Diseconomies of Scale in Animal Feeding Operations

By Sara E. Wright

Objective

- To lay out the framework for analysis to demonstrate the ultimate economic efficiency of family-run livestock operations using sustainable management practices, as compared to concentrated animal feeding operations.

Goal

- To add environmental costs back into farms' balance sheets, and to calculate and compensate for the distortions created by regulation.

Background

- Argument: intensive livestock farming operations can take full advantage of economies of scale.
- Assumption: such operations can cut costs relative to smaller farms by increasing the number of animals per unit of land and per unit of energy consumption.

Reality

- Many environmental costs are not fully reflected in market transactions, and are therefore not internalized in farm cost accounting.
- Other types of cost distortions are imposed by the regulatory environment, and have the effect of putting smaller, more environmentally responsible operations at a perceived disadvantage in efficiency terms.

Proposal

- Conduct study on Virginia & North Carolina.
- North Carolina: recent explosion in industrialized hog operations, second largest producer, suffered recent negative effect.
- Virginia: home to variety of paradigms, from industrial to CSA.

Getting Started

- Collect farm-level data from USDA’s Census of Agriculture and farm financial management data from the Agricultural Resource Management Survey (ARMS).
- Subcategorize by farm size and organization type.

Adding Costs

- Add environmental costs to the farms' cost accounting.
- Use valuation studies on various types of impact.
- Offset cost distortions created by misguided regulation.

Antibiotic Resistance

- Global problem, agricultural abuse of antimicrobials for non-therapeutic purposes is one of the primary culprits.
- Livestock producers in the US use an average of 24.6 million pounds of antibacterials and antimicrobials per year for non-therapeutic purposes.
(Union of Concerned Scientists)

In Context

- Around 70% of antibiotics produced in the US are used for nontherapeutic purposes such as accelerating animal growth and compensating for overcrowded & unsanitary conditions on large-scale confinement facilities. This translates to about 25 million pounds of antibiotics & related drugs fed every year to livestock for nontherapeutic purposes - almost 8 times the amount given to humans to treat disease. (UCS)

Evidence

- Many examples of antibiotic resistant human pathogens that have been linked conclusively to their abuse in livestock operations.
- These include campylobacter resistant to floroquinolones, avoparcin-resistant Enterococci bacteria, and multi-drug resistant DT104 Salmonella.

Valuation

- Elbasha (2003) estimates value of deadweight loss associated with antibiotic resistance.
- Around 30% of all antibiotics sold in US are for non-therapeutic purposes.
- Thus, calculate

  farm cost – {(.3 * DWL)farm cost}.

Water Pollution

- Agricultural run-off can impair the potability of water for humans and animals, make it unsafe for recreational purposes such as swimming, and reduce its capacity to serve as a habitat for edible fish and shellfish.

Water Pollution

This happens as a result of the addition of:

1. excess nutrients such as nitrogen and phosphorus from animal manure to water sources, causing eutrophication and other damage;
2. organic matter, the decomposition of which requires oxygen that would normally be used by fish and other marine life;
3. pathogens, which can spread disease in humans and animals.

CAFOs

- Concentrated Animal Feeding Operations, sometimes referred to as “industrial,” “factory,” or “intensive” farms, seek to minimize costs by minimizing the most significant inputs to livestock operations, namely land and labor.
- Take animals out of the pasture feeding environment and place them in confined spaces within buildings.

Environmental Challenge

- Minimal environmental impact associated with an animal depositing manure on the ground as it forages for food in a free-range setting.
- CAFOs must manage manure in mass quantities that greatly exceed the carrying capacity of the land on which they operate.

Valuation

- CAFOs are regulated as point source polluters, & have a specific category in CWA reporting.
- USDA publishes confined animal manure and nutrient data system.
- Crutchfield et al. conducted an empirical study to quantify the benefits of improving water quality, with a particular focus on agriculture.

Global Warming

- Agricultural activity contributes to global warming directly by way of methane production in livestock and indirectly by way of energy use in stock production.

In Context – Cow Farts

- Much of the world's livestock are ruminants - i.e. sheep, goats, camel, cattle, & buffalo - who have a unique, four-chambered stomach. In the chamber called the rumen, bacteria break down food & generate methane as a by-product. The production rate is affected by factors such as quantity & quality of feed, body weight, age, & exercise, & varies among animal species. (CIESIN)

Mitigation

- One of the primary ways to reduce anthropogenic methane emissions (farts) from livestock is to improve feed quality.
- Given the least-cost model of CAFOs, it is reasonable to assume that they will use poorer quality feed than a sustainable family farmer.

Quality Feed

- The best possible diet on which to raise cattle and other ruminants is grass, rather than the grain and agricultural by-products that so many factory livestock receive. This is because ruminants were designed to eat low-protein, high-fiber forage.

Quality Feed continued

- Grain is high-protein, low-fiber (compared to grasses), and it is very hard on a cow’s system to digest. A grain-based diet will break down the cilia in a cow’s intestines. This makes it impossible for the cow to digest grass fully ever again, and raises its digestive pH level so that many strains of E. Coli can thrive.

Energy Use

- Energy is required to produce feed for livestock, and this also can contribute to global warming.
- Consider three levels: the large intensive farm, the medium farm that supplies its own feed, and the small family farm.

Valuation

- Subak (1999) conducted a study to value the social cost of beef production.
- She arrived at a global social cost of approximately 3 – 5% of the producer price of beef.
- Assume the median of 4%.

Valuation continued

- The three levels of farm impact will be weighted.
- Assume level two has 4% cost.
- Level 1 will be calculated at 7% and level 3 at 1%.

Actual vs. Potential

- This admittedly simplifying approach is an attempt to respond to Centner's important admonition to "distinguish actual pollution from potential polluters."

Regulatory Costs

- The Poultry Products Inspection Act and the Federal Meat Inspection Act both came into being in response to growing concerns about food-borne illnesses as a threat to human health.
- Require USDA inspection during all phases of slaughter.

One Size Fits All

- Unfortunately, the requirements set forth by these regulations seem to have the industrial operation in mind, and do not fit the circumstances of the family farm.
- Consider our friends Joel Salatin and Jenny Drake.

Custom Kill

- Most custom kill facilities are designed for mass quantity.
- Custom kill operators are often unwilling or unable to adjust operations for smaller inventories.

Valuation – Opportunity Cost

- Farmers like Joel Salatin have already calculated the extra cost they incurred.
- Many farmers like Jenny Drake have done their own valuation studies of opportunity cost.
- Deduct processing and transportation fees, add back in cost estimate of facility.

Subsidies

- Among subsidy recipients, large farms collect almost all the money. Nationwide, 10% of the biggest (& often most profitable) subsidized crop producers collected 71% of all subsidies, averaging $34,800 in annual payments between 1995 & 2002. The bottom 80% of the recipients saw only $846 on average a year. (EWG)

Basic Economic Theory

- Subsidies create surpluses.
- Subsidies create artificially low prices.
- Artificially low prices make it even more difficult for a farmer to charge the true cost – one that internalizes environmental impact – for meat products.

Valuation

- It’s tempting to add the subsidy amounts directly to the cost column. However, this would not be appropriate, since farmers would have produced less without the subsidies and thus would have had lower absolute costs.
- Best guess estimate: add back 50%.

Wrapping Up

- Well, I’ve given myself a lot of work to do. Admittedly a sophomoric attempt. Got stuck in a quagmire.
- Perhaps I was naïvely inspired by Costanza’s global valuation efforts.
- It smacks of hubris, but I learned a lot!

Conclusion

- It’s hard to write a conclusion for a work in progress.
- I hope that when I’m through with this, I will have demonstrated with real numbers that family farms using sustainable livestock management practices are more economically efficient than CAFOs.