Economics 051
The Economics of North Carolina

Hog Farming and Lagoon Management in North Carolina: Economic Feasibility

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The pollution produced by disposal of hog waste is a critical issue facing the multitude of hog farms that populate the eastern region of North Carolina. Hog finishing is a large and necessary economic mainstay of the state, yet the harm to the environment that results from this industry is beyond what environmentalists and state legislatures can tolerate. Dr. Mike Williams and NC State University (NCSU) were given the responsibility of developing environmentally superior technology and assessing the ability of farmers to implement these new technologies. Mike Williams focused much of his research on calculating whether or not using alternative methods of dealing with hog waste would be economically feasible for farmers in North Carolina (Research Seeks to Balance).

Nearly all farmers in North Carolina currently use lagoon and sprayfield technology to dispose of their hog waste. Waste that accumulates in the pens where the hogs are kept is washed down to the lagoons, which are large in-ground pits that act as containment pools for the waste (Taylor: An Investigative Series). The waste in the lagoon is then left to decompose naturally. Solid wastes settle on the bottom while the liquid waste that rises to the top is pumped out and sprayed over the farmer's fields and crops to be used as a fertilizer (Taylor: Alternatives to Lagoons). Environmental groups such as the Environmental Defense, Sierra Club, and the Natural Resources Defense

Council have brought a significant amount of attention to the pollution caused by this method of dealing with hog waste. While scientists are split on whether or not lagoon/sprayfield technology poses health risks to those living near hog farms, and the Environmental Protection Agency has found no correlation between hog farming and serious health problems (Taylor: An Investigative Series; Alternatives to Lagoons), environmental groups cite research that shows the gases released by the open-air lagoons cause a myriad of symptoms, including headaches, coughing, nausea, and even depression, in neighbors of hog farms (Marks 1-2). Another significant problem associated with lagoon systems is the fact that it pollutes and contaminates water through runoff. Even when lagoons are kept in the best condition, heavy rains can cause the lagoon to overflow and wash downstream through rivers (Taylor: Alternatives to Lagoons). Runoff from groundwater that is sprayed over fields also washes downstream and can have detrimental effects on the health of both the aquatic environment of the stream and those who may use the water to drink (Marks 1-2). Additionally, lagoons have been known to break and therefore dump their waste into nearby water as well as release chemicals and pollutants into the air that compromise the health of those living near the farms (*Smithfield Projects*).

In 2000, at the urging of environmental groups, the Attorney General of North Carolina, Mike Easley, and Smithfield Foods signed The Smithfield Agreement, a contract that promised $15 million to fund research into developing “environmentally superior technology” (EST). Premium Standard Farms added an addition $2.1 million, and Frontline Farmers (an organization of independent hog farmers), although not promising any monetary aid, agreed to work and cooperate with the research and new

technologies. NC State University was chosen to head up the research, with Dr. Mike Williams, director of the Animal and Poultry Waste Management Center at NCSU, selected to oversee and coordinate the research (Smithfield). After several years, their research had identified 18 new technologies, with five specifically designated as "environmentally superior." This term is based on the following criteria as outline in The Smithfield Agreement:

> Any technology, or combination of technologies that (1) is permittable by the appropriate governmental authority; (2) is determined to be technically, operationally, and economically feasible for an identified category or categories of farms as described in Section III. B.; and (3) meets the following performance standards:
> 1. Eliminate the discharge of animal waste to surface waters and groundwater through direct discharge, seepage, or runoff;
> 2. Substantially eliminate atmospheric emissions of ammonia;
> 3. Substantially eliminate the emission of odor that is detectable beyond the boundaries of the parcel or tract of land on which the swine farm is located;
> 4. Substantially eliminate the release of disease-transmitting vectors and airborne pathogens; and
> 5. Substantially eliminate nutrient and heavy metal contamination of soil and groundwater (Smithfield Agreement).

These news technologies generally involve the separation and processing of the liquid and solid waste without the use of a lagoon. One new technology, named "Super Soils," consists of two components that are both EST. After separating the waste into liquids and solids, the liquid is treated to remove the nitrogen and phosphorus that are harmful to the environment and people, turning it into harmless water (Five Cleaner Systems). Approximately 80% of the liquid is then reused to wash out the hog barns again, while the other 20% is sprayed over the crops (Solids Separation). The solid component is transported to a separate location where it is converted into useful fertilizers or other soil products. In addition, Super Soils are entering a second generation

of technology that streamlines the process to make it equally as environmentally beneficial, yet more economically productive. A second promising new technology is Gasification. This process involves converting the solid waste into a clean-burning gas that can be used to produce electricity and/or fuels, particularly ethanol and hydrogen gas. The process of converting the solid is nonbiological and the ash left from burning the gas is useful as a fertilizer or feed supplement because it lacks pathogenic bacteria (Five Cleaner Systems).

The two additional EST options are High Solids Anaerobic Digestion and Combustion in a Fluidized Bed Reactor. The first utilizes ORBIT technology that captures the ammonia and breaks down the odor compounds that are found in solid waste using bacteria. It creates a much drier solid that can then be used as compost, fertilizer, or soil amendment, because it too is free of pathogenic bacteria. Most importantly, ORBIT technology captures methane that can be sold or burned as a reusable source of energy. The last EST, Combustion in a Fluidized Bed Reactor, burns the dry waste to produce ash that can be recycled into fertilizer or feed. Although it has not yet met the standard for environmental permits because of high emission of harmful gases (namely oxides of nitrogen, soot, and air toxins), it is capable of producing (and therefore selling) electricity through combustion (Five Cleaner Systems).

In addition to developing these new technologies, Mike Williams and researchers at NCSU were given the task of determining if the new technologies were economically feasible. The five methods previously mentioned were those that met this standard, defined by the Smithfield Agreement as including, but not limited to, the following:

> (i) the projected 10-year annualized cost (including capital, operation and maintenance costs) of each alternative technology

> expressed as a cost per 1000 pounds of steady state live weight for each category of farm system;
> (ii) the projected 10-year annualized cost (including capital, operation and maintenance costs) per 1000 pounds of steady state live weight for each category of farm system of a lagoon and sprayfield system that is designed, constructed and operated in accordance with current laws, regulations, and standards, including NRCS design, construction and waste utilization standards;
> (iii) projected revenues, including income from waste treatment byproduct utilization, together with any cost savings from the new technology;
> (iv) available cost-share monies or other financial or technical assistance from federal, state or other public sources, including tax incentives or credits; and
> (v) the impact that the adoption of alternative technologies may have on the competitiveness of the North Carolina pork industry as compared to the pork industry in other states (Smithfield Agreement).

A critical factor in making new technologies economically feasible is creating a market for byproducts produced by the new methods. After NCSU concluded their study on EST, a federal grant of $375,000 was match by public and private groups in North Carolina for a total of $750,000 to fund research that specifically targets developing and marketing economically valuable byproducts created from the new technologies. This includes the potential to sell the energy produced in many of the new technologies. This will offset the increased expenses the farmers will be subject to as a part of implementing the new technology (Turning Research Into Reality). The Smithfield Agreement contends that for a technology to be "economically feasible," the farmer does not necessarily have to receive the same amount of profits as under the lagoon/sprayfield system (Smithfield Agreement). However, if a farmer were expected to absorb the costs, they would inevitably transfer the increase costs to the consumer, something the industry cannot afford to do because of competitive markets in Iowa that are not under the same economic regulations. Dr. Michael Wohlgenant, a professor of agricultural economics at

NCSU, claims that adopting the new technologies will cost the industry $485 million each year and eliminate two-thirds of hog farms in the state. This will obviously cause a ripple effect throughout North Carolina's economy and industry that will leave many unemployed with less money earned and spent within the state (Research Seeks to Balance). Therefore it is absolutely necessary that a market is created for the byproducts of new technologies, in addition to the market that already exists, in order for the new technologies to be economically feasible and therefore implemented by hog farmers, thus boosting the economy of North Carolina as a whole (Four Steps to Cleaner Hog Farming).

Frontline Farmers, in conjunction with the Environmental Defense, have proposed four different options to promote adoption of new technologies with minor negative economic consequences for farmers. Each of the proposals center around the Early Adoption Program that was presented to Mike Easley and the North Carolina General Assembly, a system that would give incentives to farmers who are willing to adopt the new technologies. It would allow for between 50 and 100 farmers receive "substantial financial assistance" to ease the astronomical cost of implementing methods that comply with environmental standards over lagoon/sprayfield technology. This ties in with the groups' second proposal, which names firms that can be called upon to fund the Early Adoption Program, which they estimate will cost $20 million. Potential resources include: state and federal appropriations, the Golden LEAF Foundation, and the Clean Water Management Trust Fund. The third proposal is an Early Adoption Task Force to regulate and oversee all actions and projects of the Early Adoption Program with representation from every different perspective in hog farming, including environmental

groups, economists, farmers, and the pork industry. The final proposal is the development of markets for byproducts that was previously discussed. Through these proposals, Frontline Farmers and Environmental Defense hope to reach a compromise between farmers looking out for their own well-being and environmentalists looking out for solutions to the pollution problem created by hog farming (Four Steps to Cleaner Hog Farming).

Though the five ESTs identified by Mike Williams may be technically "economically feasible," there is still much to be done in the hog farming world before new methods can be implemented on a large scale. Introduction, at least at this point in time, would be suicide for small-scale farmers who can't afford to replace their lagoons. Through the development of byproducts such as energy, and supplementation by government and other firms, environmentally superior technologies have a chance to phase out current technology that is harmful to the environment and surrounding areas. Continued innovation and research, promoted by such agreements as the Early Adoption Program, can unite environmentalists and farmers to reach an environmentally sound and economically feasible alternative to the primitive yet cost effective lagoon/sprayfield technology that has plagued hog farmers in North Carolina. In it is important to note, in closing, that environmentally superior technologies need to be implemented across the United States, not simply in North Carolina, to keep the market fair and not give particular states an undeserved edge in competition.

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