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Livestock Production Contracts, Waste Management and the Environment

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Agricultural contracts are an integral part of the production and marketing of selected livestock commodities such as broilers, turkeys, eggs, and hogs. The potential impact of livestock production on environmental quality has become a nationwide concern, especially in areas with high concentration of large-scale, confined animal feeding operations (CAFOs) such as North Carolina.

It is increasingly common for environmental advocacy groups to argue that contracting *per se* is a cause of environmental problems related to livestock production. Their claim is based on the grounds that contracting increases the scale of livestock operations and simultaneously reduces opportunities for economics of scope in livestock utilization through increased specialization. An opposing view promulgated in corporate agriculture circles is that large, intensive livestock production units are, in fact, environmentally friendlier than small family farms because they can afford technologically advanced waste management systems due to significant economies of scale. This issue of the *NC State Economist* discusses the evidence on linkages between agricultural livestock contracts and environmental quality, as well as the impact of recent changes in EPA waste management regulations.

Modern Livestock Production Systems

Two distinct characteristics of modern livestock production systems have potentially important environmental implications. The first is the shift to large-scale, intensive, specialized operations. This process, which is often described as industrialization, brings different land-use patterns compared to traditional livestock production systems. In addition, large scale CAFOs are able to adopt certain waste management technologies that are not economically feasible for smaller family farm units.

The second characteristic of the modern livestock industry with important environmental ramifications is a shift away from a supply chain consisting of independent sole proprietorships exchanging inputs and outputs through open spot markets to one in which *vertically coordinated* farms, feed mills and processors are linked by production contracts, marketing agreements or common ownership. Contracts, as an instrument of vertical coordination, have emerged in response to some form(s) of market failure. The way specific contracts are written reflects an attempt to mitigate a particular set of incentive problems related to an uneven distribution of information among the various participants in the supply chain. An important implication of this is that regulatory changes may well alter the nature of the information asymmetries, which would in turn lead to contract renegotiations (with difficult-to-predict welfare effects).

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The Relationship between Contracting and Animal Waste

There are four categories of potential linkages between contracting and animal waste management problems: (a) scale of operation; (b) specialization; (c) geographic concentration; and (d) division of inputs and contract settlement. These are discussed below.

Scale of operation

While the impact of contracting on productivity is sizeable, contracting *per se* does not appear to have large effects on the scale of operation. The production technology employed in modern livestock operations displays increasing returns to scale regardless of ownership structure. This motivates increased farm size of both independent and contract operations alike. Additionally, significant economies of scale in waste management means that intensive livestock production units could, in fact, be environmentally friendlier than small family farms because the use of technologically advanced waste management systems is only economically feasible on larger farms.

Specialization

Contracting creates more specialized animal production operations, thereby limiting the joint production of crops and livestock that characterizes traditional independent family farms. However, the joint production of crops and livestock may not necessarily be more environmentally friendly than specialized production. All farmers tend to apply livestock manure in excess of the amount that would be required to just substitute for chemical fertilizer, because on any given field they not only receive the nutrient benefits of that application but also save on the transportation costs relative to applying the same manure on more distant fields. Consequently, the use of manure can be expected to worsen nutrient runoff and leaching from croplands regardless of whether the livestock producer is a contract operator or an independent farmer.

Geographic Concentration

Contract production results in high concentration of livestock production facilities in a few geographic areas. However, there is also a tendency for the independent livestock producers to concentrate in certain geographical areas due to significant economies associated with locating within an established network of feed mixers, slaughtering plants, specialized construction companies, extension specialists, veterinarians and banking services geared around the specific needs of livestock producers. These networks could become important factors of industry growth in certain regions.

However, concentration is not necessarily bad either. An empirical estimate of environmental damages caused by the neighborhood presence of large-scale hog operations suggests that social welfare would be enhanced by directing livestock industry expansion towards areas where the concentration of animal units is already high, rather than trying to distribute the future animal industry growth more evenly across the landscape (Vukina, 2003).

Contract settlement

The amount of nutrients from animal waste that ends up deposited in the environment is directly related to the composition of animal feed. Integrators determine the nutrient content of the manure through decisions about genetic makeup of animals and their feed rations, but growers own the manure and are legally liable for its removal and disposal. Because monitoring the nutrient content of feed and manure is costly and imperfect, and each party cannot observe the effort exerted by the other party, the net benefits or costs of nutrient application may fail to get incorporated into the payment schedule of a

production contract. Therefore, the question of the division of responsibilities for providing inputs in livestock production and the resultant payment schemes used to settle the contracts become important for purposes of optimal contract design.

Impact of New Waste Management Regulations

Livestock and poultry production is regulated under the Federal Clean Water Act of 1972. In February 2003, changes in regulation of livestock and poultry farming under the Clean Water Act were introduced in the so-called "Final Rule" of the National Pollutant Discharge Elimination System. EPA's Final Rule made significant modifications to the regulation of CAFOs while maintaining the basic regulatory structure. The major changes include (a) the elimination of the 25-year, 24-hour storm discharge exemption, (b) the requirement that chicken operations that use dry manure handling systems obtain permits, and (c) subjecting wastes applied to cropland and pastures under the control of the CAFO operator to permit requirements. The revised regulations address some of the key shortcomings of the old program, but they also raise even greater management challenges for the states and EPA.

A substantial portion of livestock production – the part that is organized via contracts between companies and independent growers – will be impacted by the new CAFO regulation. EPA estimates that the total cost increases associated with the new regulations will be $335 million (of which more than 80% will be associated with waste management expenses for large CAFOs). An important policy question that arises is how these costs will be shared between growers and integrators.

To begin to answer this question, first notice that the new CAFO regulation do not fundamentally change the responsibilities of contracting parties for the provision of production inputs. This came as something of a surprise to observers of the industry. Prior to the passage of the Final Rule most people in the industry and in environmental circles anticipated that some form of shared responsibility for the removal and disposal of manure between the integrators and the growers would be implemented. However, to the great dismay of environmental groups, this part of the proposed regulation did not pass. Contract growers still have full responsibility for compliance with federal, state and local environmental laws regarding disposal of dead animals and animal waste. Consequently, the legal incidence of the increased costs of environmental compliance with the new CAFO rules falls entirely on contract growers.

It is important to note, however, that the theoretical economic literature suggests that even if the *legal* incidence of waste disposal regulation falls entirely on growers, the actual *economic* incidence will generally be shared between growers and integrators. Moreover, the overall welfare consequences for the integrator, contract growers, and society will be the same whether the legal responsibility for waste management falls entirely on the integrator, the growers, or both (Bontems, Dubois and Vukina, 2003). In other words, placing the entire regulatory burden only on the integrator or only on the grower generates the equivalent outcome from the viewpoints of all parties.

There is one important caveat, however, with regard to this equivalence result. Facing increasingly stringent environmental regulation, growers are exposed to substantial risks of large penalties for environmentally hazardous disposal practices and especially catastrophic waste spills. Because growers generally have limited assets, the likelihood of

bankruptcy is much larger for them than for the integrators who are large, sometimes publicly owned, companies. The risk of bankruptcy can cause a reduction in the level of care that growers devote to waste management activities, because the contract operators would care only about the costs that they might actually have to pay.

The specter of bankruptcy risk on the part of growers means that the legal incidence of regulation may not be irrelevant (in contrast to what is implied by the equivalence result). Rather some sort of legally mandated sharing of the costs of waste management between growers and integrators might be better from the perspective of maximizing overall social welfare.

The emerging consensus from the theoretical literature on this subject suggests that in geographical areas where the market for growers is fairly competitive such that the integrator's bargaining power is rather low, making integrators liable for environmental damages caused by the growers is not theoretically justifiable. On the other hand, if the integrator is the "only game in town" and the probability of growers defecting to another integrator is low, making integrators partially liable for environmental damages caused by the growers may be socially optimal.

References

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