



Community Policy Analysis Center

**The Impacts of
Animal Feeding Operations on
Rural Land Values**

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Animal Feeding Operations on
Rural Land Values**

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Executive Summary

Recent trends in agriculture toward larger, more concentrated operations have had both positive and negative impacts on rural communities. Large scale confined animal feeding operations (CAFOs) create positive impacts through job creation and increased tax base, but also negative impacts through odor from manure handling facilities and livestock barns. This report explores only the impacts large scale confined animal feeding operations (CAFOs) have on the value of nearby property, and finds there is a relationship between proximity to a CAFO and the value of property.

Key Findings

- Data were collected on 99 rural land, non-family real estate transactions of more than one acre; 39 of the properties included a house.
- Average price per acre of land in this analysis was \$1,709. The average parcel size was 86 acres.
- Average distance to the nearest CAFO was 2.2 miles.
- 56 percent of the properties had access to a primary road.
- Proximity to a CAFO does have an impact on property values
 - Based on the averages of collected data, loss of land values within 3 miles of a CAFO would be approximately \$2.68 million.
 - Average loss of land value within this 3-mile area would be approximately \$112 per acre.

Issues for the Future

The changing structure of agriculture is an issue that many rural communities are facing, across Missouri and throughout the country. The broad effects that CAFOs have on rural communities are not well documented, as these changes are happening quickly and new studies are frequently emerging. The issues surrounding CAFOs largely rest on individual property rights and equity. Clearly there is an equity issue when long-term residents experience a decrease in property values when a CAFO locates near their property. On the other hand, the rights of farm land owners to invest in, and to operate, livestock operations have frequently been upheld in court decisions.

This report wrestles only with one part of this larger issue. Based on this research, there is a reduction in property values for properties in close proximity to a CAFO. However, this report does not account for overall increases in property values resulting from the increased economic activity attributed to the CAFO.

Questions as to what legal recourses are available to communities and to property owners arise. With very few precedents set to date, communities tackling this issue today will have a large impact on how this issue evolves in the future. The existence of CAFOs is unavoidable; the key to coexistence is to minimize the negative effects of the CAFOs through their location decisions and operating practices while maximizing their economic benefits of job creation and increased tax base.

Introduction

The size and structure of agriculture has changed dramatically over the past few decades. The trend in livestock production has been toward larger, more concentrated operations. This rapid expansion of the industry has increased income and employment opportunities. However, some environmental concerns have arisen over offensive odors released from livestock barns and manure handling facilities, and the movement of nutrients into ground and surface water. These changes in the structure of agriculture have broad impacts on rural communities. This paper deals with one of these impacts. There is concern among many rural residents that large scale CAFOs might have a negative effect on nearby property values.

The selling price of property is determined by a combination of the highest price a buyer will pay for the property, and the lowest price a seller will accept for the property. Proximity to a CAFO could affect the value of property if it affects either of these prices. For example, a seller might accept less for a property to get away from perceived negative effects of the CAFO. Likewise, a buyer might be willing to pay less for a property because of anticipated negative impacts of the CAFO. To the extent that a CAFO may cause these or other changes in the selling and purchase prices of properties is the extent a CAFO affects the nearby property values. The purpose of this report is to first explore if CAFOs impact nearby property values, and if so to determine by how much.

Measuring the Externalities from CAFOs

The potential impacts from CAFOs are considered externalities. Simply put, an externality is the impact, positive or negative, of one person's actions on the well being of a bystander. For example, if loud music being played prevents neighbors from sleeping, there is an externality, because the neighbors' well being is affected. More specifically, an externality is a side effect of an industry that affects the welfare of others, either positively or negatively, and that is not included in the price of producing a good. In other words, society, not the producer, bears the costs for these externalities. An example of an externality is water pollution from a factory dumping waste into a stream. In this example, society's welfare is negatively impacted through the degraded quality of water, but this cost is not reflected in the factory's production costs. Regulations aimed at reducing water pollution from factory dumping are attempts to revert these costs back to the producer.

Concerns have arisen over the potential negative externalities resulting from CAFOs. Odor from livestock housing barns and manure handling facilities may affect nearby residents' well being. Seepage of nutrients into ground and surface water through manure spreading may degrade water quality and thus residents' well being. These externalities, then, might be reflected through lower property values for properties near CAFOs. There are also positive externalities created by CAFOs. Through an increase in job opportunities and the tax base, land values in the county are increased. This report does not attempt to measure the overall increase in property values attributable to the presence of CAFOs in the county. Rather, this report explores the link between externalities caused by a CAFO and the value of property nearby.

Hedonic Pricing Model

Economists use several methods to measure externalities. One method is the hedonic pricing model. According to the hedonic pricing model, the price of a good is the sum of all the prices of the attributes of the good. For example, there is added value to owning a house with a scenic view. The hedonic pricing model attempts to measure the actual value of the scenic view. Therefore, according to the hedonic pricing model, the value of that scenic view is the value of the house with the view minus the price of the house without the view. Using this method, we can attempt to measure the incremental values of certain attributes of property, including how CAFOs affect the values. The attributes of a land parcel that make up its value include location, production values and environmental

characteristics. All of these characteristics contribute to the final price of a parcel of land. Using this technique we can:

- Divide the value of a parcel of land into the prices of its characteristics.
- Determine whether or not an environmental externality affects the value of the parcel of land.
- Measure how much residents value a change in environmental quality.

Data

The data for this study are the rural land market sales in Saline County, Missouri. Information on real estate transactions was compiled from the County Assessor's Office and Recorder of Deeds' Office. The Assessor's tax record allowed us to gather characteristics of these properties. Price information was obtained through personal interviews with realtors, bankers and Assessor's office staff. Data were gathered for real estate transactions that took place between January 1, 1996 to December 31, 1997. Only rural properties were studied – those outside incorporated towns in Saline County. Sales between family members were not included. In total, data for 99 rural land sales were compiled, 39 of which included a house. There are 35 CAFOs in Saline County; 32 are primarily swine, two are beef, and one is poultry.¹

Tables 1a and 1b summarize the data that were collected for each property sale. These are the attributes of land parcels that make up our hedonic pricing model. According to Table 1a, the average price per acre for the 99 land sales was \$1,709, with a range of over \$12,000 per acre. The average size of parcels was 86 acres, and the average distance to the nearest CAFO was 2.2 miles. Distance to the CAFO was measured from the center of the CAFO to the edge of the property sale.

¹ The classification of farms as CAFOs was determined by the Saline County Study Steering Committee.

Attribute	Average Value	Minimum Value	Maximum Value
Price per acre of land (\$)	\$1,709	\$160	\$12,500
Parcel size (acres)	86	0.5	560
Distance of land sale to nearest CAFO (miles)	2.2	.375	6.08

	Percent of Land Sales with Characteristic
<u>Class of land on property:</u>	
Class 1 - 51% or more of land in grades 1, 2 & 3	20%
Class 2 - 51% or more of land in grades 4 & 5	39%
Class 3 - 51% or more of land in grades 6, 7, & 8	16%
Class 4 - Commercial or residential land	25%
Property has access to a primary road	56%
Property includes a house	39%

Table 1b shows the percent of land sales that fall into certain land characteristics. Land was classified into one of four classes based on the class that contained the majority of land in the parcel. Classes 1, 2 and 3 comprise land classified as agricultural. Class 4 land represents land classified as commercial or residential. The eight land grades that make up the agricultural classes are based on the agricultural land productive values from the Department of Revenue State Tax Commission. Grade 1 is prime agricultural land, with highly favorable soil conditions and no restrictions on the use of land. Grades 2 and 3 have more restrictions and less favorable conditions than grade 1. Grades 4 and 5 represent land with limitations, unfavorable soil characteristics, and that requires conservation practices. Grades 6, 7 and 8 represent land that is not suited for cultivation and is very limited in use. In addition, each parcel was classified as having access to a primary road or not, defined as any paved road.

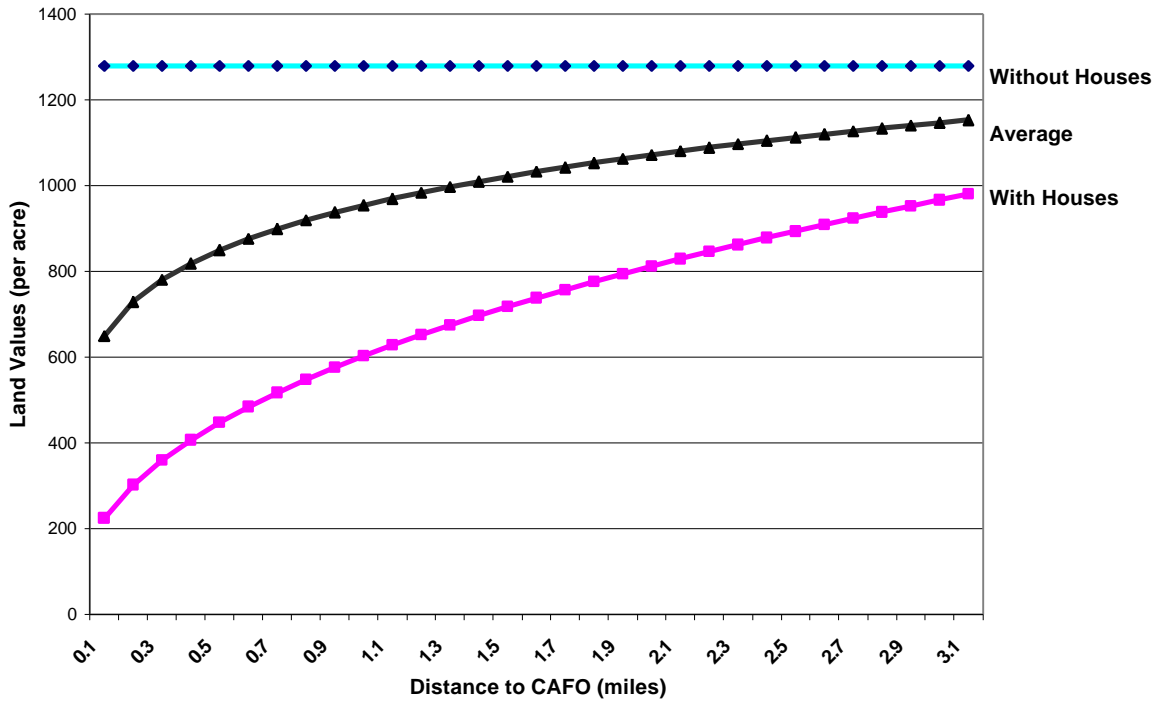
Results

This analysis seeks to estimate the impact each of these attributes has on the value of nearby property. To do this, we use a statistical technique called regression analysis. Regression analysis allows us to see how a multitude of characteristics affects a single variable, called the dependent variable. In our analysis, we are interested in how the different characteristics of the land parcels and their proximity to CAFOs affect the price per acre of the land. Therefore, the price per acre is our dependent variable, because it *depends* on the other characteristics.

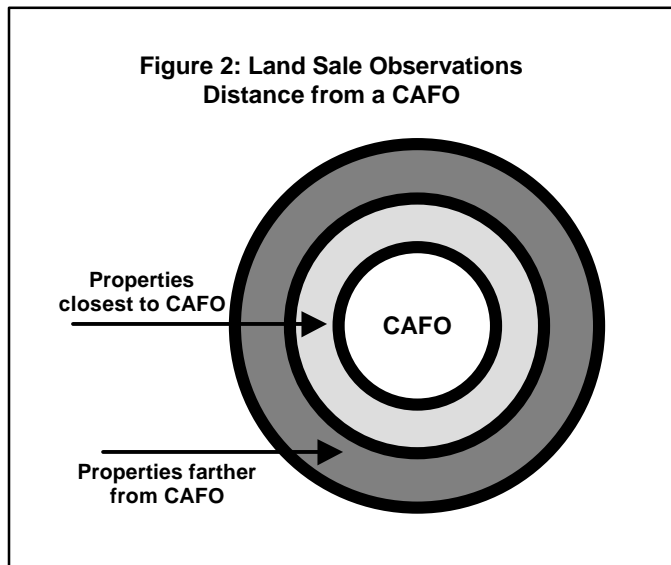
Based on our regression analysis, the distance to a CAFO does have an effect on the value of nearby property if the property has a house on it. Figure 1 shows the effect of CAFOs on land values for the average property, for only those with houses, and for only those without houses. Calculating the aggregate impact of a CAFO on surrounding land values would require specific information about the neighboring properties. If we imagine a 640-acre CAFO in average soil types, with average sized neighboring properties with an average number of houses, then the total loss of land value within three miles of the CAFO would be approximately \$2.68 million. This area includes approximately 24,000 acres, meaning that the average loss of land value is \$112 per acre. It must be kept in mind that this loss occurs only to property with residential structures. It must also be kept in mind that the average is weighted toward land farther from the CAFO, because there are more observations at a greater distance. Figure 2 illustrates this point. If the center circle represents a CAFO, the surrounding property can be captured in rings around the CAFO. There are more acres of land in the darker shaded ring (farther from the CAFO) than in the lighter shaded ring (closer to the CAFO). Thus the \$112 per acre is an average of a small number of acres that experience a relatively large drop in value, and a larger number of acres that experience a relatively small drop in value.

The class of land was also an important determinant in the price per acre of land sales. Land being classified as class 4 (residential or commercial) was the most powerful factor in explaining the sales price per acre. Land in class 1 was also an important determinant of land values, indicating that soil productivity does influence farmland prices, but is overshadowed by small-acreage rural residences with high per acre prices.

**Figure 1: Saline County Hedonic Pricing Results
The Effect of CAFOs on Land Values**



**Figure 2: Land Sale Observations
Distance from a CAFO**



Implications and Discussion

It is important to recognize that this report only measures the *negative* impacts of proximity to a CAFO. There are positive effects felt throughout the county of higher property values that result from increased jobs and tax base attributed to CAFOs. It is not possible to calculate this effect on land values, but it is certain that this would offset some of the local losses of value. Furthermore, the CAFOs represent considerable investments in real property improvements, which will also offset the losses in local assessed property values. Overall, it is likely that the losses calculated in this report significantly overstate the losses to individual landowners and to the local real property tax base.

The Community Policy Analysis Center provides objective analysis and policy decision support for Missouri communities. Located at the University of Missouri-Columbia, CPAC is part of the Social Sciences Unit of MU's College of Agriculture, Food and Natural Resources. Major funding for the Center is provided by the University of Missouri Outreach and Extension.

CPAC scientists work closely with state and local government leaders, local businesses and community groups to provide research and educational programs that will inform key decisions, and assist them in understanding how policy decisions at all levels of government affect their community's quality of life.

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