ECONOMICS OF ANIMAL PRODUCTION/MANURE MANAGEMENT SYSTEM COST BENEFIT ANALYSIS TO IMPROVE SOCIAL WELFARE

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Economics is the study of the allocation of scarce resources for the purpose of maximizing the welfare of people. The white paper summarized here is a review and application of economics to the questions of how to improve social welfare via modifications to animal production systems and waste management systems and modifications to the policy and regulations that affect them. A comprehensive approach is taken in this paper building on principles of social welfare maximization, specification and measurement of benefits and costs and welfare effects of various modifications to policy and farm production systems. Emphasis is placed on: 1) the individual farm level response to policy (regulations, incentives and education), 2) the relationship between farm level practices and environmental quality, 3) the relationship between farm level decisions and the welfare of rural communities, and 4) the identification of efficient, equitable modifications to improve social welfare.

Welfare maximization is the major economic principle defining optimal policy. If welfare is not maximized, inefficient allocation of resources diminishes societal welfare and provides fewer resources to properly address the wants of society — including greater environmental quality. While the absolute maximum of social welfare may be impossible to identify, conditions for moving towards the maximum provide us with economic principles for decision making.

First, for a policy change to be welfare increasing, the benefits must exceed the costs. Second, for a policy change to be efficient, no other policy change should provide the same benefits at lower cost (or greater benefits at the same cost). Otherwise, welfare is not increased as much as it might have been and society again has fewer resources to distribute to competing ends.

An application of these two principles is that environmental regulation of livestock farms should only impose costs where the value of corresponding benefits is greater. An extension of these principles is that costs should only be imposed to the degree, and on specific farms, where the value of corresponding benefits is greater. Otherwise, individuals, communities, regions and society have lower welfare than they might have had.

Cost and benefit analysis is a common (and legally mandated) method of evaluating environmental regulations. Costs and benefits are estimated for both the producer (assumed source of pollutants, investment, income and employment) and the rest of society (assumed beneficiary of less pollution, more investment, income and employment). This paper addresses the process of cost and benefit analysis and its appropriate use in evaluating the economic impact of proposed environmental regulations.

Non-point source pollution policy presents compounded problems when estimating the costs and benefits of pollution abatement. For example, costs of regulation oversight may increase per unit of pollutant because literally tens of thousands of dispersed animal feeding operations and millions of acres are subject to record-keeping and verification. In other words, non-point source pollution agency costs may well be higher than point source pollution agency costs per unit of pollution abated.

Benefit estimation for non-point source pollution reduction from livestock farms is problematic due to the uncertain relationship between potential pollutants applied to a farm field and the actual transport of pollutants to a site where environmental damage can occur. Point source pollutants are clearly defined as pollutants when they are discharged directly into a susceptible environment by a man-made conveyance. The probability of

potential non-point source pollutants causing environmental damage is conditional on the location of the field (source), management practices and exogenous variables such as weather. Unplanned pollution can occur from both point sources and non-point sources when systems fail (e.g. when a storage structure is breached, or a rainfall event transports a potential pollutant from its intended location). Implications for benefits estimation and policy design of non-point sources versus point sources are explored in the paper. The need for improved validation of fate and transport models is stated.

Assigning a monetary value to pollution reduction presents a second class of problems in benefit estimation. Markets for environmental quality losses due to pollution are rare. The value of benefits is therefore estimated (predicted) using some non-market method (e.g., contingent valuation) that may overvalue or undervalue the benefit. Regulatory agencies use an approach called "benefits transfer" to value improved environmental quality. An example of a pitfall in this predictive approach is that a constant marginal value (price) may be applied to ever increasing levels of environmental quality rather than recognizing that as the supply of environmental amenities increases their marginal value decreases, all else held constant.

A critical component of cost benefit analysis for welfare increasing policy design is an assessment of the distribution of impacts of the proposed policy. Averages can be highly deceiving in cases where the distribution of benefits and/or the distribution of costs are highly skewed across farms and across regions. For example, a very high fraction of the benefits of a policy change may be generated on a very small fraction of the farms being regulated. Similarly, costs of complying with a rule may vary widely by farm type, region or site specific conditions. Efficient policy design will incur costs primarily at the very small fraction of farms where most of the benefit is achieved. Inefficient policy will impose costs on farms and regions where little or no benefit is created.

Equity is an important consideration in designing policy change for livestock farms. Most policy changes result in costs being imposed on some individuals and benefits being received by others. Any policy change that imposes costs on any individual, firm, community or region is a selective appropriation of wealth by the government for reallocation to those receiving benefits. The distribution of impacts described above suggests that a small group of individuals, communities and regions could suffer large losses of wealth to create relatively small benefits for a large group of people. In the case of livestock farms, most of the individuals bearing costs will be farmers that designed their farms, invested heavily and operated their waste management systems under the guidance and in full compliance with government environmental agencies. Pareto optimal change (named after economist Vilfredo Pareto) can be defined as change that leaves no person worse off and at least one person better off than prior to the change. Note that change must be social welfare increasing to satisfy the Pareto optimality criterion. In addition, beneficiaries of the change must compensate those bearing the costs. Some concepts and mechanisms of equitable policy change for livestock farms are explored in the paper.

A critical component of cost benefit analysis is predicting farm managers' response to waste management policy (regulations, incentives and education). For example, managers' response to rules that provide negative incentives (increased paperwork and probability of fines) may be to seek a least cost solution including avoidance of violation detection. The solution may not reduce the probability of pollution if the decision maker discovers alternative methods of regulatory compliance. Producers may more willingly comply with regulations that provide positive incentives such as cost-sharing or increased access to markets.

Cost benefit analysis at the farm level must also account for the market (dis)incentives created by policy. For example, regulations that selectively define manure nutrients as pollutants discourage development of markets for manure. Crop producers needing nutrients will shun manure nutrients when commercial fertilizers are not defined as pollutants. Conversely, policy incentives for

manure nutrient utilization can stimulate markets that reduce potential pollution from manure supplied nutrients.

A core component of this paper details how farm level costs are estimated from a systems perspective. This systems perspective is important for accurate assessment of the costs likely to be incurred on individual farms. As an example of pitfalls of inadequate analysis, a simplistic analysis might assume that regulatory compliance can be obtained with existing land application technology priced at current custom rates per gallon. New regulations change the business and production environment so that this assumption leads to errors. In this example, custom rates are actually conditional on application rate (gallons/acre). When regulations result in a decreased application rate, the custom charge per gallon will increase. The simplistic analysis underestimates the cost of compliance. As described in the paper, farm level cost analysis includes financial feasibility of investments and the imputed value of farmers' time spent performing regulatory imposed activities during certain production seasons.

The paper includes a discussion of common pitfalls in assessing and aggregating costs such as misuse of frequency factors, incorrect interpretation of publicly available data (e.g. USDA price projections), and ambiguity of the effects of rule implementation on actual production practices.

In summary, this paper is intended to provide background and some guidance in applying economics to modify policy and regulations and modify animal production and waste management systems to efficiently and equitably improve social welfare.

The full text of the White Papers is available for $25 from Midwest Plan Service,

http://www.mwpshq.org/