

# Concentrated Animal Feeding Operations and Proximate Property Values

by John A. Kilpatrick

Concentrated animal feeding operations (CAFOs) are often called “feed-lots.” They may include facilities where animals are raised or where animals are brought for slaughter. The common denominator is a large, perpetual inventory and density of animals.<sup>1</sup>

Currently, the USDA and the EPA estimate that livestock in the United States produces 130 times the amount of manure produced by the entire human population of this country. Spills from CAFOs have killed fish in several states; phosphorus in land and water has been correlated with livestock density; and manure has caused eutrophication and degradation of U.S. waterways.<sup>2</sup>

The trend toward CAFOs has been rapid and pronounced in the U.S., but federal and state laws generally are considered to have some gaps. In addition to water quality issues resulting from manure and waste run-off, these facilities attract flies and other insects and pests that parasitize the insects.<sup>3</sup>

Professor John Ikerd, an agricultural economist with the University of Missouri at Columbia, sums up the problems quite succinctly in a recent working paper when he says, “Piling up too much ‘stuff’ in one place causes problems.” Writing specifically about swine CAFOs, he goes on to comment, “If you spread out the hogs and let hog manure lay where it falls in a pasture, it doesn’t bother anyone very much. But if you start collecting it, flushing it, spreading and spraying it around—all normal practices in confinement hog operations—it becomes air pollution.”<sup>4</sup>

Because of the noxious and obvious problems associated with CAFOs, many states have enacted severe restrictions on permits. For example, in 1997 the

## abstract

Property located near a concentrated animal feeding operation (CAFO) will be negatively impacted by this externality. The degree of impairment depends on proximity and property type and use. Properties with higher unimpaired values are probably impacted more than otherwise lower-valued properties.

1. Numerous documents were reviewed to develop this section, see subsequent footnotes for details. Much of the nomenclature comes from Drew L. Kershen, JD, and Chuck Barlow, JD, “Concentrated Animal Feeding Operations and Water, Air, Land, and Welfare.” A report of the American Bar Association Special Committee on Agricultural Management Roundtable II on Environmental Challenges in Animal Feeding Operations, (September 23, 1999).
2. Stephen Jann, “Recent Developments in Water Pollution Control Strategies and Regulations.” Presented at the American Bar Association Special Committee on Agricultural Management Roundtable II on Environmental Challenges in Animal Feeding Operations, Minneapolis, MN, (May 12, 1999).
3. Smith-Comeskey Ground Water Sciences, “Concentrated Animal Feeding Operations – Resources for Environmental Responsibility.” Working paper (April 1, 2000). See <<http://www.groundwatersystems.com/agwaste.html>> for more details.
4. John Ikerd, “Social, Economic, and Cultural Impacts of Large-Scale, Confinement Animal Feeding Operations.” Working paper, University of Missouri (March 2, 2001).

legislature of typically livestock-friendly Oklahoma mandated setbacks and other pollution controls, and in 1998 that legislature enacted a moratorium on new livestock permits.<sup>5</sup> Kansas is another typically agriculture-friendly state that recently has enacted a moratorium on CAFOs, and it is considering legislation to end CAFOs.<sup>6</sup> In 1998, the North Carolina legislature, faced with unregulated establishment of CAFOs, enacted House Bill 1480, which mandated the registration of growers for integrators, extended a moratorium, and mandated substantial elimination of both atmospheric emission of ammonia and odor beyond the boundary of existing CAFOs.<sup>7</sup> Minnesota enacted similar odor control legislation in 1997 and established both a complaint control protocol and an enforcement response protocol specific to CAFOs.<sup>8</sup>

### **CAFOs and the Value of Nearby Real Estate**

A CAFO impacts the value of proximate properties to the extent that the CAFO is viewed, in the market, as a negative externality.<sup>9</sup> As an externality, it is typically not considered to be economically “curable” under generally accepted appraisal theory and practice.<sup>10–12</sup> Some of this loss in value may be attributable to stigma, when there are unknowns and risks associated with ownership of the property.

### **Impairment and Value—An Overview**

From an economic perspective, the rights enjoyed by a fee-simple owner fall into three categories:

1. Right of use and enjoyment
2. Right of exclusion
3. Right of transfer<sup>13</sup>

It is important to note that in the U.S. property itself is not “owned,” but rather the rights of the property are owned.<sup>14</sup> The ability to delineate these rights, and the ability of owners to transfer some or all of these rights voluntarily is a necessary condition for property valuation.

### **Use and Enjoyment**

The first of these rights, that of use and enjoyment, is generally interpreted to mean that the owner may determine how property will be used, or if it is to be used at all. The right of use traditionally is limited in western culture by both public restrictions (e.g., eminent domain, police power) and private restrictions (e.g., liens, mortgages). Private restrictions are generally voluntary, and property owners willingly submit to the disutility of such restrictions in trade for some other economic benefit. For example, a property owner will issue a mortgage to a lender in trade for leverage in the purchase. Also, a homeowner will purchase in a subdivision with covenants and restrictions in trade for the assurance of uniform property use within the neighborhood. It is noteworthy that the voluntary acceptance of private restrictions is always in trade for some economic compensation. For example, a property owner may grant a scenic easement, which restricts the use and enjoyment of his or her property, but will expect to be compensated for that easement.

An impairment often places a restriction on the right of use without some economic compensation. This is illustrated in potential restrictions that may be placed on the use of real estate due to a physical impairment and can thus limit the property to something less than its highest and best use. For example, odor or flies from a nearby CAFO will restrict the use and enjoyment of impaired property without compensation.

5. Michelle Stephens, “NGO and Grassroots Perspectives and Action.” Presented at the American Bar Association Special Committee on Agricultural Management Roundtable II on Environmental Challenges in Animal Feeding Operations, Minneapolis, MN, (May 12, 1999).

6. Roger Myers, “Graves May Lift Licensing Ban on Large-Scale Hog Farming,” *The Topeka Kansas Journal* (24, 1998).

7. Michael C. Williams, “CAFO Odor Control Options.” Working paper, North Carolina State University, presented at the American Bar Association Special Committee on Agricultural Management Roundtable II on Environmental Challenges in Animal Feeding Operations (September 23, 1999).

8. Michael Sullivan, “Minnesota’s Program Regarding Hydrogen Sulfide Emissions from CAFOs.” Working paper, Minnesota Pollution Control Agency, presented at the American Bar Association Special Committee on Agricultural Management Roundtable II on Environmental Challenges in Animal Feeding Operations (September 23, 1999).

9. For a thorough discussion in this context, see Appraisal Institute, *The Appraisal of Real Estate*, 11th Ed. (Chicago: Appraisal Institute, 1996): 46–48, 336–337, 398.

10. *Ibid.*, 336–337.

11. For a discussion of the incurability of external obsolescence, see Hal Smith and John Corgel, *Real Estate Perspectives*, 2nd Ed. (Boston: Irwin, 1992): 524.

12. Under some circumstances, such as a class-action suit, the externality may be curable. However, when considering one impacted parcel alone, the externality probably is not economically curable.

13. While owners’ rights are delineated in many texts, this specific characterization is derived from Austin J. Jaffee and Demetrios Louziotis Jr., “Property Rights and Economic Efficiency,” *Journal of Real Estate Literature* (4, 1996): 137–162.

14. Armen A. Alchian and Harold Demsetz, “The Property Rights Paradigm,” *Journal of Economic History* (53, March 1973): 16–27. See also, Harold Demsetz, “Toward a Theory of Property Rights,” *American Economic Review* (57, 1967): 347–373.

## Right of Exclusion

The right of exclusion—often called the right of exclusive use or right of exclusive enjoyment—provides that those who have no claim on property should not gain economic benefit from enjoyment of the property. In other words, the right of use is exclusive to the property owner, and any violation of the right of exclusive use typically carries either payment of compensation to the rightful owner or assessment of a penalty. For example, if “A” trespasses on land owned by “B,” then “A” will be guilty of a crime and a possible criminal penalty may be in order, as well as civil damages. Physical impairment, such as the odor or flies, in effect is a trespass on property rights and violates the right of exclusion.

Society places a high value on the right of exclusion, for justifiable reasons. Exclusion provides that both the current benefits of ownership as well as future benefits accrue only to the rightful owner, and his/her successors and assigns. In the absence of exclusion, the right of use is under constant threat of nullification without just compensation. In an economy without the right of exclusion, property owners would adopt short-term strategies for use, rather than long-term strategies. In an economic sense, this would lead to widespread inefficiency in the allocation of resources. Hence, the right of exclusion carries with it a significant societal good,<sup>15</sup> and thus a significant, societally recognized value.<sup>16</sup>

## Right of Transfer

Finally, the right of transfer provides the owner with the ability to swap one resource for another. An impairment restricts the right of transfer, and may destroy the right of transfer altogether.

## Effects of Negative Externalities on Property Values

Real estate economics and appraisal practice uniformly recognize that many externalities such as contamination may have a negative impact on property values. For example, appraisers are required by the Uniform Standards of Professional Appraisal Practice (USPAP)

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to consider the impacts of such contamination in the value estimation process.<sup>17</sup>

Fitchen<sup>18</sup> was one of the first to look at the value of the rights of a property owner in the face of impairment—in that case, a toxic chemical pollution. As an anthropologist and a professor of anthropology, she looks principally at residential values and considers not only the real aspects of “violation of the home” by contamination (e.g., carcinogenic effects of polluting chemicals) but also the symbolic interference of what she calls “...a threat to the assumptions people have about themselves and the way life is supposed to be.”<sup>19</sup> She notes, “Toxic contamination also attacks the valued institution of homeownership, violating many of the rights that are assumed to flow from the ownership of ones home, including the assumed right to control entry to it....Chemical contamination may affect homeowners more seriously than renters, not only in terms of potential financial loss, but also in terms of devaluation of the achieved status of homeowners.”

Edelstein also deals with this “home” theme, and calls impairment to or near a residence an “...inversion of home...” when “...the previous locus of family security and identity becomes instead a place of danger and defilement.”<sup>20</sup> He builds on previous works, such as Perin<sup>21</sup> and Altman and Chemers,<sup>22</sup> that show the very special place the home has in American society, culture, and economics. Perin states, “Not being a nation of shopkeepers, America

15. See for example, Frank Snare, “The Concept of Property,” *American Philosophical Quarterly* (9, April 1992).

16. George Stigler, “Law or Economics?” *Journal of Law and Economics* (35, October 1992): 455–469.

17. This is specifically covered under USPAP Rule 1-2(e). This is one of the rules from which departure specifically is not permitted. For a thorough discussion of the appraiser’s responsibility see also, J.D. Eaton, *Real Estate Valuation in Litigation* (Chicago: Appraisal Institute, 1995): 128–129, 149–54, 235–37.

18. Janet M. Fitchen, “When Toxic Chemicals Pollute Residential Environments: The Cultural Meanings of Home and Homeownership,” *Human Organization* (48, Winter 1989): 313–324.

19. *Ibid.*, 320.

20. Michael R. Edelstein, “Toxic Exposure and the Inversion of the Home,” *Journal of Architecture Planning and Research* (3, 1986): 237–251.

21. Constance Perin, *Everything in its Place: Social Order and Land Use in America* (Princeton, NJ: Princeton University Press, 1977).

22. I. Altman and M. Chemers, *Culture and Environment* (Monterey, CA: Brooks/Cole Publishing, 1980).

is one of homeowners, busily investing in plant maintenance and expansion with both money and time, keeping the product attractive for both use and sale."<sup>23</sup>

Edelstein specifically stresses the investment diminution aspect of the inversion of home principle. In citing case studies of experiences following neighborhood-wide impairment in the Legler section of Jackson Township in southern New Jersey, he shows that residents could not separate the psychological pride in home ownership from the question of economic value. Surveys of the population found uniformity of opinion that property values had diminished as a result of the problem. While previous studies had focused on the diminution of value from existing homes, Edelstein was one of the first to focus on the opportunity costs stemming from the inability to move. In short, homeowners were stuck holding unsellable homes with stagnant prices, while homes in other neighborhoods were soaring in value. Thus, the owners were harmed not only by the diminution of value in the existing residences, but by the opportunity costs inherent in lost gains from alternative home investments.

### **Value Loss: Stigma Issues**

Edelstein refers, in a general sense, to the issue of stigma as a mechanism for manifestation of value diminution in residential property. Stigma is an increasingly common term in appraisal and real estate economics literature, and refers to a very specific quantitative mechanism by which value is impacted by proximate contamination or negative externalities.

The earliest references to stigma as a quantitative concept in real estate economics appear to be in the writings of Patchin<sup>24</sup> and Mundy.<sup>25</sup> The latter study differentiated between the cost to cure and the cost of stigma. The former is an out-of-pocket

expense born either by the property owner or some other responsible party, while the latter manifests in property value diminution even in the absence of a cost to cure. For example, a property that is completely cured may continue to suffer a diminution in value, and hence damages, because of stigma.

Kilpatrick outlines the quantitative model by which the value of income producing property is reduced by the effects of stigma manifested via increases in market driven capitalization rates.<sup>26</sup> He outlines four components of income producing property value impacts: net operating income, actual cost-to-cure, ongoing increases in maintenance, and stigma. In his model, the stigma losses actually overwhelm the other three factors as a component of value diminution. He concludes that under many circumstances the stigma impacts are actually the greater portion of value losses to property owners.

### **Other Proximate Contamination Issues**

The issue of value loss for proximate contamination or other impacts has been considered in a number of studies, and includes how the citing of an externality, such as a CAFO, can impact nearby values. Some of the earliest researchers, such as Blomquist, looked at the impact of locating a power generating plant,<sup>27</sup> while Guntermann showed that landfills have a negative impact on the value of surrounding industrial property, and that this value loss has a spatial component.<sup>28</sup> Kinnard and Geckler had similar findings for nuclear facilities,<sup>29</sup> as did Kinnard<sup>30</sup> and Kiel<sup>31</sup> for hazardous waste sites.

In a similar vein, Colwell analyzes the property value diminution associated with proximity to power lines,<sup>32</sup> and Kirshner and Moore show that water quality can impact nearby residential property values.<sup>33</sup> Simons's study of pipeline ruptures shows that diminution in value occurs on properties up to two miles from the site of a petroleum spill.<sup>34</sup>

23. Perin, 120.

24. Peter Patchin, "Contaminated Properties—Stigma Revisited," *The Appraisal Journal* (April, 1991): 162–172.

25. William Mundy, "Stigma and Values," *The Appraisal Journal* (January, 1992): 7–13.

26. John Kilpatrick, "Appraisal of Contaminated Property," *Career News* (University of South Carolina, Darla Moore School of Business, August 1998).

27. Glenn Blomquist, "The Effect of Electric Utility Power Plant Location on Area Property Values," *Land Economics* (50:1, 1974): 97–100.

28. Karl Guntermann, "Sanitary Landfills, Stigma and Industrial Land Values," *Journal of Real Estate Research* (10:5, 1995): 531–542.

29. William Kinnard and Mary Beth Geckler, "The Effects on Residential Real Estate from Proximity to Properties Contaminated with Radioactive Materials," *Real Estate Issues* (Fall/Winter, 1995): 25–36.

30. William Kinnard, "Analyzing the Stigma Effect of Proximity to a Hazardous Waste Site," *Environmental Watch* (December, 1989): 4–7.

31. Katherine Kiel, "Measuring the Impact of the Discovery and Cleaning of Identified Hazardous Waste Sites on House Values," *Land Economics* (71:4, 1995) 428–435.

32. Peter Colwell, "Power Lines and Value," *Journal of Real Estate Research* (5:1, 1990): 117–127.

33. D. Kirshner and Deborah Moore, "The Effect of San Francisco Bay Water Quality on Adjacent Property Values," *Journal of Environmental Management* (27, 1989): 263–274.

34. Robert A. Simons, "The Effect of Pipeline Ruptures on Noncontaminated Residential Easement-Holding Property in Fairfax County," *The Appraisal Journal* (July, 1999): 255–263.

## Case Studies

The following cases illustrate the effects of CAFOs and the impact of CAFOs on property value.

### Minnesota Case Study<sup>35</sup>

A homeowner in Minnesota lives about two miles from one swine CAFO and about three-quarters of a mile from a second CAFO. When these CAFOs were first opened in the early 1990s, she was initially a supporter. However, she and her family immediately began suffering illnesses, which they attributed to the proximate CAFOs. She contacted the Minnesota poison control center and for the first time learned about the dangers of hydrogen sulfide emissions. She kept track of her illnesses and weather conditions (e.g., wind and direction) and concluded that her illnesses were caused by the emissions from the CAFOs. Testing was warranted, and on at least one occasion the reading was above 1,000 ppb hydrogen sulfide, well above danger levels.

### North Carolina Study<sup>36</sup>

Palmquist, et. al, were the first to quantitatively determine that the distance from a residence to a CAFO has an impact on residential values. However, their study looked only at residences already near CAFOs and measured the impacts of additional CAFO capacity (either new CAFOs or additional livestock at existing CAFOs) located at 0.5-, 1.0-, and 2.0-mile distances from the residence. Nonetheless, they established a methodological model for spatial impacts of CAFOs.

### University of Minnesota Study<sup>37</sup>

In 1996, the Minnesota Department of Agriculture commissioned a study by researchers at the University of Minnesota on the topic of value diminution resulting from proximate CAFOs. In addition to substantial secondary research in the area, the study authors also conducted primary research into value impacts in that state. Specifically, they conducted a hedonic price analysis on 292 rural residences that were sold during 1993–1994 in two Minnesota

counties. They found a statistically significant pricing impact related both to the existence of a CAFO as well as the distance from the CAFO. In other words, not only does a CAFO have a significant impact on property value, but the nearer the CAFO, the greater the impact. The researchers also found that CAFOs tend to be located near older or lower valued homes. Hence, the pricing impacts in a simple empirical study may be muted by other negative impacts to value, and high-valued residences may be impacted to a greater degree by CAFOs than would be suggested by their findings.

### University of Missouri Study<sup>38</sup>

Following the methodology of the Minnesota study, researchers at the University of Missouri were able to quantify both the average value impact of a CAFO and the impact by distance. An average vacant parcel within 3 miles of a CAFO experienced a value loss of about 6.6%. However, if that parcel was located within one-tenth of a mile from the CAFO (the minimum unit of measure in the study) and had a residence on it, then the loss in value was estimated at about 88.3%.

### Pasco, Washington Case Study<sup>39</sup>

A 309-acre family farm that had been operated for many years produced alfalfa, asparagus, corn, apples, peaches, nectarines, cherries, melons, and a range of garden produce. A CAFO was adjacent to the residence (about ¼ mile away), and consequently the farm product was impacted by dust, flies, fly fecal matter, and odor. The farm was appraised for litigation purposes and a value diminution of over 50% was determined, using traditional farm appraisal methods. The CAFO settled the lawsuit by purchasing the plaintiff's farm and relocating the residents to a nearby farm that was not impacted by the CAFO externalities.

### Michigan Horse Farm Case Study<sup>40</sup>

A horse-breeding operation (owner-occupied farm) is located approximately 1,000 feet from a recently

35. Presentation at the American Bar Association Special Committee on Agricultural Management Roundtable II on Environmental Challenges in Animal Feeding Operations (September 23, 1999). Results of the study not independently validated by the author.

36. R. Palmquist, F. Roka, and T. Vukina, "Hog Operations, Environmental Impacts, and Residential Property Values," *Land Economics* (73:1, 1997): 114–124. Results of the study not independently validated by the author.

37. Steven J. Taff, Douglas Tiffany, and Sanford Weisberg, "Measured Effects of Feedlots on Residential Property Values in Minnesota: A Report to the Legislature," University of Minnesota Staff Paper Series (July, 1996). Results of the study not independently validated by the author.

38. Mubarek Hamed, Thomas Johnson, and Kathleen Miller, "The Impacts of Animal Feeding Operations on Rural Land Values," University of Missouri-Columbia Community Policy Analysis Center Report R-99-02 (May, 1999). Results of the study not independently validated by the author.

39. Mundy Associates, LLC files. Details of case confirmed by property owners.

40. Mundy Associates, LLC files. Details of the case confirmed by property owner and attorneys for both sides.

constructed large scale, pork processing facility. The use and enjoyment of the home has been diminished by airborne externalities, and the ability to use the site as a farm may be compromised as a result of flies carrying animal blood and feces that contain antibiotics and other nuisances. In 2000, the property owner appealed for a property tax reassessment representing a devaluation of over 50% from fair market value, and the county attorney concurred with that appeal.

### Michigan Residence Case Study<sup>41</sup>

A family purchased a “fixer upper” residence in rural Vicksburg, Michigan in 1995. In 1997, a large-scale pork processing facility was located about 700 feet from the home. The reduction in air quality was so severe as to force the residents to abandon their home and move elsewhere. To date, they have not been able to sell the home. The owner of the processing facility offered to compensate them for 60% of the fair market value of the home (i.e., a 60% diminution in value). As of this writing, litigation is pending.

### Summary and Conclusions

The above suggests that the establishment of a CAFO may result in value diminution to other nearby properties. The amount of the value loss is typically an inverse function of distance (closer properties diminish more), a function of property type (newer, nicer residences lose more), and a function of property use (farm will lose value due to diminished productivity and comparative marketability to other farm lands). While the appraisal profession has only begun to quantify the loss attributable to CAFOs, it is clear from the above case studies that diminished marketability, loss of use and enjoyment, and loss of exclusivity can result in a diminishment

ranging from 50% to nearly 90% of otherwise unimpaired value.

When appraising a property located proximate to a CAFO, the appraiser needs to consider seven specific issues, each of which will have an impact on the value conclusions:

1. Type of subject property,
2. Distance to the CAFO,
3. Physical manifestations (e.g., air quality, insects),
4. Engineering/scientific testing performed (e.g., air quality),
5. Impacts on property use (e.g., habitability, rental income or vacancy),
6. Marketability evidence (e.g., time on market of comparable properties), and
7. Impact on highest and best use.

While there is little disagreement that a CAFO has an impact on surrounding property values, the degree of impact is clearly a function of the interplay of these factors.

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**Table 1 Summary of CAFO Impacts**

Case Study	Value Loss	Remarks
Minnesota	N/A	Significant diminution in air quality
North Carolina	N/A	Established distance component to value
University of Minnesota	N/A	CAFO sited near older, less-expensive homes
University of Missouri	Residential 3 miles: 6.6%	
	Residential 0.1 mile: 83%	Quantified average value impact by distance
Washington	Family farm adjacent: 50%	Impact included flies and loss of farm income
Michigan farm	Farm adjacent: 50%	Impact included loss of use as a farm
Michigan residence	Residence adjacent: 60–100%	Residence abandoned, could not be sold

41. Mundy Associates, LLC files. Details of the case confirmed by property owner and neighbors.