Studying the impacts of industrial confined animal feeding operations:

A review of the literature

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INTRODUCTION

In 1971, Earl Butz insisted that we can no longer "justify a low farm income by the glories of the sunset and the opportunity to associate with nature and that type of thing" (United States Congress- Senate 1971:25). Such emphasis on economic efficiency implies that the future of rural America can be summarized as a logically limited set of options and consequences. Indeed, these days, considerable rhetoric suggests that there are only two options, either a continuation of the "family farm" or its replacement by corporate agriculture. But are these the only options, or are there alternatives? To wonder about such possibilities is to ask the even more fundamental question: what do we want to do with rural America at the end of the twentieth century? Always a remarkable and necessary resource for the nation's prosperity and well-being, is it still possible to think about rural development in ways that give due care and consideration to the sustainability of farm families and farming communities? Is "development" only about the bottom line, or can it also be about an increase in local alternatives for improvement in the quality of people's lives?

Today, one of the most pressing issues focusing attention on these questions has to do with large-scale corporate confined-animal feeding operations (CAFOs) and in some cases the totally integrated processing plant, especially in the pork industry. The rapid rise in corporate hog confinement strongly impacts rural development in at least twenty-seven states (see for examples DiPietre and Watson 1994; Good 1995; Lawrence *et al.* 1994; MSUAES 1992; Nickles 1998; PrairieFire 1993; Thu 1995/96; Thu and Durrenberger 1994a; Thu and Durrenberger 1998). In Colorado for example, producers such as Bell Farms, Farmland Industries, Midwest Farms, National Farms, Western Pork Development, and others have added 100,000 sows to their operations just since 1990 (Center for Rural Affairs 1998). The number of industrial hog producers with at least 10,000 sows grew by more than 40% in 1996 alone, despite a steep rise in feed-corn prices that year. And in 1998, marked by extremely low hog prices, the top 50 producers expanded 14%. Indeed, many industrial hog producers have now undertaken vertical integration that includes providing feed as well as hogs. For example, Continental Grain Company is now the third largest sow producer, Cargill the eighth largest and Purina Mills (Koch) the 11th largest. Of thirteen new integrated production firms established in

1996, five appeared in Minnesota where Bell Farms, Holden Farms, and Christenson Farms and Feedlots were each soon raising more than 15,000 animals, levels which represented as much as 50% growth in a year's time. Murphy Family Farms is the nation's largest hog producer, raising more than 337,000 sows in Missouri, its home-state of North Carolina, Oklahoma, and Illinois, while expanding feeder pig operations throughout the south, Midwest, and southwest.

Hog production has been a notable part of many states' agricultural sector for a long time. Braun and Braun (1998:49) point out that the hog farms have not always been problematic and (writing from Iowa) have constituted a "very old, very large, and in the past, very well accepted industry in our state." They emphasize that what has changed has been the loss of three guiding perspectives which "have allowed Iowa to raise 25 percent of the hogs in the nation for the last 120 years without negative front-page headlines and continual neighborhood conflict." That former vision depended on respect for the need to keep hog operations socially acceptable, economically beneficial, and environmentally sustainable.

But the 1990s have seen remarkable moves toward the corporatization of the operations involved. According to Rhodes (1995:107), the number of hog farms in the U.S. (large and small producers combined) peaked before World War II at 3,768,000 in 1940. But Marbery (1994:1) says "Since 1980, the U.S. has lost more than half its hog farms. According to USDA, there were 653,600 hog units in 1980, compared with just 235,840 of all sizes in 1993." By 1998, that figure had shrunk to just 114,380. According to Nebraska's Center for Rural Affairs, the number of family farm pork producers in the U.S. shrank by two-thirds in the 1980s and early 1990s. By 1995, only 6% of all hogs were sold through a public market as production figures not only rose but became increasingly organized by corporate hog producers. As the total number of hog farms dwindles, the size of individual operations is growing gigantic (see for example Wind-Norton, L. and J. Kliebenstein 1994b).

However, aided by rollbacks of earlier anti-corporate legislation, today's industrial hog production is characterized by more than just an increased size of operations. There is also a notable separation of ownership and management, grant of

limited liability to investors, and decreasing involvement of local actors in the flow of resources involved in each stage of the production process. The net result is less intimate contact with surrounding communities, labor forces, and ecological contexts. This is especially the case as most of the chief corporate players not only have operations in many states but are multinational firms involved in a variety of economic activities, scattering attention from any one production scenario in particular. For example, besides its pork production operations, Cargill is involved with corn milling, cocoa trading and processing, metal trading, steel manufacturing and recycling, petroleum production, and electric utility provision.

Often, public funds are used to entice corporations to locate in a particular state, but it is unclear that the benefits outweigh the costs. The assumption has been that industrial hog production can be used to stabilize rural economies badly battered by the downturns of agriculture since the 1970s. As rural Main Street boards up shops and consolidates schools to cope with shrinking enrollment, legislators and chambers of commerce hail the arrival of corporate farming as a cavalry charge onto a desperate frontier. But what are hog factories supposed to offer, more precisely? At a minimum, the following list of possibilities presents itself:

- Industrial hog production is supposed to provide higher quality employment opportunities than currently exist in depressed rural areas, both on- and off-farm, therefore improving income. The deployment of new technologies is supposed to encourage the re-skilling of local labor forces, especially providing opportunities for younger generations of rural workers capable of securing state-of-the-art training.
- Industrial hog production is supposed to operate more efficiently than independent small-scale farms, improving profits while reducing costs to and increasing product quality for consumers, therefore increasing the robustness of local economies.
- Industrial hog production is supposed to be more sustainable than smaller operations because of their capability to reach economies of scale through greater access to changing (and especially sometimes distant) markets and

sources of inputs (Langemeier and Schroeder 1993; Polson and Hudson 1990).

But expectations are increasingly countered by evidence. Often, industrial hog production creates only minimum- or low-wage jobs, since rather than increasing worker skill levels, new production technologies reduce the value of human labor input. For that matter, industrial hog producers also employ little or no local labor, preferring to utilize migrant labor ready to accept substandard pay.

Local communities are harmed more than helped by this form of development, especially in the context of public funding for industrial hog production. Tax incentives are not the only means for encouraging startup of these new forms of production and processing, as corporate agriculture can also occasion massive investment in infrastructure. Paradoxically, even though the burden of this investment is frequently shared by taxpayers throughout an affected state, such infrastructure is developed particularly in rural areas otherwise at considerable remove from economic and social central places. Remote siting can also mask numerous environmental problems that result from industrial animal production. As a Duke University study (Agricultural Animal Waste Task Force 1996) suggests, CAFOs "are a relatively new source of nutrient pollution in watersheds and...a growing source of potential water pollution. The rapid growth in the industry has surpassed the ability of scientists to evaluate its impact on water quality." One of the things which is missing is evidence of how the relationship between nutrient loads and effluent use in industrial hog operations compares to the environmental consequences of other kinds of agricultural production in similar ecological contexts.

Add to this a net reduction in community welfare since corporate producers export profits out of the community, the state, or even the country. For example, pork produced by Farmland Industries increasingly heads to Russia, Japan, and Taiwan, with exports rising from 50-130 million pounds between 1991 and 1996. Exports to Taiwan are used not only for food consumption but shoe manufacture, and exports to Japan and Russia have risen so rapidly that according to the Kansas City Business Journal (2 December, 1996), Farmland has expanded the number of processing facilities it operates in Mexico. Annually, Farmland processes more than six million hogs at seven different

plants across the country (as many as 1,100 every hour), with plans to triple output. The ability of corporate producers to manipulate resource flows with considerable effect is hinted at by Farmland's pursuit of dozens of international joint ventures. These include arrangements with a Norwegian fertilizer producer, a French packaging firm, a Mexican meat processor, and a Japanese distribution company.

Farmland is not alone in aggressive pursuit of global opportunities. During the 1995 World Pork Expo in Des Moines, the National Pork Producers Council (NPPC) announced the "Meat of Choice by 2000" program, an industry effort designed with two goals in mind (Blind 1996). First, pork is to become the most-consumed meat on a boneless equivalent in the United States by the end of the century. Second, NPPC intends to see the United States become the top pork-exporting nation in the world, despite the fact that 1995 was the first year in decades that the US became a net exporter of pork. Indeed, to achieve these objectives, exports will have to double from about 492,000 metric tons in 1996 to about 1 million metric tons in 2000. While lofty goals, post-Cold War surges in export production have already made the late 1990's a boom era for corporate animal production.

A sense of déjà vu ought to accompany any encounter with the transformations now overtaking the pork industry, since the history of pork has followed similar changes in the poultry industry (and some similar features in beef cattle production). Morrison (1998) is one of those who draws those parallels between the poultry industry's past and the current phase of the swine industry's evolution, but the differences are at least as important to note as are the similarities. Vertical integration in the poultry industry began somewhat humbly, with individual entrepreneurs operating out of backyards and backseats in the 1930's and '40s. By contrast, today's hog factories are for the most part set up by major multinational corporations building on foundations of preexisting enterprises, often in other industries (indeed, the likes of Tyson Foods, Wayne Farms (a division of Continental Grain), Cargill, and Seaboard were all established poultry producers before becoming involved in pork).

Morrison (1998:154) emphasizes that the two most serious problems with the current industrial swine production system are {a} no producer contribution to the terms

of contracts signed with corporate processors (see also Hillburn 1993), and {b} no accountability for the quality of inputs supplied by the processor for hogs grown on contract. Increasingly, processors are demanding extraordinarily high quality product, resorting to such techniques as ultrasound and nuclear magnetic resonance imaging to scan cattle and pigs for fat content before purchase from growers (Holden 1994; Ufkes-Daniels 1995). To the degree that some mega-operations now produce their own animals without having to resort to contracting growers, the possibility of even minimal community involvement with the hog industry is rapidly fading. Less contact with local workers, consumers, suppliers, and competitors can relax concern for product quality or environmental responsibility beyond consideration of profit margins.

If the effects of industrial animal production can be so readily described, why has there been only varied and inconsistent response by farmers, legislatures, taxpayers, consumers, and others? For that matter, what other kinds of impacts on rural communities attend the industrialization of livestock production and related agricultural activity? Perhaps the answers to such questions first require appreciation of the multiplicity of visions of rural development in circulation today vying for political and economic attention. It is helpful to register Nunnally's (1989:20-28) claim that a "dominant" language used to define rural places in terms of economic efficiency and agricultural commoditization has been subjected to two forms of critique in the last quarter-century. On the one hand, there is the persistence of the agrarianism common to Jeffersonian traditions favoring the independence of the family farm, while on the other hand, there is the language of social responsibility and interaction found in environmentalist critique. Nunnally's chief point is that dialogue about the intensely emotional and politically charged issues surrounding such developments as the industrialization of agriculture is difficult to generate since different groups deploy different languages to describe their visions of what's happening to rural America. He claims that rural land is differentially "habitat" for environmentalists, "home" for agrarian fundamentalists, and "commodity" for agribusiness.

But it is arguable that all three groups have seen their previously separate discourses become increasingly entangled. As both home and habitat, rural areas are threatened by the expansion of agribusiness, but habitat is also at risk from

overproduction carried out by family farms trying to survive competition. As both home and commodity, rural areas are threatened by environmental regulation exclusionary of certain types of land use, but home is also at risk from the corporatization of farming operations oblivious to communal allegiances. Even as both commodity and habitat, rural areas are threatened by the common problem of shifting macroeconomic forces which can change the ways in which land is appropriated for use (either productive or consumptive).

Under such circumstances, the terrain charted by the literature on hog factories in many respects is as varied and changeable as the industry itself has been during a period of rapid growth over the last decade. Yet it is remarkable that beyond journalistic accounts, very little has been written about the community impacts of large hog confinement operations despite the profound effects of what Goldschmidt (1978 and 1998) has called the "urbanization" of rural America by agribusiness. Goldschmidt's own careful study of the social consequences of these changes- relying on ethnographic methods instead of mere citation of secondary data- has become something of a standard for the development of similar studies of rural transformation. But Goldschmidt's seminal work is now already twenty years old and his original studies were carried out a generation earlier. Studies like his, but targeting the hog industry in particular, are of only very recent vintage. In other words, lessons and warnings once articulated from the experience of other efforts to corporatize rural production (as in the poultry industry) are now being rediscovered rather than built upon as bases for action.

Another way in which the literature on hog factories does not present an altogether focused view of things has to do with the variety of approaches being undertaken to study issues. Some studies (for example Palmquist *et al.* 1995) are intensely mathematical in their quest for dispassionate analysis of the environmental and other impacts of the new farming. By contrast, a number of studies are more expressly anthropological in tone (Thu and Durrenberger 1994; Clark and Lowe 1992), emphasizing the social consequences of industrial hog production. A third type of study tries to go beyond reporting of impacts to involve residents and workers at study sites in participatory analysis. In sorting through these and other approaches to the study of industrial hog production, it is helpful to think of the issues surrounding corporate

agriculture in terms of the intersection of four different forms of capital available for investment in the future of rural America: economic, human, social, and environmental (Thu 1996).

II. Issues of economic capital

Questions about the organization, distribution, and flow of ***economic*** capital lead the way. Not least of all, it is important to ask of what sort and to what degree is corporate agriculture's separation of ownership and management really a problem? For example, the hog market collapse in 1994, with prices dropping into the $20s per hundredweight, forced out many small producers. By contrast, large industrial pork production firms had the financial flexibility to distance themselves from events as most executives and significant investors were not tied to the communities impacted by the worst effects of a bad year.

There are also issues about the distribution of economic capital in corporate agriculture. As stated before, many corporate players in industrial hog production have strong and varied connections internationally. In Kentucky, Vall is a Spanish conglomerate, while Wyoming producer Itoham Foods is Japanese-owned. Significant European capital backs Seaboard, which has operations in many parts of the world beyond Oklahoma and Kansas, including Argentina, where it has been accused of violating the human rights of indigenous peoples with government collusion (Equipo Nizkor 1997). Under these circumstances, how problematic is the use of considerable public funding to facilitate industrial hog production investment in rural areas? For example, Colorado's Agricultural Development Authority secured $15 million in tax-exempt bonds to help finance the waste management facilities for one industrial hog production enterprise. In Kansas, $9.5 million in tax exempt bonds were provided to Seaboard for the same purpose. While many other examples can be found, the point remains: rural communities will lay out extraordinary amounts of public investment on the assumption that if they don't, communities elsewhere will.

As rural economies decline, many states are turning to industrial agriculture as a way of providing high quality employment opportunities. Corporate animal production

units commonly substitute capital and mass production techniques and technologies for labor and improved management skills (Tinstman and Peterson 1981). Paradoxically, the net effect of such developments may be to improve the outlook for those who can find jobs in the new hog factories while reducing the overall number of employment opportunities in the community. Considering data from Missouri, DiPietre (1992) and Ikerd (1998a: 161-164) illustrate that farrow-to-finish units working under contract with large processors generate total annual sales figures only slightly higher than those managed by independent farmers ($1.37 vs. $1.31 million). At the same time, while higher levels of capital investment and mechanization allow contract units to produce more hogs per worker, corporate production replaces approximately three independent hog farmers for each new job created. Moreover, returns to capital, management, and operator labor are more than 25% higher for independent farms than provided by the average employee wage in contract situations. Also, Chism and Levins (1994) confirmed in a Minnesota study that smaller operations make a greater number of input purchases from local suppliers than do larger enterprises. In summary, hog factories and contract production are only negligibly more profitable than independent farms, even as they strangle local employment options and indirectly siphon more income out of the local community.

Another assumption has been that corporate agriculture will not only revitalize rural economies but also produce cheaper, higher quality pork for America's dinner tables. But, especially in the context of increased tax burdens to support integrated industrial hog production investments, do consumers really have anything to gain? Not according to agricultural economist John Ikerd of the University of Missouri at Columbia. While just over 10% of disposable income is spent for food in the United States, about 10% of that (a penny out of every dime) is spent for pork. Ikerd maintains that farm records indicate that costs of large-scale hog operations are only slightly lower than medium- or small-scale setups. Even if production costs were 5% less, the savings to consumers would be less than two cents per dollar spent for pork at retail. This amounts to a reduction of a mere 2/100ths of 1% of overall expenditures for food. In any case, chances are that the existence of an oligopoly of corporate producers will not facilitate relief from high pork prices but their likely continued rise (Ikerd 1998b: 2-3).

This is because when a sizable share of the production and processing of pork is controlled by highly integrated corporate entities, the retail market is sheltered from even severe depressions in the price of hogs at the unincorporated farm gate.

Likewise, Ikerd is quick to point out that the "argument that factory pork would be higher in quality doesn't hold either. Pork would be more uniform because it would all come from the same basic genetic stock, as is currently the case with chickens. However, consumers have different tastes and preferences - different perceptions of quality." Reducing costs by a penny or two in order to produce a standardized product has less to do with satisfying American consumer demand than with honing the corporate competitive edge in search of overseas markets (Ikerd 1998b: 2-3). For that matter, DiPietre (1996:64) points out that the pricing system deployed by industrial pork operations is, in fact, "a low knowledge system." Paying by weight and lean percent, "it is pricing pigs to lower the cost of slaughter and carcass breakdown. It is a pricing system based on packer technology rather than consumer preferences."

III. Issues of Human Capital

Beyond straightforward economic considerations, it is important to appreciate the impacts on ***human*** capital brought about by increased corporatization of farming. These begin with the command and control large corporations can exert in the relatively small labor markets of rural areas (Padgitt *et al.* 1998). But it is also important to register that industrial hog production units experience a high employee turnover rate. For example, Kleiner and Constance (1998:16) note that in Putnam County, Missouri "it is easier to find someone who used to work for PSF, than to find one who does now."

Of course, advocates of corporate farming consistently deploy a rhetoric that insists that the new industries will enervate job markets. But factory farms often use imported rather than local labor. As Heffernan (1995) points out, the managers of a factory-style setup are disinterested in the total individual of the worker. This means that a depth of previous experience working in agriculture, such as many local people might be expected to have, is neglected in preference for a workforce that is more prepared simply to show up and learn the job on the factory floor. This provides management an

ideal situation for selectively providing skills to workers, thus effectively disabling the possible argument from labor for higher wages based on ability. Those writing about the industrialization of beef production (Stull 1994; Stull et al. 1993) have made similar arguments.

However, the effects that industrial hog production can have on local labor forces extend beyond the history of employment rates. There are also profoundly important issues about the challenges presented by CAFOs to human health. A large literature exists concerning respiratory ailments among workers in swine confinement operations. (See for examples Bar-Sela *et al.* 1984; Bongers *et al.* 1987; Brouwer *et al.* 1986; Choudat *et al.* 1994; Cormier *et al.* 1991; Crook *et al.* 1991; Donham *et al.* 1982, 1985, 1986, and 1995; Donham 1990a and 1993; Haglind and Rylander 1987; Rylander *et al.* 1989; Zuskin 1991). Other researchers have noticed higher rates of clinical depression and other psychological disorders among workers and neighbors of industrially integrated CAFOs (see for example Schiffman *et al.* 1995 and 1998). Adding an ominous echo to Secretary Butz's farewell to rural America's bucolic past, Strange (1984) concludes that where modern farming practices are concerned, "It's not all sunshine and fresh air."

At the very least, there should be concern that elevated incidence rates of respiratory ailments curtail productivity inside the new hog factories, both among workers (Cormier *et al.* 1989) and the pigs themselves (Donham 1991 and 1995). Though accurate reporting is not easy to come by, it seems likely that the incidence of tuberculosis among migrant workers in poultry confinement operations is higher than among non-CAFO livestock production laborers. Also, there is growing concern that overuse of antibiotic prophylaxis has spurred the development of resistant parasites, increasing the health risks associated with CAFOs for both humans and the animals involved. There are important linkages between corporate agriculture's impacts on human and economic capital as well. For instance, many counties with large industrial animal production workforces have experienced increases in the number of Medicaid recipients and unpaid Medicaid bills per 1000 population that exceed statewide increases (Adams 1998). Donham and Thu (1993; also Donham 1990b) have added attention to relationships of the health of farm families, livestock, and the environment to issues of agricultural and economic policy.

Admittedly, the health risks of CAFOs are not limited to large corporate operations. An operation involving only 150 hogs in confinement was held partly responsible for a Sigourney, Iowa farmer's development of angioimmunoblastic lymphadenopathy, a potentially fatal condition marked by such symptoms as a persistent cough and fatigue together with internal bleeding (DeYoung 1995). "[Doctors at the Mayo Clinic] told me I had a choice," Eugene Strohman says. "I could quit raising hogs, or start making burial arrangements. That made the decision pretty easy, but I still thought it was the end of the world." A hog farmer for twenty years before his medical problems appeared, Strohman claims "…it came about because I started converting everything to confinement….When I had the hogs in outside lots, I didn't have any trouble, but once I got inside, it began."

Needless to say, exposure to such health risks is likely intensified in the case of CAFOs bringing much larger numbers of animals under one roof. Indeed, Kendall Thu of the Iowa Center for Agricultural Safety and Health at the University of Iowa has shown a significantly higher rate of reported respiratory ailments among those living near large hog lots when compared to the overall rate in rural sections of the state. Even though a pilot study, Thu's findings are important since discussions of the effect of hog lots on air quality typically focus only on smell.

IV. Issues of social capital

It is not just farmers or industrial CAFO workers whose health is at risk, as corporate agriculture can bring with it considerable threat to the well-being of nearby communities and indeed whole regions. This raises the issue of impacts of industrial hog production on ***social*** capital. Does industrial hog production present rural communities with a net increase in opportunities or liabilities (Thu 1995)? While it is easy for some to ridicule stereotypes about rural communities, it is also pointless to do so when they are firmly based in fact. Many researchers investigating the growth of industrial agriculture insist that family farming emphasizes local connections that are discarded with perilous consequences by corporate players (see for examples Barnes and Blevins 1992; Braun and Braun 1998; Durrenberger and Thu 1996; Goldschmidt 1978 and 1998; Lobao 1990

and 1991; Office of Technology Assessment 1986; Ziegenhorn 1998). Ikerd (1998a: 167) understands that "Rural America cannot retreat to an earlier time when cost competition was less keen and full-time family farms were the norm," but he insists that it is possible to champion traditional networks without having to ignore those changes the future is likely to bring.

Thus, it is too simplistic to consider the size of operations as the only problem with industrial agriculture, since what really challenges the survival of rural communities is the degree of vertical integration and the relationships of labor forces, managers, and headquarters. Heffernan (1995) suggests three approaches are currently marking the transition from a "craft" system of family farms to a "factory" system of industrial pork production. Noting the parallels with earlier corporatization in the beef industry, Heffernan (1995; see also Heffernan and Jenkins 1983) characterizes the first approach in terms of outright consolidation of production units from the breeding and raising of the animals through to slaughter. Only three firms (Cargill, ConAgra, and IBP) are responsible for two thirds of U.S. beef slaughter. Additionally, Cargill and ConAgra own and operate two of the largest feedlots in the country. The second approach to corporate livestock production differs from the first only to the degree that "forward contracting" occurs. Under this system, feedlot operators contract with major corporate players as to how many animals and of what quality will be purchased for slaughter at scheduled times and prearranged prices. Such contracts reduce the firm's risk by gaining control over supply while reducing overhead by not maintaining feedlots themselves.

In Heffernan's third approach to factory farming, production is carried out under contract with an "integrating" firm that owns the animals and provides feed and other inputs. The "growers" (as distinguished from non-contracting "farmers") provide the labor, buildings, equipment and land, and are compensated on a piece rate. This approach to industrialization of agriculture is similar to the production system known as "cottage industry" or "the putting-out system." Under this system, social relationships in rural areas are compromised in a particularly severe way, since growers remain tied to local circumstances outside their contracted work with integrators. Unlike workers in fully consolidated corporate operations or feedlots involved in forward contracting, growers are working at home in their own neighborhood. Meanwhile, the integrators

develop considerable command and control over what happens economically without having to become intimately tied to local social circumstances.

The increasing industrialization of livestock production affects rural people much the same way that the growth of factory labor affected those in urban areas during the Industrial Revolution. Many of those raising corporate hogs, such as for Murphy Family Farms, never own the hogs. Heffernan (1995:4-6) points out, “When a farmer no longer contributes the capital or contributes only a portion of it, when a farmer no longer has title to the product during the production process, and when a farmer must adjust his behavior to meet the demands of someone in the management hierarchy, then a major occupational change has occurred.” The resulting alienation can lead to extreme reactions of apathy or resistance as workers confront the impression that what they do on a daily basis has little personal meaning. The newly emerging workforce in the countryside is left out of decision-making processes and isolated by others in their communities who recognize them as collaborators with corporate intrusion in local affairs. For example, Murphy Farms employees in Missouri noted the loss of friends after signing on with the company, and Martinson *et al* (1976) noted a long time ago the feelings of powerlessness and social isolation among workers in large-scale farming operations. It is true that in a 1982 study in Missouri, income improvements over the previous decade were more noticeable for growers than for farmers. However, an important trade-off was that farmers were generally more satisfied with “opportunities for social activities outside the home, people with whom they had contact during their work, and quality of life” (Heffernan 1995:9).

Not surprisingly, many small-scale pork producers face growing uncertainty about the continuity of their operations. According to Sioux Center, Iowa seedstock producer Delbert Broek, family farm competition with the “mega-hog” production setups of corporate hog production is “like going to war with a BB gun when the enemy has a cannon” (Zinkand 1996). Nor are such conflicts merely pitched between corporate hog production and small producers. Seaboard’s efforts to expand production in Kansas led to intense competition among communities to attract the company and swept four anti-hog activists into government as city councilors in Great Bend (Stineman 1998). Within six weeks, one of the new councilors resigned claiming that members of his family had

been threatened and intimidated by pro-hog elements in the community. Nor is the specter of violence solely the provenance of pro-hog factions. In Missouri, investigators of “the contested terrain” of industrial hog production were threatened “with the promise of a bullet, if we dared to reveal...[what an anti-hog group was] saying about Continental Grain and their community” (Kleiner and Constance 1998:18). The arrival of industrial agriculture in a rural community can have a shattering effect, making conflict resolution all the more difficult when struggles become multilateral (see also Delind 1998, as well as Flora and Flora 1995).

Heffernan arranges different rural labor forces on a continuum with respect to involvement in “formal and political activities of the community.” Fully industrialized workers in a corporate animal production are the least involved. Family farm workers and grower-integratees in the putting-out system are more involved, with little difference existing between them. According to Heffernan, the owner-managers of factory farms are the most heavily involved in political aspects of the local community (1995:10). While neighbors are locking their doors against one another (Grey 1995a and 1998), company representatives are strengthening alliances with chambers of commerce and state legislators. There are also issues of cultural change associated with the arrival of large corporate enterprises that pay little for hard work with rapid employee turnover. Cantu (1995) and others have noted the “peripheralization” of rural America signaled by the influx of new immigrants (often Latino or Asian) whose quality of life is already so low as to make the otherwise unsatisfactory employment available in hog factories seem appealing.

For that matter, Ikerd (1998b: 3-4) contends that the bad press received as a result of CAFO problems is squandering “a vast treasure of public confidence and good will.” Family farms, he points out, have historically enjoyed the award of special privileges, exemptions, and variances “because they were trusted to behave in the public interest.” Corporate agriculture produces collateral damage in terms of media and congressional reception of the needs of rural communities and smaller producers. If negative reportage was confined to academic circles and policy corridors, this might be tolerable. But “When Ms. Magazine runs a feature article on the ills of corporate hog farming, as they did in 1997, we can conclude that the story has just about made the full circuit of public

opinion shapers. Family farms will be paying for this loss of public trust for decades, if not forever."

To be sure, the towns in which industrial hog production is headquartered may experience remarkable increases in such measures of civic vitality as sales tax revenue, school enrollments, and rental rates. A study of industrial hog production development in Mercer County, Missouri indicated that fully a third of the total tax revenue and a quarter of the employment in the county are directly attributable to production by Premium Standard Farms. However, there may be severe consequences for linkages between the town and formerly associated smaller settlements and homesteads in the surrounding countryside. For that matter, some of these "improvements" may have social costs that are not readily apparent. For example, studies in related industries in Nebraska and Iowa have shown that frequently, more than one family of laborers moving into an area to work in industrial agriculture occupies the same rental housing in order to cover costs. Within a short time, differences between the rental rates of old and new housing start to disappear, affordability no longer bearing any relationship to quality of shelter even as overcrowding worsens (Adams 1998:14).

It is also important to assess the effects of CAFO-induced environmental externalities on the amenities of living in a rural setting (see for example MacCannell 1988). Seipel (1995:2) has investigated the effect CAFO proximity has on rural, non-residential property values in Putnam County, Missouri, finding that house value decreased dramatically for each additional hog within a five-mile radius. Similarly (Palmquist *et al.* 1995), in North Carolina researchers found that proximity caused a statistically significant reduction in the prices of house of up to 9 percent, depending on the number of hogs and their distance from the house.

V. Issues of Environmental Capital

Corporate agriculture prompts concern for the health of its workers, its neighbors, and even of populations farther afield. There are important shifts in who controls the ***environmental*** capital of the corporatized rural area. Each community and its surrounding countryside has a specific ecological mix of endogenous characteristics on

the one hand and exogenous relationships with other locales on the other. While it is possible for them to have large impacts on the environmental history of an area, family farms have tended to exhibit a sense of stewardship concerning the land they occupy, at least in an effort at self-preservation. Today's corporate producers, with boardrooms in distant cities (sometimes overseas), are less impelled to be sensitive to changes in the land caused by innovative production techniques.

Issues about air pollution resulting from intensive swine production have been addressed by many investigators (see for examples Al-Kanani 1992; Bourque *et al.* 1987; Bundy 1991; Carney and Dodd 1989; Du Toit 1987; Janni 1982; Lau 1992; Miner 1974, 1975, and 1980; Miner *et al.* 1975; Nielsen *et al.* 1986 and 1991; Norstedt and Taiganides 1971; Pain *et al.* 1991; Ritter 1989; Skarp 1975; Sneath 1988; Sneath *et al.* 1992; Sneath and Williams 1990; Warner *et al.* 1990). In most of these studies, particular emphasis is placed on control of immediate results, rather than giving much thought to remote causes. In other words, concern is focused on reduction of odor and toxic emissions rather than on why and how industrial CAFOs with vast inventories of confined animals are encouraged to set up shop in the first place.

Arguably, even more troublesome than odor problems is the considerable potential for water pollution associated with CAFO waste disposal that may affect water used for human consumption and irrigation, as well soil quality (National Research Council 1993). Again, the size of a hog farm is not immediately at issue. In 1996, the Centers for Disease Control in Atlanta reported six miscarriages in LaGrange County, Indiana that resulted from nitrate contamination from a leaking concrete hog manure pit on a relatively small operation (Center for Rural Affairs 1998). In Iowa at least 100,000 fish were killed in 1997 when a manure spill from Trace Inc. Pork poisoned eight miles of Crane Creek, part of the Turkey River system. The river is a popular recreational waterway between Minnesota and Iowa, meaning that the pollution affected a potentially large human population.[1] The spill occurred when a clogged connection between two lagoons caused one to back up. Information from the Missouri Department of Natural Resources indicates that "more than 60% of operations at farms using a wet-handling

[1] The Ruralist, 13 August '97

method for removal and storing manures had evidence of an illegal discharge of manure over a five-year period" (Kleiner and Constance 1998:15). Similar problems have been reported from North Carolina (Huffman and Westerman 1995). In other words, the concentration of hogs in a confined space (and the resulting difficulties of efficient disposal of waste) are more of a problem than simply the increased number of animals put into production.

The water pollution potential of hog CAFOs can be difficult to see since "animal waste is a low volume, high strength wastewater" (Hamilton and Stoecker 1998:5). Still, the concentration of ever-larger numbers of animals within a single watershed can negatively impact volume. For example, Seaboard's processing operation in Guymon, Oklahoma sits atop part of the Ogalalla aquifer, a non-recharging water resource of considerable value since it stretches over a large and is used by residents of several states. Meanwhile, "officials from the Oklahoma Water Resource Board note that water levels in many wells [in Texas County] have dropped by 50 to 100 feet over the last 30 years, and say the aquifer could be in trouble within a generation, depending on the volume of new water usage" (Seipal 1995:8).

However, these effects of concentrating large numbers of hogs in one place are not the only problem. One of the most important environmental costs has nothing to do with the pollution caused by industrial hog production. Vertical integration involves production of feed grains in one area followed by shipment to possibly distant hog factories. Environmental sustainability is jeopardized in two ways under this scenario, both in terms of manure concentration and in terms of potential soil depletion. In family farm operations where hogs are not confined, manure falls in pasture naturally or is spread onto cropland where feed grain for the animals is grown. The soil benefits from nutrient recharge, and the farmer is able to secure two kinds of income potential.

As Jackson (1998:116) emphasizes, raising animals entirely in large-scale confinement scenarios fed by specialized cash grain farms amounts to "a vast, uncontrolled experiment" in increasing the magnitude of input-intensive hog production without due consideration of the consequences for environmental sustainability. Industrial CAFOs not only pollute but also effect a profound shift away from farming

practices that previously allowed significant variation in production techniques. Such variation can include farrowing outdoors at least part of the year, as well as pasture rotation. These practices can reduce the incidence of animal disease and by planting trees to provide shade for pastured animals can also help curb erosion of farmland that might otherwise be subjected to overproduction of costly feed grain. For that matter, there is also a need to be concerned about the loss of habitat and biodiversity caused by agricultural industrialization (Jackson in press; Warner 1994).

Beyond pollution issues related to concentration and vertical integration, confinement operations put the animals at risk, too. In the spring of 1997, electrical failure at an Iowa Select Farms facility led to the suffocation deaths of more than 2,000 hogs after the ventilators stopped functioning. Such massive losses are a function of the concentration of animals.[2]

As might be expected, much of the literature on environmental impacts from industrial livestock production is often of a highly technical sort. Microbiological and meteorological studies of pollution effects are both necessary and compelling, but not ordinarily the types of information readily accessible by affected communities or legislatures trying to deal with critical issues involving CAFOs. The time delay and knowledge loss in translating the language of high science into common parlance can hamper the dissemination of vital information and may make it seem worth less serious attention. Careful and insightful studies about such things as the health consequences of air pollution from manure spreading are translated into “nuisance” legislation (Hamilton and Bolte 1988; Sweeten and Miner 1993) as though all that was at stake was an aesthetic issue.

While such issues are clearly important to communities suffering overexposure to odor problems and other pollution effects, the depth and breadth of quality of life issues are rarely addressed by official responses to grievances. There is something of a cultural predisposition to make assessment of production impacts on environmental quality difficult when, as Jackson (1998:110) points out, “our current approach to technology is to assume it is innocent until proven guilty. The burden is on the public to prove harm,

[2] The Ruralist, 11 June ‘97.

rather than on industry to demonstrate safety." Coupled with this is the paucity of hard data on such matters as the relationships between waste lagoons and soil types. Jackson claims that Huffman and Westerman (1995) published the only survey of this particular issue to date. Tension also exists between the need to find immediate solutions to extant difficulties and the need to compose thoughtful strategies for long-term conservation of resources (National Research Council 1993).

VI. Challenges and alternatives

What, if anything, ought to be done concerning industrial pork production as a development tool in rural America? Even more importantly, what *can* be done? At least two responses are possible, one involving legislative restriction of industrial hog production operations (Harl, forthcoming; Lauria and Fisher 1983); another is to practice a more sustainable agriculture. The first option has a somewhat cyclical history in rural areas of "deregulation/reregulation" of enterprises such as industrial hog production (Kleiner and Constance 1998). It is also important to understand the differential impact legislation can have on industrially controlled hog operations and the family farms competing with them. Long debates over regulation, followed by potentially longer debates over modification of subsequently imposed rules, provide challenges to producer security to which industrial CAFOs can adapt more readily than family farms given the capability of the former to shift capital to operations in other states. More needs to be understood about the international scope of major players among industrial hog producers. Heffernan (1995) notes that in poultry factory farming, a key development has been consolidation of access to genetic stock. For example, one of the largest producers in the poultry industry is Indiana Packing, a joint venture of Mitsubishi from Japan, Ferruzzi from Italy, and Cotswold Pig Development Company from England. As suggested earlier, large pork production companies such as Seaboard are also international in scope and ownership.

While such flexibility provides corporate actors a variety of investment opportunities, family farms discover that they can expand production only in much more limited ways. For example, farmers unable to afford the costs of constructing new

buildings might consider the possibility of converting nursery and finishing space for breeding and gestation, but this requires use of off-site nurseries and finishers on contract. New multiple-site production technologies can thereby promote greater sensitivity to neighborliness and ecological health, but most likely only by raising costs on independent small-scale producers.

There is also an issue of whether or not counties have the right to zone agriculture, but this is unclear or hotly contested in many states. In Iowa, the nation's top pork producer, a long-standing legal tradition prohibits county zoning of agriculture. Corporations have brought legal action against local authorities restricting their operations in response to citizens' activism even where county rights are not so clearly delimited (as in Illinois). In Kansas by contrast, counties are allowed to vote on whether or not to prohibit corporate farming. Murphy Farms, a multi-state CAFO operator with 337 thousand sows, has pressured the courts to recognize a definition of "corporate" farming which would let its operations escape such restriction. While counties in some states have been able to restrict CAFOs on the grounds that they are industrial, rather than agricultural enterprises, the Missouri Supreme Court in 1997 ruled that Lincoln Township had no authority to regulate Premium Standard Farms' operations. The court found that the state constitution prohibits a township from regulating "farm buildings or structures," rejecting an argument that PSF was not a "farm." More often than not, state legislatures create exceptions for corporate farming, but the experience of Minnesota in 1996 is the exception to the rule. There, bills were defeated which would have allowed considerable latitude for industrial CAFOs. The failed legislation redefined "family farm," reduced the number of members in a joint livestock operation required to be actively engaged in production, and preempted county or local ordinances more restrictive than those of the state.

On the related issue of "nuisance" laws, the story is virtually identical in favor of CAFOs. For example, Iowa's 1995 legislation regarding CAFOs insulated producers from most conceivable forms of litigation on the grounds of interfering with quality of life characteristics. Even when efforts are made to elevate complaints about CAFO production above the level of nuisances to issues such as air pollution, state authorities are frequently unsympathetic. In Iowa in 1996, Humboldt County succeeded in passing

four ordinances repositioning the issue of CAFO siting in terms of public health issues, but the state Supreme Court struck down the ordinances early in 1998.

Options do exist regarding the use of economic capital as an alternative to further industrialization of the countryside. For example, owner shareholding production scenarios can increase social linkages backwards and forwards, and therefore potentially improve accountability for financial and environmental costs. More thought needs to be given to public support of such options as new generation (closed) production and processing cooperatives. While the estimated economic development involved with such options may compare favorably with corporate-owned vertically integrated operations, there are advantages and disadvantages to be considered. For example, one of the problems of the new age cooperative is that it takes a lot of work ahead of time, generally necessary because if marketing to an identified source requires well-established networks. Likewise, a major problem with farm cooperatives historically has been appointment of the best farmer to run the co-op, not recognizing the important distinction which often exists between a good operator and a good manager for a running a business.

Adams (1987; see also Strange 1988) contends that large, value-added industrial hog production operations benefit from, rather than help to relieve, the grain-surplus problems faced by many states which nonetheless use such reasoning to encourage CAFO growth through the use of public funds. In this way, too, hog factories fail to deliver the benefits they are supposed to bring, in some cases driving so many small competitors out of the area that local feed corn growers face tighter market situations. This in turn can worsen the local employment picture, negating the rhetoric that fuels investment of public funds to bring industrial hog production into depressed rural areas.

It is possible to discern options other than the reorganization of human capital associated with mega-hog production. In 1997, the Center for Rural Affairs analyzed data assembled by the Iowa State University regarding the impacts on the value of employment in small-scale versus large-scale swine operations. Provided in the table below, the data reveal that it is possible for workers in smaller operations to have higher earning potential on a per-sow basis. Moreover, smaller operations return a greater share

of revenue to local and state coffers, thereby providing a more reliable foundation for community survival.

Economic impacts (no change in local feed grain production) comparing equal production from ~23 farms of 150 sows each to one 3400-sow operation

	Approximately two dozen 150-sow operations		One 3400-sow operation	
	Total	Per sow	Total	Per sow
Primary Employment (jobs)	32		21	
Employee Income ($)	925,025	272	709,097	209
Earnings/Worker ($)	28,907		33,767	
Secondary Employment (jobs)	30		19	
Employee Income ($)	490,275	144	375,821	111
Earnings/Worker ($)	16,343		19,780	
Total Employment (jobs)	61		40	
Employee Income ($)	1,415,300	416	1,084,918	319
Earnings/Worker ($)	23,202		27,123	
Revenues to Schools ($)	69,507	20	50,353	15
Total Local Revenue ($)	147,572	43	112,902	33
Net Local Revenue ($)	24,879	7	29,544	9
Net Revenue to State ($)	54,503	16	43,720	13
Property Taxes Paid ($)	30,123	9	27,972	8

There are also other issues involving the reorganization of human capital by the development of new production techniques and strategies. In considering options for the future of hog farming, more is at stake than simply reining in the excesses of rapidly growing corporate agriculture. The family farm alternative to industrial hog production carries its own cultural baggage (DeYoung 1995; Hoban and Clifford 1995; Wind-Norton and Kliebenstein 1994a). Iowa's Eugene Strohman admits that before the onset of CAFO-related medical problems, "I wouldn't wear a mask because I thought they were for sissies." His successor on the hog farm wears a 3M-respirator mask. But keeping the confinement buildings clean and well ventilated to cut down on dust and gas problems isn't enough. "It's not much of a problem in the summer," Strohman's successor says,

"but I do notice it gets a lot worse in the winter when the buildings are closed down most of the time." Keeping in mind that part of family farm culture is an emphasis on establishing connections between the farmer's work and the generation that will succeed him, he is concerned about his children's health when they're around the animals. "They love to be around them, but they don't make masks that small," he says.

Options also exist regarding the reinforcement of existing social capital in areas otherwise liable to be targeted for industrialization of agriculture. One of the more innovative responses to broad legislative restrictions on local efforts to prohibit the establishment of industrial hog production involves a group of farmers in the vicinity of Sheffield, Iowa. While state law prohibits county zoning of agricultural land, it places no such restriction on the zoning of cities. Concerned farmers near Sheffield have therefore incorporated the new town of Big Hill in order to keep DeCoster Farms of Iowa from setting up a CAFO on what is now "town" land. Other efforts are exemplified by Patchwork Family Farms in Missouri (The Ruralist, 16 June 1998), a cooperative venture of several family farms that provides producers an above-market price for locally-grown, antibiotic-free pork. An important element of Patchwork's success story is its careful development of off-farm networks, in this case involving a local food subscription program that is intended to help low- and fixed-income families make ends meet.

As previously suggested, proponents of industrial agriculture occasionally resort to rhetoric of improved product quality. Even those who understand how hollow such rhetoric really is nonetheless insist that the intensification of operations by large corporations obliges small-scale producers to innovate vigorously in order to survive (Ikerd 1998a). While there is room for debate about how to define alternatives to the industrial hog production model, non-conventional farming methods do not automatically have to mean dramatic increase in the magnitude of operations. At least one Nebraska study (Kleinschmit *et al.* 1994) labels as "sustainable" farms that have only about half the acreage, livestock, and total sales as those considered "conventional," but reports higher returns over direct costs per farm where alternative methods have been deployed. The Center for Rural Affairs (1994) suggests that while North Carolina lost almost half of its hog farmers between 1986 and 1993 (during a period of rapid industrialization of agriculture), Nebraska maintained its hog farmer population. Production figures may not

have risen noticeably in the latter case, but rural communities fared better in Nebraska than in North Carolina overall during the same time period.

Probably most difficult of all are options regarding the protection and appropriate use of existing environmental capital in rural areas, not because such options are hard to discern but because they are so frequently the source of bitter public debate (Brussard and Grossman 1990). Certainly the most contentious issue in this regard is the question of state moratoriums on further industrial CAFO expansion. For example, concerns about CAFOs in Arkansas led to a brief moratorium in 1990 and subsequent passage of environmental restrictions (packaged as Regulation 5), but concerns have been voiced that the legislative response has been weak. Regulation 5 addresses air quality issues inadequately, and critics contend that such major corporate producers as Cargill and Tyson Foods operate without strict enforcement of the new laws. For that matter, meaningful regulation can require attention to details of almost Byzantine complexity, for example including specifics about "setback distances," soil slope and moisture profiles, watercourse proximity, precipitation rates, soil temperature, and so on.

With all this attention to detail (regardless of whether or not it produces enforceable effective regulation), it is disturbing to notice how frequently corresponding issues about air quality are left hopelessly vague. Regulation 5 in Arkansas is typical in this regard, encouraging CAFO operators to adopt a "good neighbor" policy concerning odor management. Similarly, according to officials in its' Department of Natural Resources, Iowa's House File 519 (passed in 1995 after two years of debate) also considers air quality a "social issue," not a matter for environmental regulation. Moreover, most state legislatures (such as Colorado's in 1997) focus even less attention on cleanup costs associated with pre-regulation environmental impact, not to mention those associated with sanitizing abandoned facilities. As with zoning issues, where individual counties have tried to make headway on these matters, state governments have sometimes stepped in and tried to reduce home-rule authority (DeLind 1991 and 1995; DeLind and Spielberg-Benitez 1990; Morgan 1998).

Those who advocate industrialization of the countryside insist that it has come to rescue rural communities, but they do so without adequate concern about the negative

impacts of corporate agriculture. Is losing communities worth the multiple possibilities for economic, human, social, and environmental risk involved in adoption of the corporate hog production model? The fact of the matter is that it has been made profitable to farm in socially and environmentally unsound ways through a whole series of subsidies. Adjustments to how industrial hog production operates are not enough. Taking such a course of action assumes that the noxious consequences of corporate agriculture are in some sense utterly accidental, a perspective which diminishes accountability for problems and reduces capacity for envisioning alternatives. In part, this is why family farm and environmental groups walked out of the National Environmental Dialogue on Pork Production in 1997, claiming corporate representatives dominated it.

Of course, it is possible to effect change in the family farm. But neither is there any pressing need for embracing change simply for change's sake. It is important to emphasize that we often choose not to exercise how resources will be used, perhaps assuming that there is a kind of natural order that sorts out such issues. Yet the history of rural development in America has never been about stasis. Replete with examples of innovation and the meeting of considerable physical and social challenges, it remains clear that industries that stay through thick and thin usually involve people intimately involved with the community in which they operate. By contrast, the new corporate farming setups are predicated upon the notion of protecting investment by remaining footloose and unbound to immediate social, human, or environmental concerns. Beyond respect for history, there should be grave concern about how this affects the future of resource bases (land, skilled labor, and communal knowledge of how to sustain both) upon which so much of our national economic security rests.

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