Economics 051
P. Conway
Fall 2009

Assignment 2: Evaluating New Technologies for Waste Disposal

This assignment is due at the beginning of class on 8 October. Late submission will be penalized. While the numbers provided are in the spirit of those reported by the Smithfield report, they are not taken directly from that study.

The Smithfield Agreement led to a six-year study of hog waste disposal technologies. The results of this study can be stated as follows. The cost and benefit figures are provided in annual equivalents. For installation, for example, this amount represents the loan payment the finisher would have to make each year to pay off the installation costs. (EST is the acronym for "environmentally superior technology", while NDR is the acronym for "neighbors and downstream residents".) Recall that the finisher with 1000 hogs will receive $22500 in revenue during the year.

For the Finisher (all costs and benefits given are per year per 1000 hogs)

Cost of existing technology (lagoon/sprayfield):	
Installation (on a per-year basis):	$12000
Operation:	$ 2000
Maintenance:	$ 2000
Value of fertilization from spraying waste	$ 1000
Cost of Environmentally Superior Technology	
Installation	$20000
Operation	$ 7000
Maintenance	$ 1000
Cash Benefit from EST	$ 4000

The "Cash Benefit from EST" figure is based upon the ability of finishers using this EST to convert the biomass of the hog farm to electricity and to sell that electricity to the local power company for $0.02 per kilowatt/hour. (The power company then resells the electricity for $0.10 per kilowatt/hour to its customers.)

In addition to the finisher's costs and benefits, there are costs to NDR of the two technologies of hog farm operation that are not considered by the finishers in making their technology choices.

For the existing technology, the annual cost is	$16000
For EST, the annual cost is	$ 4000

Questions:

1. What is the private marginal cost (per hog) of the lagoon/sprayfield technology? What is the private marginal benefit? Be sure to distinguish in your answer between those who have already equipped their hog farms and those considering starting a new hog farm. Do the concepts of "fixed cost" or "sunk cost" apply to any of these costs? Explain.

2. What is the social marginal cost (per hog) of the existing (lagoon/sprayfield) technology? What is the social marginal benefit? Explain how you identified these amounts.

3. Does society prefer the EST to the lagoon/sprayfield technology? Explain why or why not.

4. Will the farmer adopt the EST given the current structure of costs and benefits? Why or why not?

5. The text (chapter 10) identifies three techniques for reducing externalities: negotiation, adjudication, and legislation. Explain each of these, and indicate how each could be used to reduce the externality inherent in the finisher's choice.

6. Mike Williams is the governor's designated "hog waste" expert. He has stated that he believes the moratorium on new hog farms should be lifted for any farmer willing to adopt the EST. Does the information on the preceding page support this conclusion? Explain.

7. The Cash Benefit from EST is derived for finishers generating electricity from biomass and then selling the electricity to the power company for 2 cents per kilowatt/hour. If the power company offered to buy electricity from the finishers at 8 cents per kilowatt/hour, will your analysis in questions 3 and 4 change? Explain why or why not.

The first four questions are worth 10 points each, while the last three are worth 20 points apiece.