies, grain farmers would not have been able to continue selling their product at such low prices, which benefit CAFOs.

This so-called indirect subsidy to hog and broiler CAFOs amounts to hundreds of millions of dollars per year. When extended to include the dairy, beef, and egg sectors, low-cost grain was worth a total of almost $35 billion to CAFOs from 1996 to 2005, or almost $4 billion per year.

Farms that raise animals on pasture and those that grow their own grain do not usually receive as much of a subsidy as the CAFO industry. Pastures themselves are not subsidized at all, so the sustenance that livestock derive from pastures receives no government support.

During the past few years, grain prices have approached or even risen above the cost of production. Under these conditions, CAFOs no longer benefit from grain subsidies, but the problem of increasing concentration in the processing industry persists. This may make it difficult for CAFO alternatives to gain substantial market share without changes in U.S. policy.

Pollution prevention subsidies

Another farm bill program, the Environmental Quality Incentives Program (EQIP), provides CAFOs with another important subsidy. Beginning in 2002, CAFOs were no longer explicitly excluded from EQIP funding (which was originally intended to help smaller farming operations reduce their pollution), and the maximum funding level for individual projects has increased dramatically to $450,000. Several criteria used to prioritize projects such as manure disposal actually favor CAFOs over pasture-based operations. Extrapolation from the available data suggests that U.S. CAFOs may have benefited from about $125 million in EQIP subsidies in 2007.

State-level EQIP projects can also favor confinement operations. California, the state with the most dairy CAFOs, spends $10 million of its allocated EQIP subsidies each year to address dairy manure issues. Georgia, the state with the most broiler chicken CAFOs, uses EQIP funds to support the transportation of chicken manure from that part of the state where broiler CAFOs are primarily located to areas with enough cropland to accept this manure. The distance involved would often not be economically feasible without subsidization.

Water pollution from manure

Disposal of CAFO manure on an insufficient amount of land results in the runoff and leaching of waste into surface and groundwater, which has contaminated drinking water in many rural areas, and the volatilization of ammonia (i.e., the transfer of this substance from manure into the atmosphere). Several manure lagoons have also experienced catastrophic failures, sending tens of millions of gallons

of raw manure into streams and estuaries and killing millions of fish. Smaller but more numerous spills cause substantial losses as well.

Remediation of the leaching under dairy and hog CAFOs in Kansas has been projected to cost taxpayers $56 million—and Kansas is not one of the country's top dairy- or hog-producing states. Based on these data, a rough estimate of the total cost of cleaning up the soil under U.S. hog and dairy CAFOs could approach $4.1 billion.

The two primary pollutants from manure, nitrogen and phosphorus, can cause eutrophication (the proliferation and subsequent death of aquatic plant life that robs freshwater and marine environments of the oxygen that fish and many other aquatic organisms need to survive). For example, runoff and leaching from animal sources including CAFOs is believed to contribute about 15 percent of the nutrient pollution that reaches the Gulf of Mexico, where a large "dead zone"—devoid of fish and commercially important seafood such as shrimp—has developed. CAFO manure also contributes to similar dead zones in the Chesapeake Bay (another important source of fish and shellfish) and other important estuaries along the East Coast. The Chesapeake Bay's blue crab industry, which had a dockside value of about $52 million in 2002, has declined drastically in recent years along with other important catches such as striped bass, partly due to the decline in water quality caused in part by CAFOs.

Although it is difficult to account for all of the social benefits (such as fisheries and drinking water) lost due to CAFO pollution, it is reasonable to assume the losses are substantial. One indirect way of estimating such costs is to calculate the cost of preventing some or all of the pollution caused by CAFOs. The USDA, for example, has determined how much it would cost to transport manure to enough crop fields or pastures to comply with new Clean Water Act rules governing the distribution of manure on fields. Based on a nitrogen-limited standard and realistic estimates of the rate at which farms will accept manure, the annual cost of adequate manure distribution in the Chesapeake Bay region alone would total $134 million per year. Using a phosphorus-limited standard and an unrealistically high manure acceptance rate, the cost would be $153 million annually. Considering that net returns for the animal industry in this region amount to $313 million, compliance with such standards could comprise between 43 and 49 percent of net returns.

Air pollution from manure

Airborne ammonia is a respiratory irritant and can combine with other air pollutants to form fine particulate matter that can cause respiratory disease. And because ammonia is also re-deposited onto the ground, mostly within the region from which it originates, ammonia nitrogen deposited on soils that have evolved under low-nitrogen conditions may reduce biodiversity and find its way into water sources. Ammonium ion deposition also contributes to the acidification of some forest soils.

Animal agriculture is the major contributor of ammonia to the atmosphere, and the substantial majority of this ammonia likely comes from confinement operations, since manure deposited by livestock on pasture contributes proportionately much less ammonia to the atmosphere than manure from CAFOs. Up to 70 percent of the nitrogen in CAFO manure can be lost to the atmosphere depending on manure storage and field application measures. Over the past several decades, the amount of airborne ammonia deposition in many areas of the United States with large numbers of CAFOs has been rising dramatically, and may often exceed the capacity of forests and other environments to utilize it without harm.

The USDA has estimated the total U.S. cost of controlling air and water pollution through manure distribution onto farmland—in quantities that comply with the Clean Water Act—at $1.16 billion per year under high manure acceptance rates. However, the standard applied in this calculation would only reduce airborne ammonia pollution from CAFOs by about 40 percent. And if lower, more realistic ma-

nure acceptance rates were used, the manure would have to be transported unacceptable distances. Therefore, proper manure disposal from CAFOs at current farmer acceptance rates would in all likelihood exceed these values considerably.

Harm to rural communities

CAFOs are sited in rural communities that bear the brunt of the harm caused by CAFOs. This harm includes the frequent presence of foul odors and water contaminated by nitrogen and pathogens, as well as higher rates of respiratory and other diseases compared with rural areas that are not located near CAFOs.

One study determined that each CAFO in Missouri has lowered property values in its surrounding communities by an average total of $2.68 million. It is not possible to accurately extrapolate this value nationally due to the many differences between localities, but as a very rough indication of the magnitude of these costs, multiplying by 9,900 (the total number of U.S. CAFOs as defined for this report) would yield a loss of about $26 billion.

Antibiotic-resistant pathogens

Estimates have suggested that considerably greater amounts of antibiotics are used for livestock production than for the treatment of human disease in the United States. The massive use of antibiotics in CAFOs, especially for non-therapeutic purposes such as growth promotion, contributes to the development of antibiotic-resistant pathogens that are more difficult to treat.

Many of the bacteria found on livestock (such as *Salmonella, Escherichia coli,* and *Campylobacter*) can cause food-borne diseases in humans. Furthermore, recent evidence strongly suggests that some methicillin-resistant *Staphylococcus aureus* (MRSA) and uropathogenic *E. coli* infections may also be caused by animal sources. These pathogens collectively cause tens of millions of infections and many thousands of hospitalizations and deaths every year.

The costs associated with *Salmonella* alone have been estimated at about $2.5 billion per year—about 88 percent of which is related to premature deaths. Because an appreciable degree of antibiotic resistance in animal-associated pathogens is likely due to the overuse of antibiotics in CAFOs, the resulting costs are likely to be high. Eliminating the use of antibiotics for growth promotion (the majority of which occurs on CAFOs) could cost CAFOs between $1.5 billion and $3 billion per year.

Conclusions and Recommendations

The costs we pay as a society to support CAFOs—in the form of taxpayer subsidies, pollution, harm to rural communities, and poorer public health—is much too high (Table ES-1, p. 6). For example, conservative estimates of grain subsidies and manure distribution alone suggest that CAFOs would have incurred at least $5 billion in extra production costs per year if these expenses were not shifted onto the public. The figure would undoubtedly be much higher if truly adequate manure distribution was required. Although we do not have good national data for other costs quantified in Table ES-1, and some that have not been quantified (such as water and energy use and water purification costs), they could amount to billions of dollars more per year.

Technological solutions to specific CAFO problems have been proposed, such as feed formulations that would reduce manure nitrogen, lagoon covers that would reduce atmospheric ammonia, and "biogas" capture and production that would reduce methane emissions from manure, but these are only partial solutions and would generally add to the cost of production. None of these technologies solve antibiotic resistance, loss of rural income, or the ethical treatment of animals. By comparison, sophisticated CAFO alternatives can provide plentiful animal products at similar prices, but with much fewer of the problems caused by CAFOs.

The bottom line is that society is currently propping up an undesirable form of animal agriculture with enormous subsidies and a lack of accountability for its externalized costs. Once we appreciate the role these subsidies—along with government

Table ES-1. **CAFO Costs Underwritten by U.S. Taxpayers**[1]

	Cost of Pollution or Pollution Avoidance	Cost of Subsidy
Cost to Distribute and Apply Manure to Fields	$1.16 billion/year[2]	
Reduction in Property Values	$26 billion (total loss)[3]	
Public Health Costs from Overuse of Antibiotics in Livestock	$1.5 billion – $3.0 billion/year[4]	
Remediation of Leakage from Manure Storage Facilities (Swine and Dairy)	$4.1 billion (total cost)[5]	
Grain Subsidies for Livestock Feed		$3.86 billion/year[6]
EQIP Subsidy		$100 million – $125 million[7]

[1] Numbers are rough estimates of current or recent costs and are presented only to indicate the magnitude of these costs. See the text for details.
[2] SOURCE: Aillery et al. 2005.
[3] SOURCE: Mubarak, Johnson, and Miller 1999. Extrapolation from Missouri data based on national CAFO numbers.
[4] SOURCE: NRC 1999. Extrapolation based on U.S. population of 300 million.
[5] SOURCE: Volland, Zupancic, and Chappelle 2003. Extrapolation from Kansas data based on national swine and dairy CAFO numbers.
[6] SOURCE: Starmer 2007. Data averaged over the period 1996–2005.
[7] SOURCE: NRCS 2003. Calculations based on NRCS projections for 2007 (yearly values increase from a low in 2002 to a high in 2007).

policies—play in shaping the way our food animals are raised, we can also see the environmental, health, and economic benefits to be gained from redirecting agriculture toward smart pasture operations and other desirable alternatives.

Public policies that support CAFOs at the expense of such alternatives should be eliminated, and policies that support these alternatives should be implemented. Needed actions include:

- Strict and vigorous enforcement of antitrust and anti-competitive practice laws under the Packers and Stockyards Act (which cover captive supply, transparency of contracts, and access to open markets)
- Strong enforcement of the Clean Water Act as it pertains to CAFOs, including improved oversight at the state level or the takeover of responsibilities currently delegated to the states for approving and monitoring and enforcement of National Pollution Discharge Elimination System (NPDES) permits; improvements could include more inspectors and inspections, better monitoring of manure-handling practices, and measurement of pollution prevention practices
- Development of new regulations under the Clean Air Act that would reduce emissions of ammonia and other air pollutants from CAFOs, and ensure that CAFO operators cannot avoid such regulations by encouraging ammonia volatilization
- Continued monitoring and reporting of ammonia and hydrogen sulfide emissions as required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly referred to as the "Superfund") and the Emergency Planning and Community Right-to-Know Act (EPCRA)
- Replacement of farm bill commodity crop subsidies with subsidies that strengthen conservation programs and support prices when supplies are high (rather than allowing prices to fall below the cost of production)
- Reduction of the current $450,000 EQIP project cap to levels appropriate to smaller farms, with a focus on support for sound animal farming practices
- Revision of slaughterhouse regulations to facilitate larger numbers of smaller processors, including the elimination of requirements not

appropriate to smaller facilities, combined with public health measures such as providing adequate numbers of federal inspectors or empowering and training state inspectors

- Substantial funding for research to improve alternative animal production methods (especially pasture-based) that are beneficial to the environment, public health, and rural communities