

ANIMAL WASTE

Background

Animal waste is one of the major pollution problems in the United States. At any given moment, there are 2 to 3 times more farm animals than there are people. The resulting effects of this problem are:

- (1) Contamination of ground water through deep percolation
- (2) Contamination of surface water through runoff
- (3) Air pollution

Disposal of dead animals is a related problem.

Major Livestock Sectors

(A) Dairy

Dairy cows are found in most of the United States. In lake states such as Minnesota and Wisconsin, and in the northeast United States, dairy cows are still grain fed and operations are small. In California, and throughout the southwest, large feeding devices are used a lot and concentrated food is relied upon. In southern California, they are fed alfalfa and ??? of the major crops.

The dairy industry in California initially existed on the urban fringe and gradually migrated over the years, i.e. from Los Angeles to Orange County, and from San Bernardino and Chino to Tulare. Appreciation of land value in the southern California region played a major role in this migration and in changes of the dairy industry in the that region.

Dairy is capital-intensive and as a result, a lot of attention is given to the genetic improvement of cows and to the monitoring of their performance. Cows that do not produce are killed. The dairy industry has strong cooperatives (Land O'Lakes) and political action networks.

Dairy Waste Management

Feedlots have disposal areas, areas of land on which waste is spread and is used for fertilization.

During the 1970's, the state attempted to limit the cow/acre ratio in southern California to 1.5. However, due to the high density of cows in the region (approximately 15 per acre) the cost would have been staggering.

A solution found was to separate liquid and solid waste; solid waste is shipped out of the region and disposed, while liquid waste is disposed of on disposal acreage.

The environmental regulation problem that arises is the monitoring and appropriate management of solid waste facilities. Hochman, Zilberman, and Just demonstrated that:

- (1) Regulation of the industry has to recognize heterogeneity. Some of the most efficient producers have a limited amount of land. An environmental quality target can be achieved at a minimum cost by placing a tax on cow/acres.
- (2) The solution of separating solid and liquid waste is very close to being the optimal solution, in terms of cost. It cuts the cost of reaching regional environmental policy (relative to limiting cow per acre) by 80%.
- (3) They raised the issue of financial constraints. Some in the dairy industry will not be able to cover fixed costs and may become insolvent, even though their revenue is greater than the variable cost. Concern about solvency prevents the improvement of restriction.

(B) Beef Cattle

Beef Cattle is the least capital-intensive animal production system. The packing of beef has been modernized, but production is still handled by many small, grazing-land operations throughout the country. Pollution problems are less severe when there is less of a cow/acre density. In some places, problems of grazing still exist, while in other areas the problem of excess waste still exist.

Poultry

Poultry, which is is a very popular meat in the United state now, was not consumed extensively in the past. Until researchers in Iowa State University developed the practices required to raise chicken in confined environment in the 1940s, chicken meat was a delicacy. The broiler industry is young, and feed grain suppliers, who are major

supplier of the industry have played a major role in its development. In the early days of the industry (1950s) broiler prices were unstable, and that reduced the willingness to join the industry. Input suppliers that wanted to build markets to their feed, offered growers marketing contracts- committed to buy the chicken at a certain price, and that established a tradition of significant reliance on contract in the broiler industry. We should distinguish between marketing and production contract. The second category refers to arrangement where an integrator supply the producer feed, genetic material and production specification. Today many broiler producers operate under both production and marketing contract.

The most popular institutional arrangement in broiler production is contracting, where integrator provides genetic material and feed and sell the chicken. Some known companies serve as integrators, including Tysons, Purdue, etc. These companies have large chicken processing facilities and they may engage in activities to enhance the value added of the poultry food. Some of the large processor are also major growers of chicken. and another widely used organizational structure is vertical integration, where the same company may

engage in obtaining grain, production of poultry, and processing and marketing the final product. This is the case with Foster Farms, Nicholas turkeys etc.

There is a growing literature on the design of contracts once they are selected. It relies on the asymmetric information literature and suggest contract that take advantage of partial information available to growers, We do not have as good understanding on reason to join

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Reasons for Contracting

Much of the literature on contracting emphasizes asymmetric information and suggests that the reason contracting has been established is because certain activities require a large amount of effort that cannot be induced within a vertically integrated firm. In addition, penalties associated with not fulfilling a contract may lead to efficient outcomes. That does not seem to be a reasonable justification because there are many other situations where vertically integrated organizations conduct complex tasks that are more complicated than raising poultry. On the other hand, once an integrator decides to establish contractual relationships with producers, asymmetric information considerations and mechanism designs are appropriate for obtaining the best contract. We argue that the following are other reasons for establishing contractual relationships in the livestock sector.

1. Many integrators, especially in the early stages of their operation, have limited capital and contractors provide large amounts of capital needed to invest in facilities. Reliance on the contractors to finance much of their investment on integrated operations enable integrators to have a larger volume and to invest in processing and marketing in areas where they can gain higher rates of return.

2. The contractors have local knowledge and contacts that may reduce their cost in purchasing real estate and constructing new structures.

3. Farmers are sometimes entitled to special loans that are not available to integrators.

4. Environmental agencies will be more forgiving to local firms than to large corporations.

One way to view a contractual relationship is as a trade between individuals with different relevant advantages. The integrator has business know-how and connection and needs capital and local contacts to build a large enterprise. The contractors have resources. They want to be independent businessmen, but they lack the knowledge and contacts and are adverse to risks from being completely on their own. Both parties may gain from a trade with a contractual relationship. The nature of the contractual relationship and their desirability vary across locations. Contractual relationships may be more attractive in regions that do not have a track record in, say, production of poultry and when local governments and businessmen are in search of employment opportunities.

In regions where poultry farmers were on their own, transition to contract relationships may have some drawbacks. They lose their independence and they may lose some market power. Thus, some of them may resist introduction of contracts. One

thing that is important when considering animal waste is that contractors, not the integrators, are liable for the waste, even though the integrators may affect the waste by determining levels of output, providing seeds, and determining, for example, the content of phosphates. By establishing processing facilities and indirectly determining the location of the production facilities, the integrator becomes not liable.

Things have not changed in Maryland where the notion of joint liability was introduced. This issue of liability is important in other sectors. Manufacturers such as Chrysler will not be liable for pollution caused by its suppliers, even though Chrysler determines the output levels and is responsible for providing time specifications. The issue of liability in a production system may not be that simple because in many cases the contractor may work for several integrators and the degree of independence that contractors have varies across industries. Nevertheless, this is a major issue that will be addressed later.

Poultry waste, relative to other waste products, is dry and rich in nutrients and, therefore, cannot be actually processed and sold as fertilizers. Yet, in many regions, e.g., the Eastern shores of Maryland, poultry waste runoff caused algae problems (**pfistria**) and led to significant damage to fisheries. An interesting note is that one of the most difficult animal waste problems is getting rid of dead birds. In some locations in the south, farmers solved the problem by placing alligators in ponds. The alligators were later processed to produce meats and leather. This is another example of a creative biological solution to a waste problem. Of course, it requires the capacity to handle alligators.

Swine

Swine waste management is the most difficult animal waste problem. The waste is liquid and unpleasant and shipping and handling are difficult. Historically much of the swine production was done in the Corn Belt region where a system of corn and hog production was established. This system has been a model of sustainability since hog waste has been used as fertilizer. When the number of animals per acre was relatively small, people tolerated the smell, and this system was indeed exemplary.

Improvements in technology, especially in management of animals in confinement, distribution of food, etc., resulted in new production systems and confined a large number of animals. These systems have an advantage in terms of labor cost and product quality. As the demand for hogs and swine meat increased and needed to expand, new large production systems that are based on large facilities were established. The most pronounced example of this phenomenon occurred in North Carolina where integrators (Murphy Farms) established processing facilities and had contractors with thousands of animals. Establishment of such systems is slowing occurring in Iowa and other states because, when there is need to remodel production units or to build a new one, new technologies are more cost effective. Another characteristic of the new systems is the separation between feed production and animal production. Production facilities produce a lot of waste and have relatively small disposal acreage.

The waste contains three substances—nitrates, phosphorous, and potassium.

Ground water contamination by nitrates has been the most severe problem and, therefore, leading technologies of lagoons where liquid waste is accumulated and the nitrates are evaporating. They may cause air pollution which will be discussed later, but the remaining material has low concentration of nitrates. On the other hand, the

phosphorus causes another problem. During storms, runoff carries a large volume of phosphorus to bodies of water. This suggests that government policies should address problems of nitrates, phosphorus, and other minerals that are sources of problems. Strict regulation of phosphorus may lead to adoption of new waste technologies. One such technology spreads and dries waste products so that they can be exported and spread to large acres without causing problems. An alternative approach is to use the waste product and production of algae or buckwheat that can be later used as a feed for animals.