A Summary of the Regional Economic Effects of CAFOs

By Dr. William J. Weida
July 21, 2001

A Summary of the Regional Economic Effects of CAFOs

By:
Dr. William J. Weida
Department of Economics
The Colorado College, Colorado Springs, CO

July 21, 2001

Interference with Amenities

Amenities are those characteristics that make a region pleasant or a desirable residence. Amenities differ from one region to another, but each amenity helps create a quality of life that draws people to an area and makes them want to stay there. Large hog CAFOs tend to diminish local amenities. In 1990, Abeles-Allison and Connor found that large, concentrated animal-feeding operations can generate flies, odors, and other externalities that decrease land values near production facilities. A Michigan study estimated that house values decreased $0.43 for each additional hog within a five-mile radius..[1]

This study may overestimate the loss in real estate value because home sale observations were recorded only near hog farms having received multiple complaints. However, in 1999 Chapin and Boulind also found that the effects of large hog farms on the amenities of a region are far reaching. Besides the odor and gases, nearby residents must cope with an increasing number of flies, rats, and other scavenging animals. Improperly managed manure wastes and pre-slaughterhouse carcasses threaten water quality. The close proximity of humans to these facilities raises concerns that infectious diseases may cross over from hogs to humans. In addition, new evidence indicates that the use of antibiotics in industrial swine production can contribute to the increase of antibiotic resistance in human pathogens. [2]

In a 2001 study of farming dependent areas , Tweeten and Flora found that if they create environmental problems such as those just discussed, newly developed or arrived CAFOs may undermine a community's opportunities to expand its economic base. [3] They also found that the vertical coordination structure used by large CAFOs can cause a loss of resources from farms and rural communities because CAFO facilities tend to be so large and because ownership and control may reside in distant metropolitan centers. [4] All else being equal, they found the productivity gains attributed to large CAFOs decrease aggregate employment and other economic activities in rural communities. [5]

This was confirmed by a study of 1,106 rural communities by Gómez and Zhang of Illinois State University who found that large hog farms tend to hinder rural economic growth at the local level.. All models in this study indicated an inverse relationship between hog production concentration and retail spending in local communities. Economic growth rates were 55% higher in areas with conventional hog farms as opposed to those with larger hog operations in spite of the fact that economic growth rates had been almost identical in all the studied communities before the advent of larger hog operations in the1990s. Data in the study also showed that communities with heavy hog concentration suffered larger population losses than those with conventional hog operations. According to the authors, the results of this study suggest that without public policy to protect rural communities, the most probable outcome is the continuing decline of rural communities in the future as the size agriculture and livestock production units continue to increase.[6]

A study by Palmiquist, Roka and Vulkina (1998) shows that large hog operations tend to depress the sales value of nearby homes and real estate.[7] An eighteen month study of 75 rural land transactions near Premium Standard's hog operations in Putnam County, Missouri conducted by the departments of Agricultural Economics and Rural Sociology at the University of Missouri found an average $58 per acre loss of value within 3.2 kilometers (1.5 miles) of the facilities. This study primarily evaluated farmland without dwellings. These findings were confirmed by a second study at the University of Missouri-Columbia by Hamed, Johnson, and Miller that found that proximity to a hog ILO does have an impact on property values. Based on the averages of collected data, loss of land values within 3 miles of a hog ILO would be approximately $2.68 million (US) and the average loss of land value within the 3-mile area was approximately $112 (US) per acre.[8]

These findings were further substantiated by a Sierra Club study that discovered tax adjustments by county assessors in at least eight states lowered property taxes for neighbors of CAFOs. As Table 1 shows, local property tax assessments were lowered in Alabama, Illinois, Iowa, Kentucky, Maryland, Michigan, Minnesota and Grundy County, Missouri. Grundy County has lowered some residents' taxes by up to 30% due to their close proximity to the corporate hog operations of Continental Grain.

Table 1--Property Tax Reductions In Areas Around ILOs

Area	Amount of Reduction	Reduction In Value Of:
Grundy Co, MO	30%	
Mecosta Co, MI	35%	dwellings only
Changed to	20%	total property (land and structures)
Midland Co, MI	20%	
DeWitt Co, IL	30%	rescinded
McLean Co, IL	35%	
DeKalb Co, AL	base reassessment, variable rates	
Renville Co, MN	base reassessment, variable rates	dwellings only
Humbolt Co, IA	20-40%	dwellings only--now rescinded
Frederick Co, MD	10%	now reduced to 5%
Muhlenberg Co, KY	18%	dwellings only

Radius of reduction varied, up to 2 miles. All were for hogs except Muhlenberg, for chickens.
Source: Property Tax Reductions, scott.dye@sfsierra.sierraclub.org, March 13, 2000

The Potential Impact of CAFO Production On Regional Economies

The four economic characteristics that generally define a CAFO are fundamentally incompatible with regional economic development. Regional economic development proceeds on the premise that the wages paid and purchases made by a company are transferred to other individuals or companies in the region. The multiplier effect of these payments further assumes that they are again spent within the confines of the region and that they do not "leak" into other areas of the state or nation. However CAFOs are structured so they will not aid regional economic development for the following reasons:

(1) Constraints on Regional Economic Development Due To Employment

As a capital intensive company, a CAFO is designed to minimize the number of workers and hence, minimize the economic impact on the region. A 1998 Colorado State University study found that only 3-4 direct jobs (jobs with the hog producer) are created for every 1000 sows in a CAFO sow farrowing operation.[9] Ikerd calculated that a farrow-to-finish contact hog operation would employ about 4.25 people in to generating over $1.3 million in revenue. His figures showed that an independently operated hog farm would employ about 12.6 people to generate the same amount of hog sales.[10] Further, a number of studies have found that compared with small farms with an equivalent composite production value, a large farm tends to buy a smaller share of consumption and production inputs in nearby small towns. p. 25[11]

This is important because input-output analysis shows each farm job adds another job in local communities and another in the state outside the local communities. Similarly, each $1,000 of farm income adds an-other $1,000 to local communities and another $1,000 to the state outside the local communities.[12] However, the real issue here is whether or not CAFOs are even agricultural operations. A good case can be made that CAFOs are much closer to industrial operations and if one treats CAFOs as industrial operations, the multiplier would be much lower--about 1.35.[13]

Either of these figures probably overstate the economic impact on rural counties. For the employment multiplier to operate at the levels specified in the above paragraphs all employees must both live and work inside the region. Given the ability to commute, it is likely that many workers will live well outside the region and that the resulting employment multiplier will be further depressed.

The size of the employment multiplier further depends on amount of purchases a CAFO makes in the region. However, large scale animal production facilities are more likely to purchase their inputs from a great distance away, bypassing local providers in the process.[14] A 1994 study by the University of Minnesota Extension Service found that the percentage of local farm expenditures made by livestock farms fell sharply as size increased. Farms with a gross income of $100,000 made nearly 95% of their expenditures locally while farms with gross incomes in excess of $900,000 spent less than 20% locally.[15]

Confined animal production can occasionally benefit local grain sellers, but only when it consumes all the grain produced in the county. If the county has to export even one bushel of grain, all the grain in the county will have to be priced at a lower level that will enable the grain to compete in the export market.[16]

(2) Constraints on Regional Economic Development Due To Taxes

Federal, state and local taxes are levied on taxable amounts calculated on federal returns. The numerous tax write-offs that are possible because CAFOs are sometimes treated as industries and, at other times, treated as farms, significantly decrease the amounts of taxes paid locally. At the same time the operations of the CAFO create social, health and traffic costs that the local government must finance. The local government, in turn, must rely on increased taxes to pay these CAFO-induced costs--and this can decrease other economic activity in the region.

For example, additional costs associated with hosting a CAFO include increased health costs, traffic, accidents, road repairs, and environmental monitoring. One Iowa community estimated that its gravel costs alone increased by about 40% (about $20,000 per year) due to truck traffic to hog CAFOs with 45,000 finishing hogs. Annual estimated costs of a 20,000 head feedlot on local roadways were $6447 per mile due to truck traffic.[17] Colorado counties that have experienced increases in livestock operations have also reported increases in the costs of roads, but specific dollar values are not available.[18] In addition, an Iowa study found that while some agricultural land values increased due to an increased demand for "spreadable acreage," total assessed property value, including residential, fell in proximity to hog operations.[19]

(3) Constraints on Regional Economic Development Due To Vertical Integration

Vertical integration requires purchases from and sales to other members of the vertically integrated company, not from local producers and suppliers. Thus, vertically integrated companies stimulate regional economies only to the extent that all elements of the company are located in the region. Historically, this factor has severely limited the economic impact of CAFOs on the regions in which they are situated. For example, Lawrence found that in Iowa smaller hog operations (less than 700 head annually) purchased 69 percent of their feed within 10 miles of the operation. Large hog operations (2000 or more hogs per year) that are more likely to be vertically integrated only purchased 42 percent of their feed within 10 miles of the operation.[20]

Tweeten and Flora also find that consolidation affects the ability of small producers to respond to shifting demand by entering or leaving markets. Large CAFOs tend to have higher overhead costs (fixed costs for facilities and equipment) than operating costs (variable costs for labor and feed). This

means that in hog CAFOs, large buildings must be kept full in order to minimize cost/unit and in the face of falling prices, large CAFOs will increase production because it lowers their overall cost to produce each pig.

Conversely, conventional operations have lower fixed costs and higher variable costs. These operations will reduce their production in a time of falling prices. Thus, in the past, the burden of adjusting hog supply to weak demand has fallen on small producers and it has driven most of them out of the market.[21] The demise of the majority of small producers has created a dilemma for large hog CAFOs because it signals an end to the period when overproduction by large producers can be absorbed by forcing small producers out of the market. To address this problem, large hog agribusiness appears to be creating another class of small farmers—contract operators--who can be cut out of the market when demand falls. Since the fate of these individuals is entirely in the hands of large agribusiness concerns, it will be easy to quickly create slack in the markets when hog prices fall by simply canceling contracts and removing hogs from the contract producers.

(4) Constraints on Regional Economic Development Due To Cost Shifting

The previous three sections have described the reasons inherent in the structure of CAFOs that most of the money from a CAFO will either be directly spent outside the region or it will quickly migrate there. However, through cost shifting the CAFO will also leave the costs of its odor, health risks, surface water pollution, ground water pollution and in the long run, its abandoned lagoons and facilities for the region to deal with. For example, these costs may arise from:

(1) The Cost of Odor From Injecting or Broad-Casting Manure

Actual field tests on injection odor were conducted in Iowa in 1998 by Iowa State University. The researchers found that injecting manure resulted in odor reductions of as little as 50% and never greater than 75% compared to broad-cast applications (application by sprinkler--the highest odor option.)[22] Thus, injection of manure can be accompanied by substantial odor.

(2) The Cost of Groundwater Contamination From Manure

Ruhl studied earthen basins with above-grade, earth-walled embankments and compacted clay liners. The hog basins held a manure-water mixture from a 5000 pig gestation barn. Monitoring systems were installed below the compacted clay liners both in the sides and the bottom of the basin. Seepage from the basin ranged from 400-2200 gallons per day except during one month and three month periods when 3800 to 6200 gallons per day. Seepage flow in areal units ranged from .025 to .43 inches/day. Except during the first three months when the basin was filling, seepage flow was greater through the sidewalls than through the bottom of the basin. The seepage had concentrations of 11 to 100 mg/L of chloride, 2.58 mg/L or less of ammonium-N, 25.7 mg/L or less of nitrate-N, and organic-N concentrations of .92 mg/L or less. Nitrate-N concentrations in the seepage exceeded the US Environmental Protection Agency drinking water standard of 10 mg/L in 17 of 22 samples.[23]

Injection of liquid manure is only acceptable in areas where pathways to the underlying groundwater do not exist. Improperly closed wells are a likely source of groundwater contamination. For example, based on a number of scientific studies, the US Department of Agriculture's Agricultural Waste Management Field Handbook states specifically that

(n) Presence of abandoned wells and other relics of past use

> The site and its history should be surveyed for evidence of past use that may require special design considerations…. If an abandoned well exists on the site, special efforts are required to determine if the well was sealed according to local requirements. An improperly sealed well can be a direct pathway for contaminants to pollute an aquifer. Other remnants of human activity, such as old foundations, trash pits, or filled-in areas, require special design or site relocation.[24]

The Field Handbook also stresses that caution is necessary because openings formed after initial deposition or formation of the soil enable contaminants to move to the groundwater with little attenuation (reduction) or filtration. [25]

(3) Potential Costs from Pathogens, Chemical and Antibiotics in Manure

A large number of diseases are present in animal manure. These diseases are not present in inorganic fertilizers. Table 2 shows that the potential presence of 25 different diseases in animal manure make this form of fertilizer very different from the inorganic chemicals that are used as crop fertilizer.

Table 2, Diseases and organisms spread by animal manure

Disease	Responsible organism	Disease	Responsible organism
Bacterial		Viral	
Salmonella	Salmonella sp	New Castle	Virus
Leptospirosis	Leptospiral pomona	Hog Cholera	Virus
Anthrax	Bacillus anthracis	Foot and Mouth	Virus
Tuberculosis	Mycobacterium tuberculosis Mycobacterium avium	Psittacosis	Virus
Johnes disease	Mycobacterium paratuberculosis	Fungal	
		Coccidioidomycosis	Coccidoides immitus
Brucellosis	Brucella abortus Brucella melitensis Brucella suis	Histoplasmosis	Histoplasma capsulatum
		Ringworm	Various microsporum and trichophyton
Listerosis	Listeria monocytogenes	Protozoal	
Tetanus	Clostridium tetani	Coccidiosis	Eimeria sp.
Tularemia	Pasturella tularensis	Balantidiasis	Balatidium coli.
Erysipelas	Erysipelothrix rhusiopathiae	Toxoplasmosis	Toxoplasma sp.
Colibacilosis	E.coli (some serotypes)		
Coliform mastitis Metritis	E.coli (some serotypes)	Parasitic	
		Ascariasis	Ascaris lumbricoides
		Sarcocystiasis	Sarcocystis sp.
Rickettsial			
Q fever	Coxiella burneti		

Source: Agricultural Waste Management Field Handbook, United States Department of Agriculture Soil Conservation Service, April, 1992, p. 3-13, 3-14.

The pathogens present in hog manure are not found in inorganic chemicals. These pathogens could be transported to ground water supplies through improperly sealed wells or other naturally occurring pathways. Studies released since 1999 have found that:

(a) Swine herds are a potential animal reservoir for Swine Hepatitis E Virus and this virus is present in fields to which manure has been applied and in water waste from these fields. Swine Hepatitis E Virus may persist in the environment for at least 2 weeks and possibly longer.[26]

(b) A broad profile of chemical and microbial constituents are present in both ground and surface water proximal to large-scale swine operations--chemical (pesticides, antibiotics, heavy metals, minerals, and nutrients) and microbial (Escherichia coli, Salmonella sp., Enterococcus sp., Yersinia sp., Campylobacter sp., Cryptosporidium parvum) contaminants were present.[27]

(c) Antibiotics are present in waste generated at confined animal feeding operations and may be available for transport into surface and ground water.[28]

(4) The costs of closing hog lagoons

In South Carolina, where the state has been forced to assume responsibility for closing hog lagoons, the cost has averaged $42,000 per surface acre of lagoon. These costs are paid by the taxpayers of state, not the companies that created the lagoons.[29] By comparison, The Big Sky Farming Group, LLC proposed a total remediation cost—including lagoon closure--of less than $1 million for a 55,000 sow farrow-to-finish operation that had 160 sow barns, 240 finishing barns, 527 acres of 5 foot deep evaporation pits, 141 acres of 11-12 foot deep settling pits, and 30 digesters for methane production.[30]

Not surprisingly, costs shifted to the residents in a region by CAFOs adversely impact the value of neighboring property in the region and this, in turn, lowers the taxable value of these properties. Palmquist et al., in a 1995 study in North Carolina, found that neighboring property values were affected by large hog operations based on two factors: the existing hog density in the area and the distance from the facility. The maximum predicted decrease in real estate value of 7.1 percent occurred for houses

within one-half mile of a new facility in a low hog farm density area. A 1997 update of this study found that home values decreased by $.43 for every additional hog in a five mile radius of the house. For example, there was a decrease of 4.75% (about $3000) of the value of residential property within 1/2 mile of a 2,400 head finishing operation where the mean housing price was $60,800. [31] A 1996 study by Padgett and Johnson found much larger decreases in home value than those forecast by Palmquist. In Iowa, hog CAFOs decreased the value of homes in a half-mile radius by 40%, within 1 mile by 30%, 1.5 miles by 20% and 2 miles by 10%.[32]

Costs such as those in (1) to (4) above can also directly affect both long and short run regional economic development. As Tweeten and Flora note, costs of odor-, waste-, and pest-control need to be charged to the producing units and not to their neighbors or to other "downstream" parties.[33] Unfortunately, the costs of hog CAFOs are currently charged to the residents of the region and the regional effect of this cost shifting is felt both in its impacts on current residents and on those residents and businesses that do not move to the region due to the presence of these costs. Put bluntly, every company and every potential resident have many choices of location and active recruitment is practiced by most regions. Quality of life is a major factor in decisions to locate in a region, and neither companies nor potential residents would never consider locating in an area where a large hog CAFO is operating.

---

[1] Abeles–Allison, M. and L. J. Connor. 1990. *An analysis of local benefits and costs of Michigan hog operations experiencing environmental conflicts*. Agricultural Economics Report No. 536. Department of Agricultural Economics, Michigan State University, East Lansing.

[2] Chapin, Amy R. and Boulind ,Charlotte M., Environmental and Public-Health Risks Associated with Industrial Swine Production, 1999 USGS AFO Meeting, Session B, Fort Collins, CO., September, 1999, http://water.usgs.gov/owq/AFO/proceedings/afo/index.html.

[3] Tweeten, Luther G. and Flora, Cornelia B., Vertical Coordination of Agriculture in Farming-Dependent Areas, Council for Agricultural Science and Technology, Task Force Report No. 137, Department of Agricultural, Environmental, and Development Economics, The Ohio State University, Columbus, Ohio and North Central Regional Center for Rural Development, Iowa State University, Ames, Iowa. March 2001, p. 32.

[4] Ibid.

[5] Ibid.

[6] Gómez, Miguel I. and Zhang, Liying, Impacts of Concentration in Hog Production on Economic Growth in Rural Illinois: An Econometric Analysis, Presented at the American Agricultural Economics Association annual meeting in Tampa, Florida, July 31 to August 2, 2000.

[7] Palmquist, R.B., F.M Roka, and T. Vukina. 1997. "Hog operations, environmental effects, and residential property values," *Land Economics*, 73, 114-124.

[8] Mubarak, Hamed, Johnson, Thomas G., and Miller, Kathleen K., The Impacts of Animal Feeding Operations on Rural Land Values, Report R-99-02, College of Agriculture, Food and Natural Resources, Social Sciences Unit, University of Missouri – Columbia, May 1999, http://www.cpac.missouri.edu.

[9] Park, Dooho, Lee, Kyu-Hee, and Seidl, Andrew, "Rural Communities and Animal Feeding Operations," Department of Agricultural and Resource Economics, Colorado State University, Ft. Collins, CO, 1988.

[10] Ikerd, John E., "Sustainable Agriculture: An Alternative Model for Future Pork Producers," in The Industrialization of Agriculture, Jeffrey S. Royer and Richard T. Rogers, eds., Ashgate Press, Brookfield, VT, 1998, pp. 281-283.

[11] Chism, J. and R. Levins. 1994. *Farms spending and local selling: How much do they match up?* Minn Agric Econ 676:1–4 and Henderson, D., L. Tweeten, and D. Schreiner. 1989. *Community ties to the farm*. Rural Dev Perspect 5(3):31–35.

[12] Sporleder, T. 1997. Ohio Food Income enhancement program. Agricultural, Environmental, and Development Economics Department, Ohio State University, Columbus, p. 9.

[13] RIMS II, Department of Commerce, Bureau of Economic Analysis, Washington, DC, October, 1997.

[14]Lawrence, John D., et al., "A Profile of the Iowa Pork Industry, Its Producers, and Implications for the Future," Staff Paper No. 253, Department Of Economics, Iowa State University, 1994.

[15] Chism, John, and Levins, Richard, "Farm Spending and Local Selling: How Do They Match Up?," Minnesota Agricultural Economist, no. 676, University of Minnesota Extension Service, Spring, 1994.

[16] Hayes, Dermot, Iowa's Pork Industry--Dollars and Scents, Iowa State University, January, 1998.

[17] Duncan, M.R., Taylor, R.D., Saxowsky, D.M., and Koo, W.W., "Economic Feasibility of the Cattle Feeding Industry in the Northern Plains and Western Lakes States," Agricultural Economic Report No. 370, Department of Agricultural Economics, North Dakota State University, 1997.
[18] Park et al., op. cit.
[19] Ibid.
[20] Lawrence et al., op. cit.
[21] Tweeten, Luther G. and Flora, Op. Cit., p. 32.
[22] Powers, W. J., " Strategies to Reduce Odors During Land Application", Odor Control for Livestock Systems, Department of Animal Science, Iowa State University, Ames 50011-3150, 1999, p. 171, 174.
[23] Ruhl, James F. "Quantity and Quality of Seepage from Two Earthen Basins Used to Store Livestock Waste in Southern Minnesota, 1997-98--Preliminary Results of Long Term Study," US Geological Survey, Mounds View, MN, 1999, a paper presented at the conference on "Animal Feeding Operations--Effects on Hydrological Resources and the Environment," Colorado State University, Fort Collins, CO, August 30-Sept 1, 1999.
[24] Agricultural Waste Management Field Handbook, United States Department of Agriculture Soil Conservation Service, April, 1992, Chapter 7.
[25] Ibid.
[26] Yuory ,V., Karetnyi, Nelson, Moyer, Mary, Gilchrist, J.R. and Naides, Stanley J., Swine Hepatitis E Virus Contamination in Hog Operation Waste Streams--An Emerging Infection?, 1999 USGS AFO Meeting, Session C, Fort Collins, CO., September, 1999, http://water.usgs.gov/owq/AFO/proceedings/afo/index.html.
[27] Campagnolo, Enzo R., Currier, Russell W., Meyer, Michael T., Kolpi, Dana, Thu, Kendall, Esteban, Emilio and Rubin, Carol S., Investigation of the Chemical and Microbial Constituents of Ground and Surface Water Proximal to Large-Scale Swine Operations, 1999 USGS AFO Meeting, Session C, Fort Collins, CO., September, 1999, http://water.usgs.gov/owq/AFO/proceedings/afo/index.html.
[28] Meyer, Michael T., Bumgarner, J.E., Daughtridge, J.V., Kolpin, Dana, Thurman, E.M. and Hostetler, K.A., Occurrence of Antibiotics in Liquid Waste at Confined Animal Feeding Operations and in Surface and Ground Water, 1999 USGS AFO Meeting, Session D, Fort Collins, CO., September, 1999, http://water.usgs.gov/owq/AFO/proceedings/afo/index.html.
[29] State of South Carolina Data reported in The Squealer, ARSI@juno.com, March 26, 2001.
[30] Application for Conditional Use Permit, Before the Board of County Commissioners, Cassia County, Idaho, CU991002, October 12, 1999, and verbal and written clarifications of the nature of the Big Sky organization given at that meeting and during the permitting process until January, 2001.
[31] Palmquist, R. B. et al., "The Effects of Environmental Impacts from Swine Operations on Surrounding Residential Property Values," Department of Economics, North Carolina State University, Raleigh, North Carolina, 1995.
[32] Park et al., op. cit.
[33] Tweeten and Flora, Op. Cit., p.6.