

A Discussion Of The Likely Economic Impacts Of The Proposed Iron County Agricultural Ordinance

By Dr. William J. Weida
February 12, 2001

**A Discussion Of The Likely Economic Impacts Of The
Proposed Iron County Agricultural Ordinance**

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

February 12, 2001

Executive Summary

1. Any implied contract between a CAFO and Iron County will be based on asymmetrical information that heavily favors the CAFO. This creates what economists call a moral hazard, a process that occurs when one party is better informed than the other about the transaction. A moral hazard leads to higher costs for the least informed party --the residents of Iron County.
2. If monitoring fails or is not effectively implemented, the only other option for controlling the behavior of a CAFO is through economic incentives. However, the CAFO operates to maximize profit, and if it can shift the costs of its waste to someone else, that is what it will do.
3. Strict standards can protect citizens from conditions that could be harmful to the general safety, health or welfare of a community. However, when a moral hazard has been created, violations of standards are unlikely to be detected without monitoring by professional inspectors.
4. A vertically integrated CAFO purchases the majority of its inputs from outside the region and avoids, to the maximum extent possible, paying taxes to local and regional governments.
5. Depending on county zoning ordinances, additional costs of hosting a CAFO may include increased health costs, traffic, accidents, and repairs. One Iowa community estimated 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.¹
6. Iron County benefits from having as residents a large number of the workers (and their income) from CAFOs in Beaver County while it has avoided the costs of actually having these CAFOs located in Iron County.
7. Employment in both Beaver and Iron counties is becoming increasingly non-agricultural and the introduction of the Circle Four CAFO in Beaver County has not stopped the losses in agricultural jobs in either county.
8. Original economic estimates for the Circle Four operation forecast 714 employees by 1999 with 517 of those employees living in Beaver County and 197 living in Iron County. Population increased by about 3000 people over the same period. However, only 406 people in Beaver County were employed in agricultural jobs of any nature in 1999 and population increases since Circle Four Farms began operation were only about 750 people.²
9. Iron County generates 95% of its employment from non-agricultural sources. The county is heavily reliant on tourism and recreation activities. The impact of agriculture on the Iron County economy is small--in 1997 livestock sales for accounted for only \$14 million.³
10. The environment and the quality of life are major factors in decisions to travel or locate in a region, and neither tourists nor companies are likely to travel or locate where CAFOs operate.
11. A new study of 1,106 rural communities found that large hog CAFOs tend to hinder rural economic growth. Growth rates were 55% higher in areas with conventional hog farms as opposed to those

with larger hog operations even though economic growth rates had been almost identical in all communities before the advent of larger hog operations in the 1990s

12. While setback requirements are well defined by the proposed ordinance, the county pays a significant price in reduced alternative uses for the setback areas. It is paying this price to continue an undesirable form of agricultural development in an economic sector of little importance to the economic future of Iron County.

Introduction

The economic model that became capitalism is based on efficiencies from standardization, specialization and concentration of productive resources. As capitalism developed and this model was applied to production activities, social and environmental problems such as child labor, unhealthy working conditions, unfair labor practices, and polluting activities often occurred. Over time, these issues were dealt with in the industrial sector through a framework of laws and regulations.

Capitalism assumes that investment capital will flow to the most efficient use. This should maximize the return to the investor and increase the living standard of all members of society. However, capitalist philosophy neither forecasts, anticipates, nor desires that this search for efficiency levy unacceptable costs on the surrounding society. In fact, if this was an anticipated outcome of reallocating capital to achieve efficiency, the resistance to such reallocation would be so great it would seldom occur.

Recent economic research shows that capital reallocation involved in the transition to Concentrated Animal Feeding Operations (CAFOs) has not worked to the benefit of agricultural communities where CAFOs are located.⁴ However, if the assumptions underlying economic theory are correct, it should. Simply put, conventional farms that can't compete with larger animal-raising operations should transition to other, more efficient uses and this should strengthen the fabric of the community and society in which the farms exist. Instead, the major export of most rural communities is now their youth and the average age of farmers has increased to about 60 years. There are four reasons that these unfavorable outcomes have been realized instead of the benefits that proponents of CAFOs have claimed:

1. The measure of efficiency currently used to guide agricultural investment is based on accounting costs (the costs that show up on the books), not true economic costs (the costs to society.)
2. The revenue stream of the "more efficient" operations contains significant subsidies and, in the non-cost category, tax benefits for the CAFOs.
3. Vertically integrated corporate farms drive smaller producers out of the market and suffer no loss by doing this because the price they receive is the price of the final product--which they also manufacture. Thus, there is no true competition in the raw product market place.
4. And finally, when CAFOs attract capital because they are "more efficient" based on (1) through (3) above, they have the potential to destroy the health, the environment and finally, the economic viability of the surrounding owners of the "less efficient" conventional farms.

Residents of rural regions are usually quick to recognize these problems. However, agriculture's shift to industrial CAFOs has outpaced laws and regulations governing agricultural activities--laws and regulations that were meant for conventional farms and ranches. To protect their citizens in this environment, counties have enacted zoning laws that are meant to control the potentially damaging

activities of large CAFOs. In this respect, the proposed Iron County Agricultural Ordinance follows the same path taken by many other counties and is, in part, designed:

- to balance growth with prudent environmental safeguards and
- to promote effective and cooperative relations between agricultural and other enterprises within Iron County.⁵

This paper discuss the likely impacts of the proposed Iron County Agricultural Ordinance on the economic development objectives of Iron County.

I. ECONOMIC ISSUES CONCERNING WHETHER A CAFO IS LIKELY TO TAKE ALL NECESSARY ACTIONS TO PREVENT OR ELIMINATE ANY ADVERSE IMPACT ON THE PUBLIC HEALTH OR THE ENVIRONMENT RESULTING FROM PERMIT NONCOMPLIANCE

The ability of permitting agencies to gain full information about the operating practices of the CAFO depends on the "contract" established with the CAFO when it applies for its permit. However, there are actually two contracts of interest created when a CAFO enters a region such as Iron County:

1. the contract within the CAFO's vertical organization where information is equally shared (for example, Circle Four Farms was established as a joint venture of Smithfield Foods, Carroll's Foods, Murphy Farms, and Prestige Farms) and where the motives of all players are a consistent and singular search for profit, and
2. the contract between the residents in Iron County and the Circle Four Farms hog CAFO where asymmetrical information exists.

When a CAFO enters a rural region, it strikes a bargain with the rural communities in that region. This implicit contract is usually formed around stated, but not legally enforceable, promises of jobs. For example, in its initial proposal Circle Four claimed it would employ 888 people by 2000 with potential long-term employment being about 2788 people. It further claimed there would be over two hundred of construction jobs in Beaver County in the 1995-1997 period and that by 2000 about 700 of Circle Four's employees would live in Beaver County.⁶

This created a promise of economic benefits in return for land, water, access, power and the other factors that are required for the Circle Four CAFO to operate. This implicit contract also implied a certain physical relationship with the region that manifested itself in the presence (or lack) of pollution, traffic, resource consumption, etc., that arise from the operation of a CAFO.

A CAFO is typically well informed about the legal contract with its organization and the implied contract with the region because it signed the legal contract with the vertical organization (Smithfield, et. al.) and it extended the offers on which the regional contract is based. As the Utah Governor's Office of Planning and Budget has noted,

One effect of vertical integration is that the sale price of hogs to packing plants is internalized within the firm. These prices are often no longer explicit or visible because the transaction occurs within a coordinated entity. Further, many formerly independent operators have entered into contracts with much larger corporations. These contracts may take a variety of forms, but in general specify production practices / conditions and marketing arrangements.⁷

However, the citizens of the region are privy to very little information about the CAFO's explicit contract with its vertical organization. As a result, there is an incentive on the part of the CAFO to shift costs between the contracts based on each party's access to information about those costs. The party with the least information about costs is most likely to have those costs shifted in its direction.

County, state, and national laws and policies on the environment and on zoning are important determinants of the location of CAFO facilities.⁸ Further, these laws and policies affect the ability of CAFOs to control information about their operations and they are major determinants of the role the CAFO will play in the physical, social and economic environment of a region. The issue here is not whether Circle Four Farms can make an implied contract with Beaver or Iron Counties. Instead, the

issue is that this contract will be based on asymmetrical information that heavily favors Circle Four Farms. Such a contract is likely to work in only one direction--it is likely to increase the profits of Circle Four Farms by shifting the operating costs of the CAFO either to the region in which it is situated or, through some mechanism of pollution migration, to another region further removed from the CAFO. The certainty of this outcome follows directly from existence of asymmetrical information about the operation of the CAFO and from the motivation of Circle Four Farms.

In theory, the permitting process used to evaluate CAFO applications should insure that the citizens of a region are fully informed about all aspects of the CAFO's proposed operation. If this was indeed the case, there would be no asymmetrical information. However, the nature of the permitting process allows the CAFO operator to acquire an operating permit while withholding significant amounts of information from the residents of the region. This occurs in the following ways:

1. The CAFO's requirements for secure, sterile operating facilities limit public inspection of and knowledge about the CAFO and even limit the overall organizational knowledge of many CAFO employees.
2. The usual position of the CAFO as a contract operator for a larger, out-of-area corporations may limit even the CAFO operator's knowledge of the source of inputs (feeds, antibiotics, etc.), the rationale behind the amounts and types of inputs selected, and the actual value of the product to the owner. For example, according to the Utah Governor's Office of Budget and Planning, "often production contracts...specify the particulars of precisely how hogs must be produced."⁹
3. Out-of-area ownership severely limits the ability of regional residents to determine the motivation, trustworthiness, and credibility of those who own and operate the CAFO and Limited Liability Corporation status (LLC) limits the ability of regional residents to make the operators of the facility financially liable for problems the facility causes.
4. The short life span of CAFOs (normally, ten to twelve years due both to the increasing incidence of hog disease in older facilities and the extreme corrosive atmosphere in the hog barns) and the normal practice of building CAFOs as turn-key operations limits the ability of regions to establish any reliable record of CAFO performance before committing to a fully-constructed operation.
5. And finally, the CAFO permit approval process is usually based on information controlled by the CAFO. Residents of the region seldom have sufficient time to learn enough about the proposal to ask intelligent questions or to do relevant research.

A combination of these factors creates an agreement (contract) between a CAFO like Circle Four and the Iron County region based on non-enforceable promises of jobs and economic development. However, the factual information needed to validly assess the magnitude of the environmental, physical, social and economic costs of the CAFO is not available to the public even though some of this information may be known by the CAFO operator based both on past experience and the design characteristics of the proposed operation. The result is that the county and other permitting agencies have inadvertently created what economists call a moral hazard, a process that occurs when one party is better informed than the other about the characteristics of the transaction. By definition, a moral hazard leads to lower efficiency and to higher costs to the party that is least informed (in this case, a higher cost to the residents of Beaver and Iron counties.)

If it allows this moral hazard to be created, Iron County will then be faced with a second economic condition called adverse selection. There will be an incentive for additional owners of hog CAFOs who also want to shift their costs to the residents of a region to migrate to Iron County. As Milgrom and Roberts note, adverse selection is "a kind of precontractual opportunism that arises when

one party to a bargain has private information about something that affects the other's net benefit from the contract and when those whose private information implies that the contract will be especially disadvantageous for the other party agree to a contract."¹⁰

Casson has laid out the general outline of the relationship that develops between a region and the owners of a CAFO as a result of these factors by noting that:

the crucial question... is whether the other party to the transaction can be trusted. There are two fundamental approaches to engineering or creating trust. The one most commonly used in much of the Western world is to monitor performance through the institutional and legal system and penalize those parties that do not fulfill their negotiated commitments. The alternative approach to engineering trust is to manipulate the incentive structure so that individuals fulfill their commitments based on rewards they receive rather than penalties they incur.¹¹

For an operation like the Circle Four Farms hog CAFO the issue of trust is directly tied to out-of-area ownership and the asymmetrical information in the agreement between Circle Four Farms and the residents of Iron or Beaver Counties. Since the motivation of Circle Four Farms is to create profit, not to control pollution or engage in any of the other social benefits the region may desire, Circle Four can only be trusted to act in its own self interest. The interests of the region could initially be protected by disclosure of full information concerning the operations of the proposed CAFO during permitting. However, due to the factors already discussed, the CAFO controls a large amount of critical information in this part of the process and the only recourse for the region is monitoring by knowledgeable regulators.

Unfortunately, in this proposed Agricultural Ordinance much of the testing and reporting necessary to monitor compliance with zoning laws will either be done by the CAFO itself or, in the case of odor, it will rely on citizen complaints to determine if odor problems exist using "records maintained by neighbors, that show that the CAFO is causing or contributing to an objectionable odor."¹² The County Zoning Administrator's role is essentially one of monitoring the frequency of citizen complaints and receiving responses from the CAFO to these complaints instead of providing professional monitoring of the odor from the CAFOs.

The factors that make it difficult to get information on proposed CAFO operations during the permitting process also complicate the attempts of citizens to monitor CAFO operations. This leads to a condition called low separability. Separability is "...the feasibility to see who has done the work. With low separability, the principal [in this case, Iron County] will face either high control costs or intense cheating."¹³ So far, the history of CAFO operations shows that cheating is likely. And it is made even more likely by the decision to rely on citizen complaints instead of more costly professional monitoring. If monitoring fails or is not effectively implemented, the only other option for controlling the behavior of a CAFO is through economic incentives. But, as previously noted, a powerful economic incentive structure is already in place and this incentive structure has been formalized in the explicit contract between the CAFO and its investors. This contract directs the CAFO to operate in such a way as to maximize profit, and if it can do this by shifting the costs of its waste to its neighbors in the region, that is how it will operate.

A. Specific Impacts

The proposed Iron County ordinance specifies that open air anaerobic lagoons are not adequate wastewater treatment and that superior technology to that accepted in the past by the state of Utah is required.¹⁴ This is very important given the known problems with seepage from the kinds of earthen lined ponds and settlement basins used by most CAFOs. For example, 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.¹⁵

Ham found that after accounting for evaporation, seepage from lagoons could be determined to within +/- .5 mm per day. The lagoons studied ranged in size from .5 to 2.5 ha (1.24 to 6.2 acres) and waste depths between 1.5 and 5.6 m (4.92 to 18.4 feet) and were built with compacted soil/bentonite liners. Average seepage rates were 1.2 mm/day (.05 inch). Calculated nitrogen export losses from seepage were 2000-3000 kg/ha/year (1826 to 2738 pounds/acre/year).¹⁶

In addition, conditions that could be unreasonably harmful to the general safety, health or welfare of the community could easily arise from pathogens that migrated into the ground water supply from the CAFO. For hogs, the pathogens that normal leakage could transfer to the groundwater could include some or all of the 25 diseases in Table 1.

Table 1, 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	Psittacosis	Virus
	Mycobacterium avium		
Johnes disease	Mycobacterium paratuberculosis	Fungal	
	Brucella abortus	Coccidioidomycosis	Coccidoides immitus
Brucellosis	Brucella melitensis	Histoplasmosis	Histoplasma capsulatum
	Brucella suis	Ringworm	Various microsporium and trichophyton
Listeriosis	Listeria monocytogenes	Protozoal	
Tetanus	Clostridium tetani	Coccidiosis	Eimeria sp.
Tularemia	Pasturella tularensis	Balantidiasis	Balatidium coli.
Erysipelas	Erysipelothrix rhusiopathiae	Toxoplasmosis	Toxoplasma sp.
Colibacillosis	E.coli (some serotypes)		
Coliform mastitis	E.coli (some serotypes)	Parasitic	
Metritis		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.

In addition to these problems, studies released in 1999 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. Swine Hepatitis E Virus may persist in the environment for at least 2 weeks and possibly longer.¹⁷

(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.¹⁸

(c) Antibiotics are present in waste generated at confined animal feeding operations and may be available for transport into surface and ground water.¹⁹

These data and scientific and governmental studies indicate that strict standards are necessary to protect citizens from conditions that could be unreasonably harmful to the general safety, health or welfare of the community. However, when a moral hazard has been created, violations of these standards are unlikely to be detected unless the facility is monitored by professional inspectors.

II. WILL THE CAFO CREATE EXCESSIVE ADDITIONAL REQUIREMENTS AT PUBLIC COST FOR PUBLIC FACILITIES AND SERVICES THAT WILL BE DETRIMENTAL TO THE ECONOMIC WELFARE OF THE COMMUNITY?

The Utah Governor's Office of Budget and Planning states that

Increased concentration (horizontal integration) in hog production, processing, and marketing has occurred simultaneously with increased vertical integration of all of these functions. This has resulted in fewer, larger operations dominating production [with] financial ties to packing houses. In the majority of cases, these large producers are part owners in the pork processing operations.²⁰

By definition, a vertically integrated CAFO is structured to purchase the majority of its inputs from outside the region and to avoid, to the maximum extent possible, paying taxes to local and regional governments. Proponents of vertically integrated CAFOs claim that increasing returns to scale occur because of efficiencies that are realized when more capital is brought to a production process--i.e., the larger the operation, the cheaper one can produce hogs. The resulting capital-intensive process has a much higher reliance on machines and technology and is less reliant on labor.

If this was all there was to efficiency, one would expect efficiency of operations to continue to increase as more capital in the form of hogs and buildings was added to a CAFO. However, this is not the case. Efficiency quickly peaks as animal concentration rises because the cost of waste disposal for any CAFO increases sharply after one surpasses the ability of the land to absorb the waste and the cost of disease control rises sharply as concentration is increased. The fact that CAFOs try to avoid these costs by shifting the cost of their waste to the surrounding region makes no difference--the confined operation is still less efficient in an economic sense.

The Efficient Size of CAFO Operations

A team of Purdue University economists recently found that pork industry concentration had increased to the point where the top four pork processing firms controlled 56 per cent of the business.²¹ However, if all the economic costs of CAFO operation are considered, two economic concepts--diseconomies of scale and diminishing marginal returns--both mandate that the efficient size of most animal feeding operations should be relatively small. To understand why smaller and medium sized hog operations have lost market share to the CAFO giants it is necessary to investigate how the expected effect of these two economic concepts has been altered by the actions of the CAFO industry.

The first economic concept--diseconomy of scale—usually comes into play when problems associated with some element of a production process increase much faster than the size of the process itself increases. With hogs such a situation occurs with attempts to control disease and the stress factors that occur during confinement, movement and transportation. The possibility of disease among hogs is so great that a heavy use of antibiotics, limitations with respect to shed populations, the requirement to maintain a sterile site, and time limits on how long hog operations can stay in one spot all act to create diseconomies of scale. In fact, large hog CAFOs are usually limited to ten to twelve years at a site before health factors become so overwhelming that they can no longer be controlled with certainty and the hog operation must abandon the site.

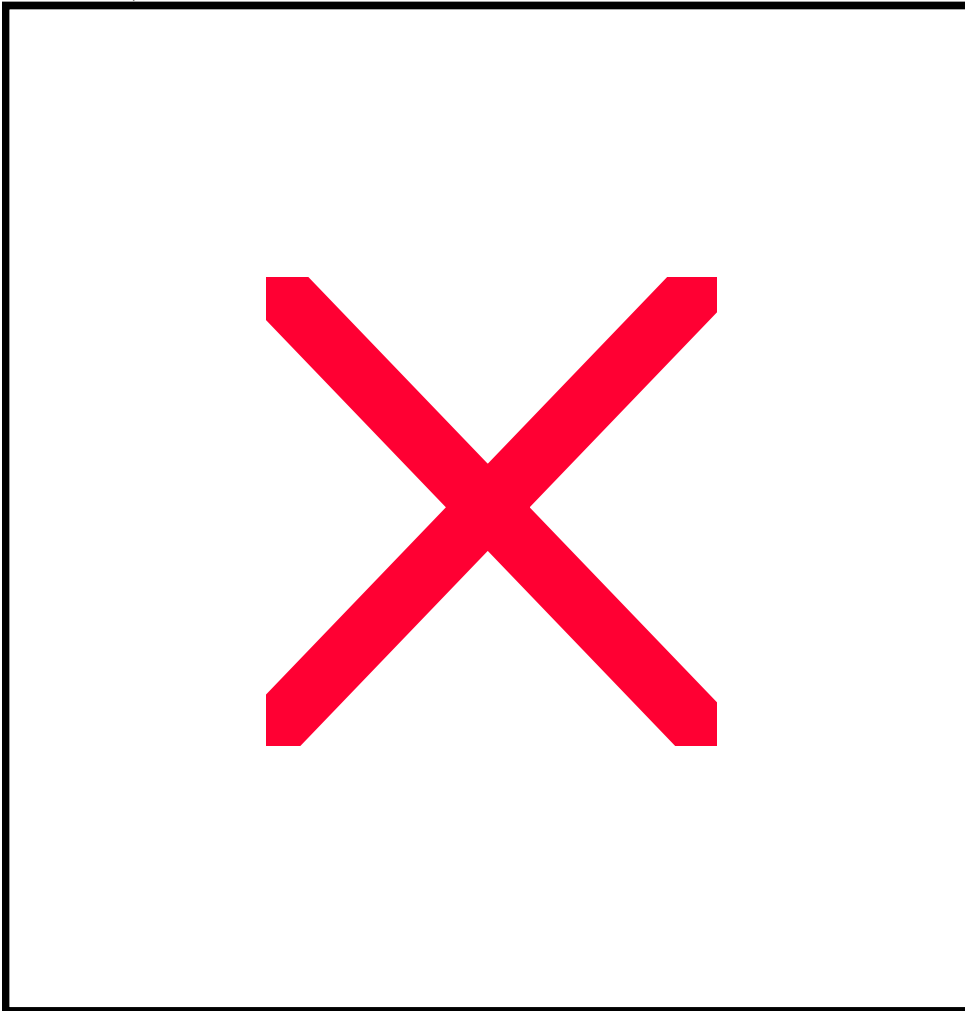
A second, more powerful economic concept called diminishing returns also acts to limit the size of efficient CAFO operations. Under this concept, when units of a variable resource (such as hogs) are added to a fixed resource (such as land) one reaches a point where the marginal product (the revenue gained from the last hog added to the operation less the cost of the last hog added to the operation) of the variable resource begins to decline. Because of the costs of handling animal waste responsibly, the point at which this decline occurs is closely related to the ability of the land on which the CAFO is located, and the land over which the CAFO will apply its waste effluent, to absorb and recycle the manure. If diminishing returns to a CAFO did not exist, all the hogs in the world could be raised on a single, small plot of land.

To overcome these costs, CAFOs have been designed to take full, economic advantage of assumptions about agriculture that allow important costs of CAFO operations to be either omitted or understated in the profit and loss calculations of the CAFO. They also allow the CAFO to take advantage of important tax and investment opportunities that, in effect, subsidize its operation. These factors artificially inflate the amount of profit available from CAFO operations and generate short term gains for developers and investors. This provides an economic incentive for an organizational model that gives rise to the four common attributes of every CAFO:

- (1) The use of capital intensive production methods. CAFOs use less labor and more machinery to achieve production output.
- (2) Employment of a production methodology that maximizes tax benefits and subsidy availability to the corporation.
- (3) The use of vertically integrated operations where separate divisions of the same company produce the different stages of a product and market their output to one another.
- (4) The use of cost shifting to reduce the costs of production. Cost shifting occurs when the costs of health problems, traffic, social problems and pollution (odors, chemical and particulate air pollution; chemical, pathogen, and particulate water pollution) are transferred to the residents of a region and are neither paid by the company responsible for the costs nor included in the price of the products they market.

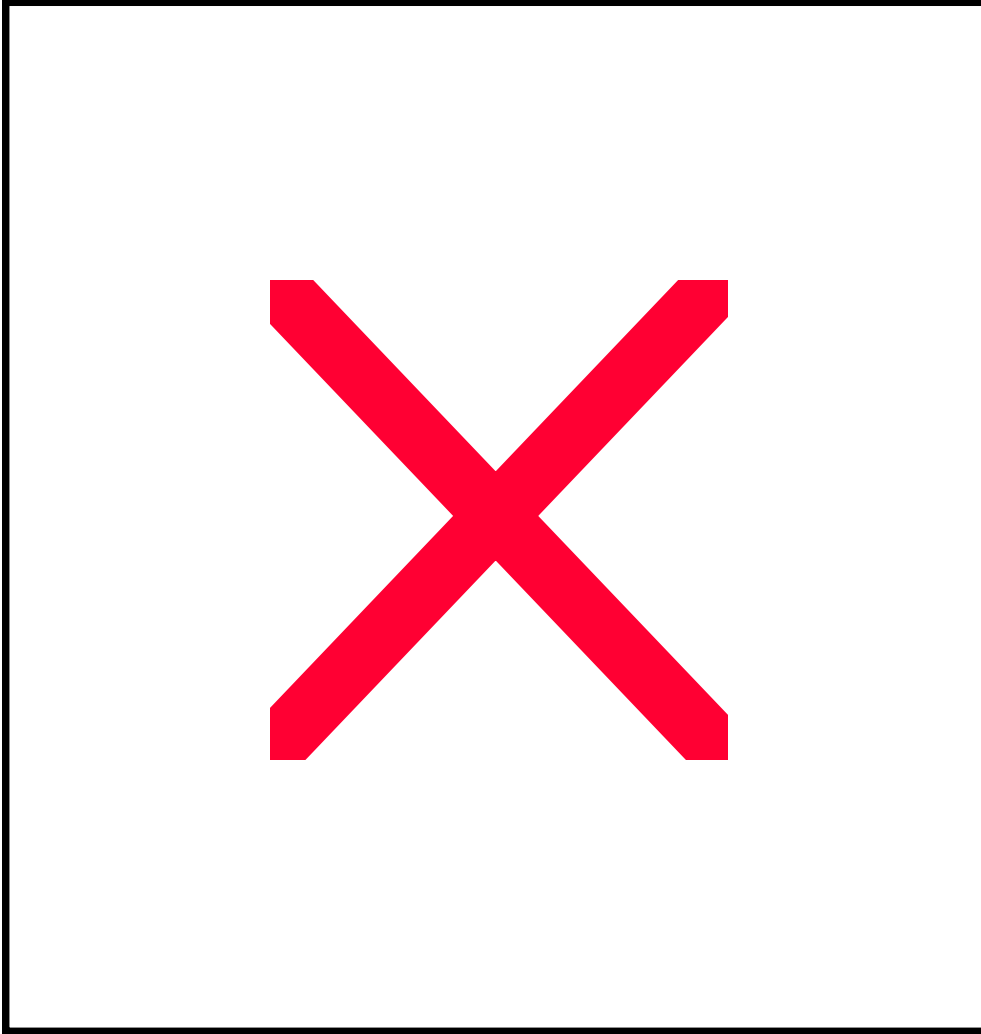
For example, depending on the restrictions in the county zoning ordinances, additional costs associated with hosting a CAFO will include increased health costs, traffic, accidents, and repairs. One Iowa community estimated that its gravel costs increased by about 40% (about \$20,000 per year) due to truck traffic to hog CAFOs with only 45,000 finishing hogs. Annual estimated costs of a 20,000 head feedlot on local roadways were \$6447 per mile due to truck traffic.²² 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.²³ While the costs of wear and tear on the roads can be compared to the taxes paid in Iron County by Circle Four Farms, the costs of the traffic in terms of safety, congestion and pollution are shifted to the residents of the county without reimbursement.

III. THE LIKELY ECONOMIC EFFECT OF THE PROPOSED CAFO ON IRON COUNTY'S ATTEMPTS TO ENCOURAGE THE ORDERLY GROWTH OF THE COUNTY, PROTECT THE TAX BASE AND PROPERTY RIGHTS, STABILIZE AND IMPROVE PROPERTY VALUES, AND PROTECT BOTH URBAN AND NON-URBAN DEVELOPMENT



How the conditions discussed in the previous section are incorporated into the proposed Iron County Agricultural Ordinance will have a major impact on the economic development of Iron County. Currently, Iron County benefits from having as residents a large number of the workers (and their income) from CAFOs in Beaver County while it has avoided the costs of actually having these CAFOs located in Iron County. This trend is likely to persist as long as the quality of life in Iron County remains high. In this respect, it should be noted that there is a significant difference between economic growth and economic development. Economic growth concentrates on short-term changes in jobs or prices while economic development has the objective of creating a diversified economy that is capable of providing jobs, economic stability and economic growth for the citizens of a region over the long term.

CAFOs like the Circle Four Farms hog CAFO in Beaver County are unlikely to diversify the economy of Iron County or to improved the stability of the agricultural base. Figures One and Two show that the employment in both Beaver and Iron counties is becoming increasingly non-agricultural and further, that the introduction of the Circle Four CAFO in Beaver County did not stem the losses in agricultural jobs in either county.



The reason CAFO operations like Circle Four have had such a limited impact on employment is that 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 like Circle Four Farms are specifically structured to limit these kinds of payments. In fact, the issue is not that the Circle Four Farms hog CAFO is unlikely to aid regional economic development, the issue is that any CAFO that is part of a vertically integrated company is structured so it cannot aid regional economic development for the following reasons:

(1) Constraints on Regional Economic Development Due To Employment

As a capital intensive company, a CAFO such as Circle Four’s hog operation has been designed to minimize the number of workers involved and this, in turn, minimizes the economic impact of Circle Four’s proposed operation on Beaver and Iron counties. The original economic estimates for the Circle Four operation forecast 714 employees by 1999 in the Scenario 1 operation with 517 of those employees living in Beaver County and 197 living in Iron County. These employees would bring with them a total population increase of about 3000 people over the same period. However, according to state of Utah

data, only 406 people in Beaver County were employed in agricultural jobs of any nature in 1999 and population increase in the county since Circle Four Farms began operation was only about 750 people.²⁴

There are several reasons these figures are smaller than what was forecast. First, it is clear that a large number of workers at Circle Four Farms have chosen to live far away from the CAFO to avoid the pollution and odor associated with CAFO operations. For the employment multiplier to operate at the levels specified, employees must both live and work in Beaver County. Given the short commute from places like Cedar City, it is likely that most workers live well outside the region and that the actual employment multiplier is much lower than forecast.

Second, a 1998 Colorado State University study found that only about 3-4 direct jobs (jobs with the hog producer) are usually created for every 1000 sows in a CAFO sow farrowing operation.²⁵ This implies that a much smaller number of direct jobs than the figure presented in state forecasts would be created at both the present Circle Four CAFO and at future expansions of this operation. Ikerd calculated that large farrow-to-finish contract hog operations employ about 4.25 people to generate over \$1.3 million in revenue. His figures show that an independently operated hog farm would employ about 12.6 people to generate the same amount of hog sales.²⁶ Based on this estimate, if the same increase in hog production levels proposed by Circle Four Farms were achieved simply by expanding the herd size on existing conventional hog farms, three times as much employment would be created.

The size of the employment multiplier will further depend on amount of purchases that Circle Four makes in the region. Large scale hog production facilities are more likely to purchase their inputs from great distances away, bypassing local providers in the process.²⁷ 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.²⁸

(2) Constraints on Regional Economic Development Due To Taxes

Federal, state and local taxes are levied on the 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 may 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 decreases other economic activity in the region.

(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.²⁹

(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 is likely to leave the costs of its odor, health risks, surface water pollution, ground water pollution and in the long run, its abandoned basins, pits and facilities, for the region to deal with. This directly effects both long and short run economic development.

Up to this point, the economic development of Iron County has proceeded at a healthy rate, but this development has not come from the production of livestock. For example, Iron County generates most of its employment (about 95%) from non-agricultural sources (See Figure 2, above). During the 1990s, the population of Iron County increased at an average annual rate of 4.7% and this was among the fastest rates in Utah.. Total wages for the county were \$263.2 million in 1999, and the unemployment rate in Iron County is the seventh lowest in the state.³⁰

This economic performance did not come from the agricultural sector. It came from the government (27%), trade (23%), and service industries (23%) that accounted for nearly 75% of total non-agricultural employment (1999). In addition, manufacturing firms like Metalcraft Technologies, O'Sullivan Industries, and Smead Manufacturing added to Iron County's growth rate.³¹

Iron County's proximity to Zion National Park and Bryce Canyon National Park, as well as the hosting of the nationally recognized Utah Shakespeare Festival, serve as catalysts for a healthy and growing tourism industry. The county is heavily reliant on tourism and recreation activities. Zion National Park alone averages over 2.5 million visitors each year and expenditures made by these visitors outside of Zion National Park (within a one hour drive), average \$130 for groups and about \$45 for each individual (in 1999 dollars).³²

The limited impact of agriculture on the Iron County economy stands in stark contrast to these non-agricultural economic impacts. While Iron County has 404,574 acres of land in 375 farms, the market value of agricultural products sold was only \$42.1 million in 1997 and of this amount, livestock sales for accounted for only \$14 million.³³

The relative contributions to the economy of each sector must be carefully considered when one plans for the long term economic health of the Iron County region. Every tourist has many choices of areas in which to travel just as every company has many choices of location. Active recruitment of both tourists and companies is practiced by most regions. The condition of the environment and the quality of life are major factors in decisions to travel or locate in a region, and neither most tourists nor most companies would consider traveling or locating in an area where large CAFOs are operating.

A. Likely Property Tax And Economic Development Effects Of CAFO Operations

The proposed changes to the Iron County Land Management Code are, in part, designed to "balance growth with prudent environmental safeguards."³⁴ A major rationale for this objective is to preserve the tax base and to promote economic development in the county. However, the assumed role of CAFOs in achieving this objective is at variance with the conclusions of a large amount of credible research about the actual effects of CAFOs on economic development and the tax base.

For example, on the issue of economic development a new study of 1,106 rural communities by Gómez and Zhang of Illinois State University found that large hog farms tend to hinder rural economic

growth at the local level.. All models in the 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 the 1990s. 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.³⁵

With respect to property taxes, 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 value of 7.1 percent occurred for houses within one-half mile of a new facility in a low hog farm density area. [Note: this would mirror the situation in Iron County where hog farm density is currently low.] 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 \$60,800.³⁶

Large hog facilities have also been shown to have a negative impact on rural residences in other studies. Negative impact decreases as distance from the facility increases and in areas that already have a large number of hog operations.³⁷ 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%.³⁸

A more recent study by Palmquist, Roka and Vulkina (1998) shows that large hog operations tend to depress the sales value of nearby homes and real estate.³⁹ An eighteen month study of 75 rural land transactions near Premium Standard's hog operations in Putnam County, Missouri that was 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.⁴⁰

These findings were further substantiated by a study that found that tax adjustments by county assessors in at least eight states lowered property taxes for neighbors of factory farms. 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 CAFOs

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

And finally, in January, 2001 the Alberta, Canada, Municipal Government Board lowered property taxes on property located around CAFOS. The board considered the following factors:

Odor from the CAFO

Dust, noise and potential danger from truck traffic

Odor and spillage of deliveries to the CAFO

Possible groundwater contamination

Possible groundwater depletion

A general decline in quality of life for residents surrounding the facility.

Based on these considerations, the Board lowered property taxes for residents around CAFOs in the following amounts:

(a) a 50 percent reduction for properties within 2 miles of the CAFO.

(b) a 25 percent reduction for properties located between 2 and 2.5 miles to the north, west and south of the CAFO.

(c) a 25 percent reduction for properties located between 2 and 3 miles to the east of the CAFO.

(d) a 15 percent reduction for properties in the next .5 mile from the areas described in (b) and (c) above.⁴¹

These data lend economic support for the setback requirements in the proposed Iron County Agricultural Ordinance. Since property tax reductions are evidence of both losses incurred by the owners of the property and by the county, whose ability to collect revenues is reduced, they indicate the magnitude of the costs that are likely to be shifted from a CAFO to the surrounding residents. In this light, the setback requirements in the proposed ordinance are a reasonable attempt to shield residents of the county from these costs while, at the same time, providing an indication of the costs of having CAFO operations in the county. By defining the setback requirements in this manner, the costs of hosting a CAFO are reflected in a zone of "non-development" that would be established by the proposed ordinance to fully protect the citizens of the county from the pollution generated by the CAFO. While the dimensions of this "non-development" zone appear to be correctly specified by the proposed ordinance, the county should recognize that it will pay a significant price in reduced alternative uses for these rather substantial areas--and that it is paying this price to continue an undesirable form of agricultural development in an economic sector that is of little importance to the economic future of the county.

¹ 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.

² State of Utah, Governor's Office of Planning and Budget, Demographic and Economic Division, February, 2001, http://governor.state.ut.us/dea/publications/web_hog/h2.htm.

-
- ³ Utah State and County Profiles, url:<http://www.governor.state.ut.us/dea>, November, 2000.
- ⁴ Gómez, Miguel I., and Zhang, Lying, Impacts of Concentration in Hog Production on Economic Growth in Rural Illinois: An Econometric Analysis, Presented at the American Agricultural Economics Association Annual Meeting, Tampa, Florida, August, 2000.
- ⁵ Iron County Planning Commission, Iron County Agricultural Ordinance, Draft 4, January 11, 2001, p. 2.
- ⁶ State of Utah, Governor's Office of Planning and Budget, Demographic and Economic Division, February, 2001, http://governor.state.ut.us/dea/publications/web_hog/h2.htm.
- ⁷ State of Utah, Governor's Office of Planning and Budget, Demographic and Economic Division, February, 2001, http://governor.state.ut.us/dea/publications/web_hog/h2.htm.
- ⁸ Hennessy, David A. and Lawrence, John D., "Contractual Relations, Control, and Quality in the Hog Sector," Review of Agricultural Economics, vol. 21, no. 1, Spring/Summer, 1999, p. 53.
- ⁹ State of Utah, Governor's Office of Planning and Budget, Demographic and Economic Division, February, 2001, http://governor.state.ut.us/dea/publications/web_hog/h2.htm.
- ¹⁰ Milgrom, P. and Roberts, J., Economics, Organization, and Management, Prentice Hall, Englewood Cliffs, NJ, 1992.
- ¹¹ Casson, M., The Economics of Business Culture: Game theory, Transaction Costs and Economic Performance, Clarendon Press, Oxford, England, 1991.
- ¹² Iron County Planning Commission, Iron County Agricultural Ordinance, Draft 4, January 11, 2001, p. 22.
- ¹³ Sauvee, Loic, "Toward an Institutional Analysis of Vertical Coordination in Agribusiness," in The Industrialization of Agriculture, Jeffrey S. Royer and Richard T. Rogers, eds., Ashgate Press, Brookfield, VT, 1998, p. 55, 56.
- ¹⁴ Iron County Planning Commission, Iron County Agricultural Ordinance, Draft 4, January 11, 2001, p. 13.
- ¹⁵ 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.
- ¹⁶ Ham, J.M., "Field Evaluation of Animal Waste Lagoons: Seepage Rates and Subsurface Nitrogen Transport," Department of Agronomy, Kansas State University, Manhattan, KS, 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.
- ¹⁷ 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>.
- ¹⁸ 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>.
- ¹⁹ 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>.
- ²⁰ State of Utah, Governor's Office of Planning and Budget, Demographic and Economic Division, February, 2001, http://governor.state.ut.us/dea/publications/web_hog/h2.htm.
- ²¹ Paarlberg, Philip, "Structural Change and Market Performance in Agriculture: Critical Issues and Concerns about Concentration in the Pork Industry, Testimony before the Senate Committee on Agriculture, Nutrition, and Forestry, Washington, DC, February 1, 2000, in Anthan, George, "Hog-industry concentration assessed," Des Moines Register, Washington Bureau, February 27, 2000.
- ²² 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.
- ²³ 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.
- ²⁴ State of Utah, Governor's Office of Planning and Budget, Demographic and Economic Division, February, 2001, http://governor.state.ut.us/dea/publications/web_hog/h2.htm.
- ²⁵ Park, Dooho, Lee, Kyu-Hee, and Seidl, Andrew, op. cit.
- ²⁶ 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.
- ²⁷ 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.

- ²⁸ 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.
- ²⁹ Lawrence et al., op. cit.
- ³⁰ Utah State and County Profiles, url:<http://www.governor.state.ut.us/dea>, November, 2000.
- ³¹ Utah State and County Profiles, url:<http://www.governor.state.ut.us/dea>, November, 2000.
- ³² Visitor Services Project, Zion National Park, July 12-18, 1992.
- ³³ Utah State and County Profiles, url:<http://www.governor.state.ut.us/dea>, November, 2000.
- ³⁴ Iron County Planning Commission, Iron County Agricultural Ordinance, Draft 4, January 11, 2001, p. 2.
- ³⁵ Gómez, Miguel I., and Zhang, Liying, op. cit.
- ³⁶ 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.
- ³⁷ Lasley, Paul; Duffy, Mike; Ikerd, John; Kliebenstein, Jim; Keeney, Dennis; and Lawrence, John, “Economic Development,” Understanding the Impacts of large-scale Swine Production, Proceeding from an Interdisciplinary Scientific Workshop, Des Moines, Iowa, June 29-30, 1995, p. 123.
- ³⁸ Park et al., op. cit.
- ³⁹ Palmquist, R.B., F.M Roka, and T. Vukina. 1997. “Hog operations, environmental effects, and residential property values,” *Land Economics*, 73, 114-124.
- ⁴⁰ 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>.
- ⁴¹ Alberta Municipal Government Board, Re: Appeals on Roll No. 068044000 et. al., January 4, 2001.