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**WHY DO LIVESTOCK FARMERS PARTICIPATE IN VOLUNTARY
ENVIRONMENTAL PROGRAMS? AN EMPIRICAL STUDY OF THE MICHIGAN
AGRICULTURE ENVIRONMENTAL ASSURANCE PROGRAM (MAEAP)**

By

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ABSTRACT

WHY DO LIVESTOCK FARMERS PARTICIPATE IN VOLUNTARY ENVIRONMENTAL PROGRAMS? AN EMPIRICAL STUDY OF THE MICHIGAN AGRICULTURE ENVIRONMENTAL ASSURANCE PROGRAM (MAEAP)

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Previous studies have identified regulatory preemption and differentiation as two main motives for participation in voluntary environmental programs (VEPs). This research examines the motivations of livestock farmers to participate in the Michigan Agricultural Environmental Assurance Program (MAEAP). It employs a signaling model of interaction between the regulator and livestock farmers under imperfect information to analyze the potential equilibria of participation decisions in VEPs. Data from a survey of livestock farmers in Michigan is analyzed to test hypotheses regarding the realized equilibrium in MAEAP participation. The results suggest that livestock farmers who are interested in regulatory preemption are more likely to be MAEAP-verified while those who are interested in differentiation are less likely to be verified at the time of the survey. Consistent with the model predictions under the regulatory preemption equilibrium, MAEAP-certified farms also perceived more stringent enforcement effort by the regulators.

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LIST OF ABBREVIATIONS

Animal Feeding Operation (AFO)

Animal Unit (AU)

Concentrated Animal Feeding Operation (CAFO)

Comprehensive Nutrient Management Plan (CNMP)

Clean Water Act (CWA)

Environmental Council of the States (ECOS)

Environmental Quality Incentive Program (EQIP)

Generally Accepted Agricultural and Management Practices (GAAMPs)

Michigan Agriculture Environmental Assurance Program (MAEAP)

Michigan Department of Agriculture and Rural Development (MDARD)

Michigan Department of Environmental Quality (MDEQ)

National Pollutant Discharge Elimination System (NPDES)

Right to Farm (RTF)

Technical Service Provider (TSP)

USDA Natural Resource Conservation Service (USDA-NRCS)

US Environmental Protection Agency (USEPA)

Voluntary environmental program (VEP)

I. INTRODUCTION

Traditional instruments used by governments for environmental protection include command and control approaches, where regulators impose limits on environmental emissions or mandate specific control technologies, or market based approaches that involve emission taxes, emission subsidies and tradable emission permits.

Voluntary environmental programs (VEP) are increasingly being employed as an alternative approach where firms voluntarily participate in programs that help improve their environmental practices, performance, and management systems (Segerson & Miceli, 1998). For example, firms voluntarily participate in USEPA's 33/50 Program and commit to 33% to 50% reduction in discharges of industrial toxic pollutants. Similarly firms voluntarily seek ISO 14000 certification for their environmental management systems that include a commitment to continual improvement in environmental performance.

The European Commission (Commission of the European Communities (EC), 2002) identifies the following potential advantages of voluntary environmental programs: 1) the promotion of actively cooperative actions for environmental protection from industry, 2) greater flexibility to find cost-effective solutions that are suitable for specific conditions of individual firms, 3) the ability to achieve environmental goals more rapidly due to a reduction in negotiation time and implementation lags, and 4) lower monitoring/enforcement costs.

The Michigan Agriculture Environmental Assurance Program (MAEAP) is a voluntary environmental program for the agriculture sector initiated in 1999 by a coalition of state government agencies and agricultural, environmental and conservation groups in Michigan. The initial impetus for the MAEAP came from the Governor's Pollution Prevention Strategy for Michigan Agriculture 1998, which sought innovative approaches for participatory environmental

compliance. Livestock farmers seeking MAEAP verification participate in education programs, develop a comprehensive nutrient management plan (CNMP) or a “Livestock-A-Syst” plan (a simpler version of CNMP developed for smaller farms), and follow generally accepted agricultural and management practices (GAAMPS). MAEAP activities, including verification, are managed by officials at Michigan Department of Agriculture and Rural Development (MDARD). Under a special agreement negotiated between the US Environmental Protection Agency (USEPA) and the state government, MAEAP verification was allowed for animal feeding operations (AFO) in lieu of obtaining the National Pollutant Discharge Elimination System (NPDES) permits during the period 2002-2007. The number of livestock farms receiving MAEAP certification in Michigan had grown to 507 by the end of September in 2012.

The key question addressed by this thesis is why do livestock farmers participate in voluntary programs such as the MAEAP? Existing economic literature identifies two major motives for participation in VEPs: regulatory preemption and differentiation. Under a ‘regulatory preemption’ scenario, firms engage in voluntary pollution reduction through VEPs when faced with potentially stringent future regulations. Under a ‘differentiation’ scenario, firms that are already proactively engaged in environmentally responsible activities would like to send a signal about their environmental responsibility to regulators, other stakeholders and/or environmentally conscious consumers. The goal there is to differentiate themselves and to capture additional returns—either in the form of higher prices from consumers or in reduced regulatory oversight.

We develop a conceptual model of strategic interaction between a regulator and a farmer, drawing on ‘signaling’ models in economics. The farmer’s decision to participate in a VEP is modeled to be based on costs of signaling via participation in MAEAP, and expected regulatory/stakeholder reaction and associated benefits. Similarly the regulator’s/stakeholder’s

reaction is based on MAEAP participation and prior beliefs about what such certification reveals about the type of the farmer. The model identifies four potential equilibria and conditions under which they may occur: all farmers either participate or do not participate in MAEAP (pooling equilibria), or separating equilibrium where only environmentally responsible farmers participate in the MAEAP, or another separating equilibrium where only environmentally less responsible farmers choose to seek MAEAP certification. We posit that the separating equilibrium where only environmentally responsible farmers participate in the MAEAP represents a ‘differentiation motive’ scenario, and the separating equilibrium where only environmentally less responsible farms choose to seek MAEAP certification represents a ‘regulatory preemption motive’ scenario. We then develop testable hypotheses about MAEAP participation under each of these scenarios.

These hypotheses are then tested empirically, using survey data on a sample of livestock farmers in Michigan collected in 2010. The results from a probit model estimation suggest that livestock farmers who were interested in regulatory preemption were more likely to be MAEAP-verified while the differentiation motive did not appear to have a significant effect on the program participation at the time of the survey. Consistent with the model predictions under the regulatory preemption equilibrium, MAEAP-certified farmers also perceived more stringent enforcement effort by the regulators.

The contributions of this research to existing literature are twofold. Most prior theoretical literature modeling VEP participation decision either assumes a regulatory preemption motive or a differentiation motive as the maintained hypothesis. Our model considers strategic interaction under both motivations. Prior empirical analyses take mostly a mechanistic approach to analyzing factors affecting VEP participation decisions, while our empirical analyses tests for the

underlying motives, based on predictions of realized outcomes from a strategic interaction model. The results generate richer and more nuanced insights into VEP participation decisions.

The rest of this thesis is organized as follows: the next section provides a brief description of the MAEAP and its evolution; extant literature is reviewed briefly in section 3; the conceptual signaling model and hypotheses are presented in section 4 followed by description of the data collection and empirical model in section 5; estimation results and discussion are presented next followed by the final conclusion section.

II. MICHIGAN AGRICULTURE ENVIRONMENTAL ASSURANCE PROGRAM

2.1 Introduction

The Michigan Agriculture Environmental Assurance Program is a voluntary environmental program in the agricultural sector which aims to support all Michigan farmers in preventing or minimizing their environmental risks by the adoption of environmental management and conservation practices. The MAEAP program covers different types of agricultural activities including livestock, farmstead, and cropping. The livestock system was the first program to be developed by MAEAP and will be the focus in this thesis.

2.2 Development of MAEAP

The Michigan Agriculture Environmental Assurance Program (MAEAP) was initiated in 1999 by a coalition of state government agencies and agricultural, environmental and conservation groups in Michigan. The initial impetus for the MAEAP came from the Governor's Pollution Prevention Strategy for Michigan Agriculture 1998, which sought innovative approaches for participatory environmental compliance¹. Michigan agricultural industry associations and commissions, Michigan State University, and governmental agencies have developed and designed the structure, goals and standard procedures of MAEAP to assist livestock producers with environmental issues in the farm operation. The Michigan Right-to-Farm legislation and stewardship practices associated with the Generally Accepted Agricultural and Management Practices (GAAMPs) are incorporated as components of MAEAP guidelines.

During the period 2000-2001, The U.S. Environmental Protection Agency (EPA), the Environmental Council of the States (ECOS) and the Michigan Department of Environmental

¹ http://www.michigan.gov/documents/deq/deq-ead-P2-ag-agimpplan_302829_7.pdf

Quality (MDEQ) collaborated to develop a regulatory innovative agreement which was known as the ECOS agreement. Under the ECOS agreement, any Concentrated Animal Feeding Operations (CAFOs) in Michigan that had not had a regulated discharge in the previous two years could choose either to become MAEAP-verified or to apply for a National Pollutant Discharge Elimination System (NPDES) permit, but all CAFOs and Animal Feeding Operations (AFOs) that had had a regulated discharge in the previous two years had to apply for a NPDES permit so as to comply with the Clean Water Act (CWA) regulation.

A CAFO is defined as equal to or more than 1,000 animal units (AUs). An AFO is defined as less than 1,000 AUs. One AU was defined as 1 feeder calf, heifer, or steer; 0.7 mature dairy cows (whether a milking or dry cow); 25 pigs weighing over 25 kg (55 lb); 0.5 horses; 10 sheep or lambs; 55 turkeys; 100 laying hens or broilers when the facility has an unlimited continuous flow watering systems; or 30 laying hens or broilers when the facility has a liquid manure handling system (EPA 2008).

The ECOS agreement was implemented from December 2002 until December 2007. After the end of the ECOS agreement, MAEAP verification was no more available as an alternative to the NPDES permit for CAFOs.

On March 8, 2011, Public Acts 1 and 2² were signed by Governor Rick Snyder, establishing MAEAP in law. These Public Acts set up the MAEAP Advisory Council (AC) to advise on the implementation of MAEAP, including recommendations on MAEAP standards and protocols for farm verification. The MAEAP Verification Protocol specifies the requirements for MAEAP verification, MAEAP reverification, MAEAP revocation, and the procedures for revocation. In addition to establishing the MAEAP Advisory Council, MDARD will establish a

² http://www.maeap.org/about/history_of_maeap

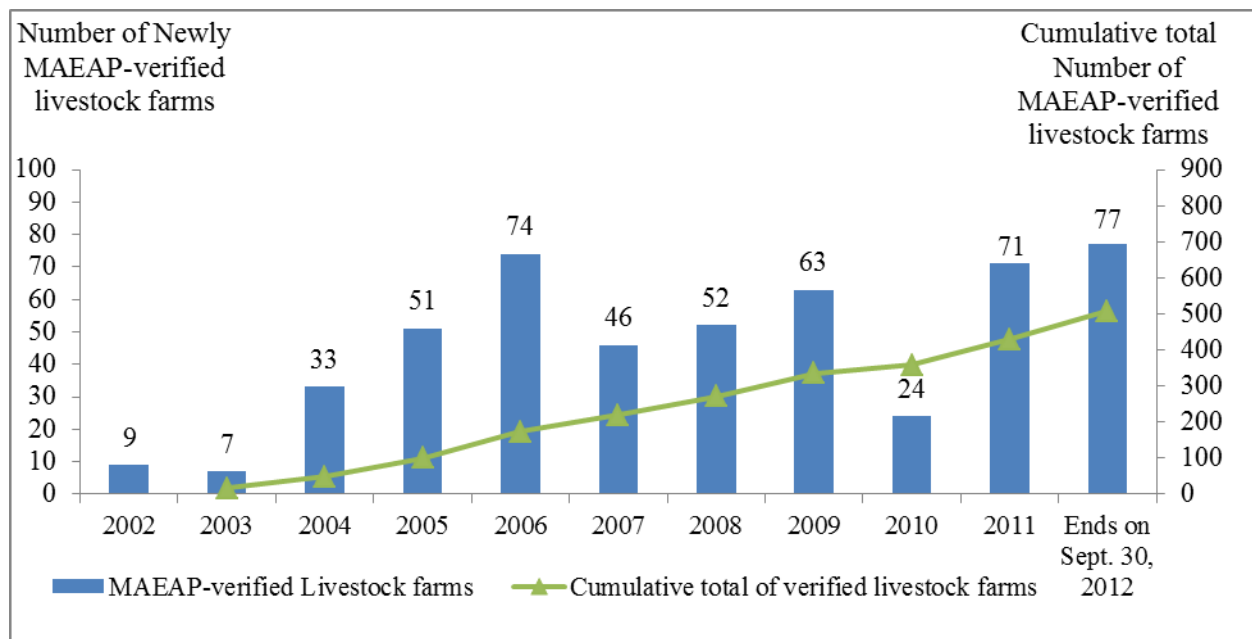
MAEAP grants program for uses such as technical assistance, educational programs, demonstration projects to implement conservation practices, and removal of potential contamination sources.

The MAEAP Advisory Council is composed of all of the following: a) the director of the MDARD, b) the director of the MDEQ, c) the director of the Michigan State University Extension, d) the director of the Michigan State University agricultural experimentation station, and e) the representatives of all of the following: i) The United States Department of Agriculture - Farm Service Agency, ii) The United States Department of Agriculture - Natural Resources Conservation Service, iii) Conservation districts, iv) Farmers and other agricultural organizations, v) Nongovernmental conservation and environmental organizations, and vi) Regulated agricultural industries.

The MAEAP Advisory Council has developed its recommendations, establishing subcommittees and workgroups. This action was followed by a considerable effort to increase public outreach and marketing, and focus efforts on educating farmers on the benefits of participation in MAEAP.

Figure 1 below represents the number of MAEAP-verified livestock farms over time. The total number of MAEAP-verified livestock farms has been increasing, at the end of September 2012 there were 507 MAEAP-verified livestock farms.

Figure 1 The total number of newly MAEAP-verified livestock farms over time



Source: MAEAP, the Michigan Department of Agriculture and Rural Development (MDARD)

2.3 Structure of MAEAP

MAEAP is designed to reduce producers' legal and environmental risks through a three-phase and three-system program. The three systems cover different types of agricultural activities, namely livestock, farmstead, and cropping. The livestock system was the first program to be developed by MAEAP and will be the focus in this thesis.

The three phases of MAEAP livestock system are: 1) education; 2) farm-specific risk assessment; and 3) third-party on-farm verification that verifies that livestock farmers have implemented the required environmental practices for MAEAP certification. When livestock farms complete all three phases, they become MAEAP-verified livestock farms.

The purpose of the education phase of MAEAP is to encourage livestock farmers' awareness of the importance of legal and environmental risks and to educate livestock farmers about various practices that may reduce or prevent these risks. The educational meetings that are

conducted jointly by MAEAP partners are organized throughout the state and year round. With attendance at the educational meetings, livestock producers will have information about state and federal environmental regulations, the three systems of MAEAP, Michigan's Right to Farm Act, and Generally Accepted Agricultural Management Practices (GAAMPs). After completing the education phase, livestock producers should understand environmental risk identification in the farm, the development and implementation of a livestock improvement action plan, and MAEAP verification/ reverification process.

The second phase involves the farm-specific risk assessment. Livestock producers can select to complete either a Comprehensive Nutrient Management Plan (CNMP) or MAEAP Livestock *A*Syst to use as a specific-risk assessment in the farm. The Livestock *A*Syst is the lists of risk questions and answers about livestock management practices following the requirements of a CNMP. With the implementation of recommended practices based on the Livestock *A*Syst, small and medium-sized farms are able to ensure that their practices are in compliance with the Right to Farm Act (RTF) and GAAMPs. Producers are able to work with a MAEAP partner to support the identification of potential environmental risks. Upon completion of the risk identification step, producers can continue using Livestock *A*Syst to create an action plan, or they can use the support of a certified CNMP provider to develop an improvement action plan (MAEAP 2012).

The third phase is the third-party verification on-farm. After developing a livestock improvement plan by using Livestock *A*Syst or CNMP and implementing all the recommendations, livestock farms have to complete an on-farm inspection to become MAEAP-verified livestock farms. The on-farm verification is conducted by the Michigan Department of

Agriculture and Rural Development (MDARD) to ensure that livestock farmers have implemented the required environmental practices of MAEAP.

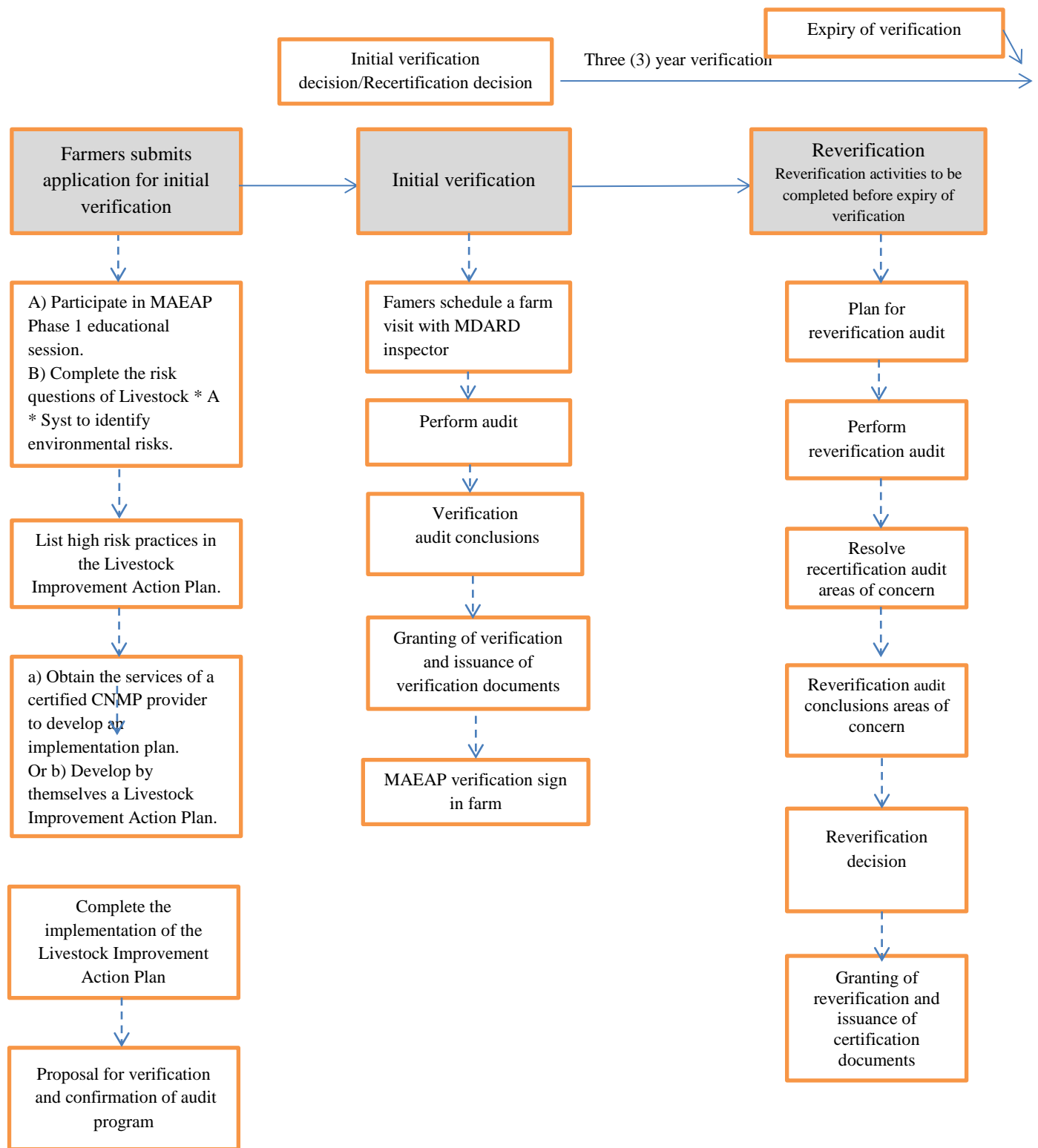
In order to maintain MAEAP verification condition, MAEAP-verified livestock farms have to update their CNMP. MAEAP verification will be terminated after three years of being MAEAP-verified livestock farms; therefore, livestock farms need to contact the officials of the MDARD to request an on-farm visit to reverify their farm operations. Figure 2 shows the flowchart of MAEAP audit and verification process.

The MAEAP Verification Protocol, adopted on September 14, 2011, explains MAEAP revocation³ process. MAEAP-verified livestock farms may be revoked verification by MDARD if any of the following condition apply: a) scientific evidence of water quality data shows that MAEAP-verified livestock farms cause a violation of water quality standards as a result of noncompliance with MAEAP standards, b) MAEAP-verified livestock farms fail to conform to MAEAP standards as a result of gross negligence, c) the MAEAP-verified livestock farm fails to comply with protocols for verification as approved by the Commission of Agriculture & Rural Development, and d) upon advice from the DEQ/MDARD technical review panel, MDARD determines that MAEAP-verified livestock farms are responsible for a pattern of violations of environmental laws, rules, regulations, permit conditions, settlement agreements, orders of consent, or judicial orders due to separate and distinct events (MDARD 2012)

3

http://www.michigan.gov/documents/mdard/Verification_Protocol_Adopted_9.14.11_364195_7.pdf

Figure 2 Flowchart of MAEAP audit and verification Process



III. LITERATURE REVIEW

Livestock producer decisions on whether participate in voluntary environmental programs basically depend on the benefits and costs of participating into the programs. Previous theoretical and empirical researchers have studied factors influencing firms' decision to participate in voluntary environmental programs and third-party certification schemes.

3.1 Theoretical studies

The theoretical studies of the motivations of participating in voluntary environmental programs can be summarized into three groups of theoretical frameworks. The first group is litigation avoidance. The second group is regulatory preemption. The third group is differentiation.

3.1.1 Litigation avoidance

Organizations with poor environmental performance are likely to confront with the greater risks of nuisance lawsuits. Livestock production potentially generates negative externalities such as bad odor and contaminated water that interfere with the enjoyment of neighbors and communities around farms. Consequently, neighbors and the regulators keep an eye on the environmental performance of livestock operations or are more likely not to accept the new livestock operations near their houses. When there are environmental problems generated by livestock farms, neighbors or the regulators are more likely to sue livestock farmers for the benefits of the general public. By bringing to a law suit, neighbors or the regulators seeks to control or limit the use of the land for livestock farm operations.

The Michigan Right to Farm Act was created in 1981 in response to an increase in complaints and lawsuits. The Michigan Department of Agriculture and Rural Development

(MDARD) is the state agency in Michigan that administers the Right to Farm Act. The Act provides a defense in nuisance lawsuits brought against the Michigan farmer by neighbors when the farmer is conforming to Generally Accepted Agricultural and Management Practices (GAAMPs). GAAMPs are developed using science and are intended to provide uniform, statewide standards and management practices for various aspects of farming. When complaints of environmental problems from livestock operations are verified, livestock farmers implement the corrective management practices to solve these problems, bring their farm operations into the conformance with GAAMPs, and earn nuisance protection under the Right to Farm law (MDARD 2012). Since they are already protected under RTF, litigation avoidance is not likely to be a major factor in Michigan livestock producers' decisions to participate in MAEAP.

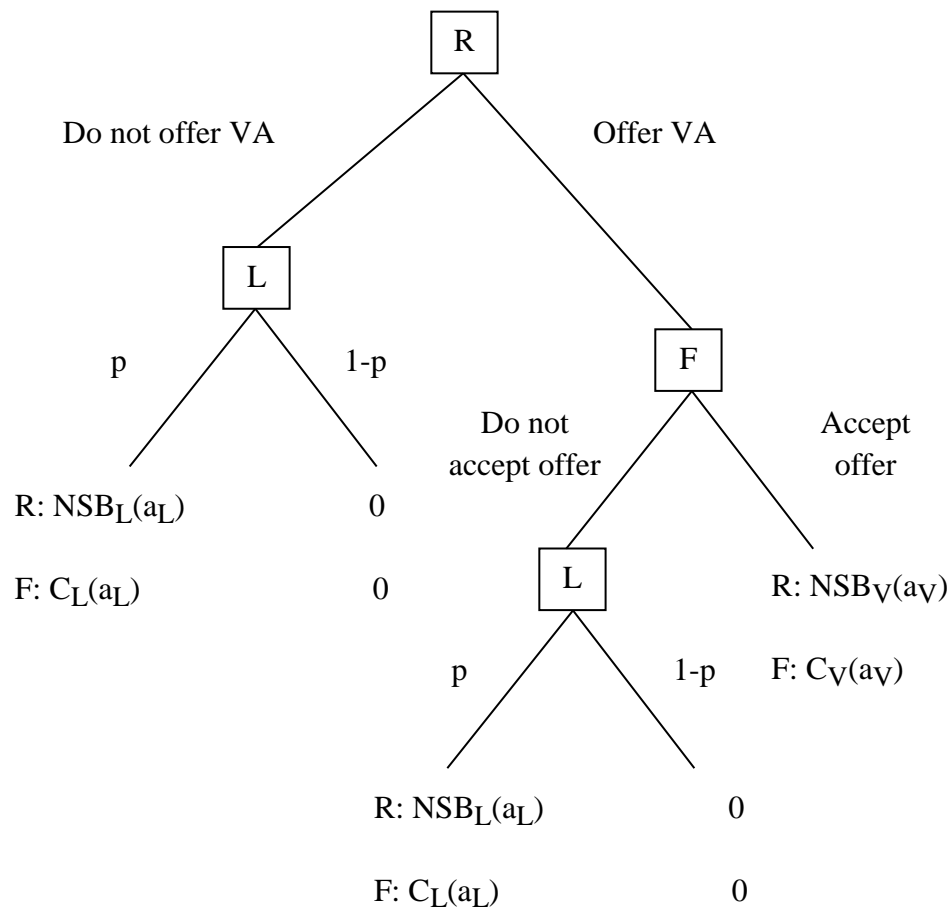
3.1.2 Regulatory preemption

Previous studies examine the motivations of firms to participate in voluntary environmental protection programs, specifically to preempt governmental regulations (Segerson & Miceli 1998, Lyon & Maxwell 2003).

Segerson & Miceli (1998) developed the interaction model between the regulator, the legislator and the firm in order to investigate whether or not the firm accepts the voluntary environmental agreement and what is the level of optimized abatement under the agreement. There are the three stages of the strategic game. The first stage the regulator decides whether to offer a voluntary environmental agreement to the firm or not. The second stage the firm decides whether to accept or not the voluntary environmental agreement. The third stage is whether or not the legislator passes the regulation under the two conditions that a) the regulator does not offer the voluntary environmental agreement or b) the regulator offers the voluntary environment agreement but the firm does not accept it. The assumption of this model is that the regulator has

perfect information that good firms only accept the offer of the voluntary environmental agreement; and the firms are required to comply with the voluntary agreement and regulation. The probability of legislation getting passed (p where $0 \leq p \leq 1$) is an exogenous known value which varies across an industry. For example, political support for a mandatory control of environmental pollution in the agriculture sector is less than in the manufacturing sector; therefore, p in the agriculture sector is likely to be smaller than p in the manufacturing sector.

Figure 3 The sequence of preemption signaling game of Segerson and Miceli (1998)



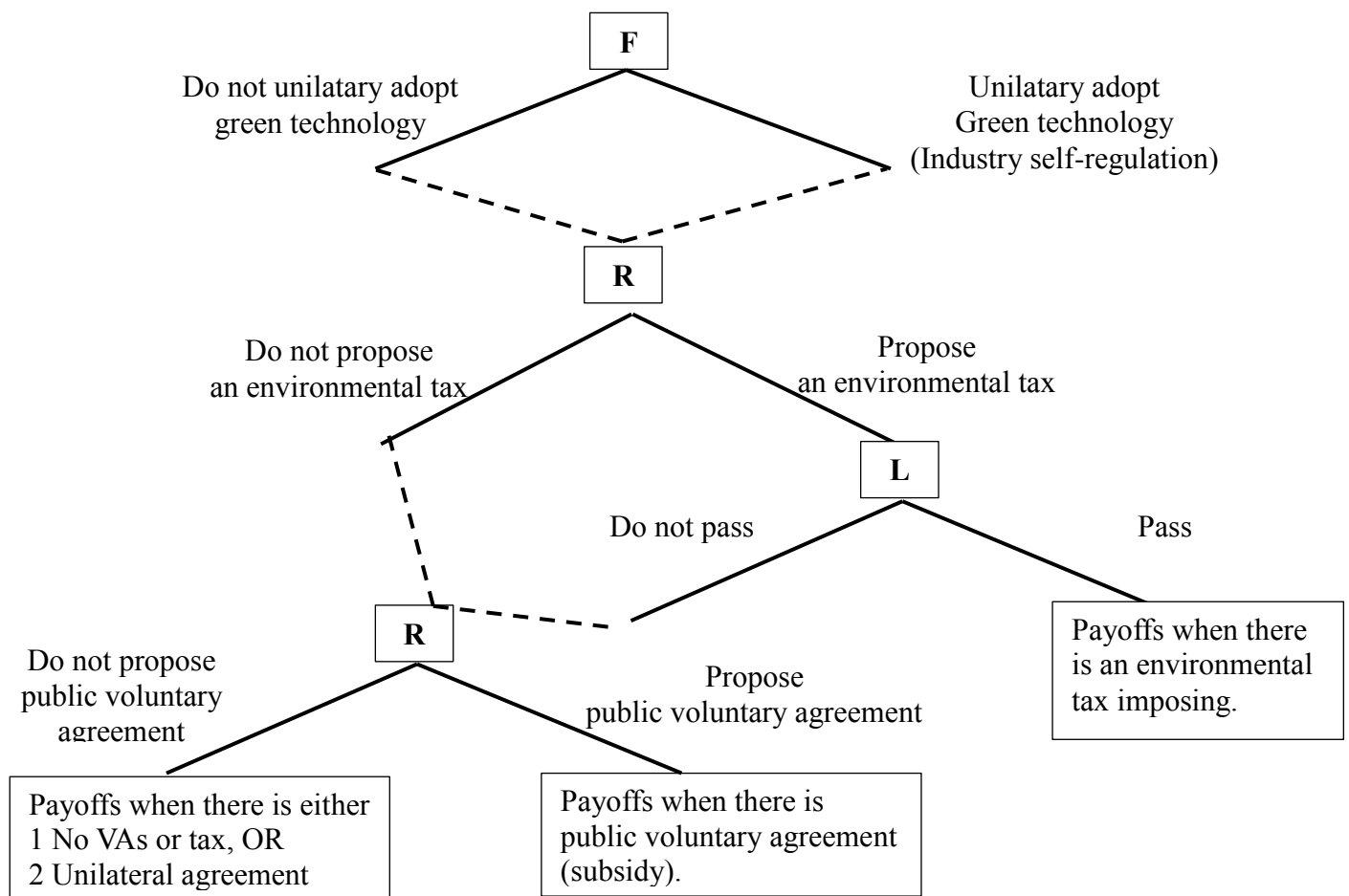
R= the regulator, L = the legislator, F = the firm

The results of this model suggest that the equilibrium outcome of the interaction between the regulator and the firm will always be the voluntary environmental agreement when the costs of abatement including the compliance and transaction costs are lower under the voluntary agreement than under the legislation. This optimal outcome leads to the regulatory preemption. However, the achieved level of equilibrium abatement depends on the allocation of bargaining power between the regulator and the firm, the threat of legislation, and the social cost of funds. If the regulator has high bargaining power under the situation of high threat of regulation background and the low social cost of funds, it is possible that the level of optimal abatement under the voluntary environmental agreement would exceed the level of abatement that might be imposed by mandatory regulation by the regulator. On the other hand, if the firm has high bargaining power under the situation of low threat of regulation background and high social cost of funds, it is possible that the level of optimal abatement under the voluntary agreement would be lower than the level of abatement that might be imposed by mandatory regulations by the regulator.

Lyon & Maxwell (2003) also developed an interaction model between the regulator and the firm by using game theory in order to investigate the social welfare outcome under the condition of different instruments of environmental control: industry self-regulation, taxation, and public voluntary environmental agreements. There are the three stages of the strategic game. The first stage is that the firm decides whether or not to adopt an environmental technology based on industry self-regulation. The second stage is that the regulator decides to whether or not to propose a tax. The third stage is that if the regulator does not propose a tax, or if the tax proposal is not approved by the legislature, the regulator will choose whether or not to offer the public voluntary agreement with a subsidy, having the cost of social funds. The assumption of this

model is that the costs of compliance with the public voluntary agreement are not cheaper than the costs of mandatory regulations. The probability of imposing taxation p where $0 \leq p \leq 1$ depends on the political opposition of the firm that opposes the taxation legislation.

Figure 4 The sequence of preemption signaling game of Lyon and Maxwell (2003)



R= the regulator, L = the legislator, F = the firm

The result of this model suggests that taxation is preferable as an instrument of environmental policy to public voluntary agreements under the condition of low political pressure because taxation is able to encourage the existing firms to adopt clean technology and force the bad polluting firms to exit from the industry. In contrast to taxation, public voluntary agreements can induce firms to adopt the clean technology but cannot force bad polluting firms to exit from the industry. Therefore, the pollution tax policy yields higher social welfare than the public voluntary agreement.

Public voluntary agreements may be more desirable than taxation if the social cost of funds and cost of environmental technology is low and the political pressures to taxation is high. Industry associations may initiate unilateral actions in order to preempt the threat of taxation. However, public voluntary agreements may reduce the motivation of firms to initiate industry self-regulated action because firms think that they may gain subsidy from public voluntary agreement if the regulator is likely to establish public voluntary environmental agreements when the tax proposal is not passed.

3.1.3 Product differentiation

A firm can use an environmentally friendly attributes to differentiate itself from other competitors. Porter (1980) proposes the concept of product differentiation which firms can provide unique and superior products to customers in terms of quality, special features, or service. Product differentiation creates brand loyalty, positive reputation, and it facilitates premium pricing. There are several strategies of product differentiation in livestock products such as organic, non-hormone use, and free-range.

Arora & Gangopadhyay (1995) developed the the interaction between two firms by using game theory to examine firms' strategy of product differentiation by choosing the level of

pollution emission. With public disclosure of firms' pollution, consumers are equipped with full information to decide to purchase a product by considering the level of environmental performance. Assume that first, the product is homogenous but differ in the level of polluting emission. Consumers derive the utility from the level of firms' abatement. Second, consumers with different incomes have the same preferences but differ in ability to pay for green products. There are two stages of this strategic move. The first stage is that two firms choose the level of emission. The second stage is that two firms choose the prices of products.

The results of this model explores the conditions under which each firm chooses a different emission technology as a product differentiation strategy, i.e. one firm chooses the high level of clean-up while another firm chooses the low level of clean-up. The difference in the income level of each consumer leads to differential ability to purchase either green products or conventional products. If the affordability of green products is increased by i) the same amount of additional income of each individual or ii) an increase in income of the poorest group, the emission levels of both firms will be improved. The reason is that the firms can charge slightly higher price to compensate for the incremental cost of adopting cleaner technology.

Arora and Gangopadhyay assume consumers have perfect information of the environmental performance of firms. This assumption might not be applicable for an environmentally friendly product because an environmentally friendly product is a credence good. This means that an environmental soundness attribute cannot be directly observed by consumers even after purchase and consumption. Therefore, consumers need to rely on product labeling and advertising about environmental quality of a product. Third-party labeling systems have played a major role in verifying and investigating whether companies' claims about environmental friendly attribute of products are truth or not.

Kirchhoff (2000) developed a model to explain why firms voluntarily overcomply with environmental regulation in the case of credence goods based on the concept of reputation effects. He assumes that there are two levels of environmental quality of product: conventional and environmentally friendly products. The production of conventional products satisfies the minimum environmental regulations while the production of environmentally friendly products overcomplies with the environmental regulations. The unit cost of environmentally friendly products is higher than conventional products. Consumers' willingness to pay for environmentally friendly products is higher than for conventional products.

This model is two-stage game. At the beginning of the first stage, consumers set their initial beliefs about the probability that the firm does not cheat them by the claim of producing an environmentally friendly product. Given consumers' beliefs, the firm chooses its level of environmental attribute of its product. After the firm selects the level of environmental quality of its product, consumers purchase the good at the price that equals to their willingness to pay. A third-party labeling organization monitors truthfulness of firm's claims by random checking. In stage 2, if the firm is found cheating, consumers will revise their expectation about the firm's environmental performance. Then consumers respond either paying the dishonest firm at the price of conventional product in the market or not purchasing the product.

The analysis from the model shows that the firm with profit-maximization objective will over comply with the environmental regulation by producing an environmentally friendly product if: a) the premium of an environmental attribute product is relatively large, b) the additional cost of adoption of green production technology is small, c) the probability of being found cheating is high, and d) consumers' perceived probability that the firm is honest is high. Consumer expectations are self-fulfilling. This means that under the condition that the firm is

not found cheating, if consumers' beliefs that the probability that the firm is honest about the claim of environmental quality of a product is high, their willingness to pay for the product is high. As a consequence, the firm can earn the premium of its environmentally friendly products by building up reputation. The existence of third-party labeling increases the probability that a firm is investigated and strengthens initial consumer beliefs about truthfulness of a firm. Therefore, the third-party certification increases the likelihood of overcompliance with the environmental regulation.

The large price premiums encourage firms cheating by the claim that their conventional products are environmentally friendly. These firms are called "Greenwash" firms. The author proposes possible mechanisms to prevent misconduct of firms. The first possible instrument is to impose a fine based on the third-party certification. If third-party certification organizations find that a firm violated the requirement of certification, the firm has to pay a fine. Another possible instrument is that consumers punish Greenwash firms which are found cheating by boycotting the products of these firms.

3.2 Empirical studies

The empirical studies on the motivations of participating in the voluntary programs can be classified into three groups, relating to regulatory pressure, effective communication of environmental stewardship to societal stakeholders, and available resources and benefits of voluntary environmental programs.

3.2.1 Regulatory pressure

Perceived pressure from the regulator influences firms to undertake voluntary actions to manage environmental issues. Participating in voluntary environmental programs improves the relationship between firms and the regulator through collaboration on pollution reduction. The

regulator views participating firms favorably and is less likely to impose tough enforcement of the existing regulations. Firms also view the regulator as a supporter to help them improve environmental performance by providing financial and technical assistance. As a result, firms are likely to participate in VEPs to reduce pressures from the regulators and to present their environmental stewardship of minimizing environmental risks (Dasgupta, Hettige, & Wheeler 2000, Henriques & Sadosky 1996, and Khanna & Damon 1999).

Poor environmental performance of the firm leads to the greater risks of environmental liabilities, fines, legal expenses, and clean-up cost in the future. Previous studies show that potential liability induces firms to adopt better environmental management. Empirical studies show that the potential legal liabilities for environmental damage is positively significantly related to the decision to participate in voluntary environmental programs (Khanna & Damon 1999, Videras & Alberini 2000).

3.2.2 Effective communication of environmental stewardship to societal stakeholders

Participation in voluntary environmental programs helps firms communicate their environmental stewardship to societal stakeholders. This promotes public recognition and goodwill of firms, reducing perceived pressures from societal stakeholders and building mutual trust between firms and stakeholders. The empirical studies suggest that perceived pressures from shareholders, lobby groups, and neighborhood and community groups influence firms to undertake voluntary environmental actions (Henriques & Sadosky, 1996). However, Dasgupta, Hettige & Wheeler (2000) and Darnall, Seol, & Sarkis (2009) found that perceived pressures from societal stakeholders have no influence on the adoption of the use of environmental audits. These findings may be due to the fact that societal stakeholders, such as neighborhood and

community groups who live near a company, might have less concern about environmental certification because they directly get the negative effects of environmental problems.

3.2.3 Available resources and benefits of the program

Firms may decide to participate in voluntary environmental programs because they are eligible for obtaining government assistance in terms of financial or technical assistances. These forms of assistance act as the complementary resources for firms to facilitate to get certified by VEPs and to attain their environmental goals. Especially, firms with less capability of environmental management need to receive external resources so as to reduce the cost of participating in VEPs (Darnall & Edwards, 2006). Darnall (2006) find that the government assistance programs influence firms' decisions to seek ISO 14000 certification.

3.3 Previous study about MAEAP program

Vollmer-Sanders, Wolf, and Batie (2011) studied the incurred cost, environmental outcomes, and attitudes and perceptions of early-adopting livestock producers with MAEAP-verified operation. The authors interviewed 29 operators managing 31 MAEAP-verified livestock operations in January 2005 during the implementation of the ECOS agreement.

The authors found that the average total producer cost (not on an annual basis) to become MAEAP-verified, including the cost of CNMP writing, the costs of operational changes and investment costs, was \$120,600 per farm. The average producers paid \$104,423. The remaining amount of \$16,177 was provided through Environmental Quality Incentive Program (EQIP) cost-share funds. In consideration of the annual producer cost per animal unit (AU)⁴ excluded cost-

⁴ The annual producer cost per animal unit was the annual producer cost averaged by the number of animals. The annual producer cost of implementing and maintaining MAEAP verification

share funds, smaller AFOs, on average, paid nearly four times the amount that CAFOs paid to become MAEAP verified (\$12.11/AU compared to \$3.75/AU). With respect to environmental outcomes, the average mass P balance of MAEAP-verified livestock farms had improved which lowered the potential for P runoff from MAEAP- verified livestock farms.

Vollmer-Sanders et.al. (2011) found that the primary motivation of livestock farms to become MAEAP-verified was the perception of current or future environmental regulations affecting their farms. This perception influenced large livestock farms to become MAEAP-verified over small and medium livestock farms. Another strong incentive mentioned was the desire to obtain technical and financial assistance. Livestock farmers that prepared for getting MAEAP verification received a support from the program to improve environmental management practices in their operations, to understand the potential impact of the program on pollution reduction in the livestock operations, and to access financial assistance.

Miller, Abdulkadri, Batie and Joshi (2011) studied the motivation, barriers, and incentives for the participation in MAEAP program. The data of this study came from a mail survey of Michigan livestock producers conducted in 2010. This study used the descriptive analysis to find the perceptions of livestock farmers about how MAEAP verification impacts their operation. The authors found that the desire to become environmentally sustainable was a major reason for becoming MAEAP verified and most respondents perceive MAEAP verification as being beneficial to their operations. However, one third of respondents disagreed or strongly disagreed with the following statements that MAEAP participation either reduced their insurance premiums or increased their property value. Only 9% of respondents agreed that MAEAP will enable farmers to receive higher prices. Also, respondents are equally distributed

included managerial costs, which were composed of annualized technical service provider, and annualized capital investment.

across disagreement, neutral and agreement that the MAEAP logo is well recognized in their community.

In comparison to the above study by Miller et.al 2010 which was mainly descriptive, this thesis proposes a strategic interaction model under both regulatory preemptive and differentiation motives; then predictions/hypotheses are developed from the strategic interaction model regarding the motivations of livestock farmers to participate in MAEAP and the these hypotheses are statistically tested using probit model using the same survey data collected by Miller et al(2010). As a result the findings of thesis provide theoretically sounder, and empirically more refined, robust and policy relevant insights into MAEAP participation and design.

IV. CONCEPTUAL MODEL AND HYPOTHESIS DEVELOPMENT

4.1 Conceptual model

In this section, we present a stylized, simple game theoretic model of signaling aimed at developing hypotheses about the factors influencing participation of livestock farmers in MAEAP. A signaling game is a dynamic game of incomplete information involving two players: a sender and a receiver. The two players in this signaling game are the regulator and the livestock farmer. The regulator is a receiver while livestock farmer is the sender. The signal being sent is the participation in the MAEAP. The regulator can also represent other stakeholders such as environmental groups, neighbors and consumers towards whom MAEAP participation may be targeted as a signal.

We assume that there are two types of livestock farmers: environmentally more responsible (type G) and environmentally less responsible (type B) farmers⁵. This is an imperfect information game because the farmer knows his own type. The regulator does not know the type of a specific farmer, but has estimates of the population proportions.⁶

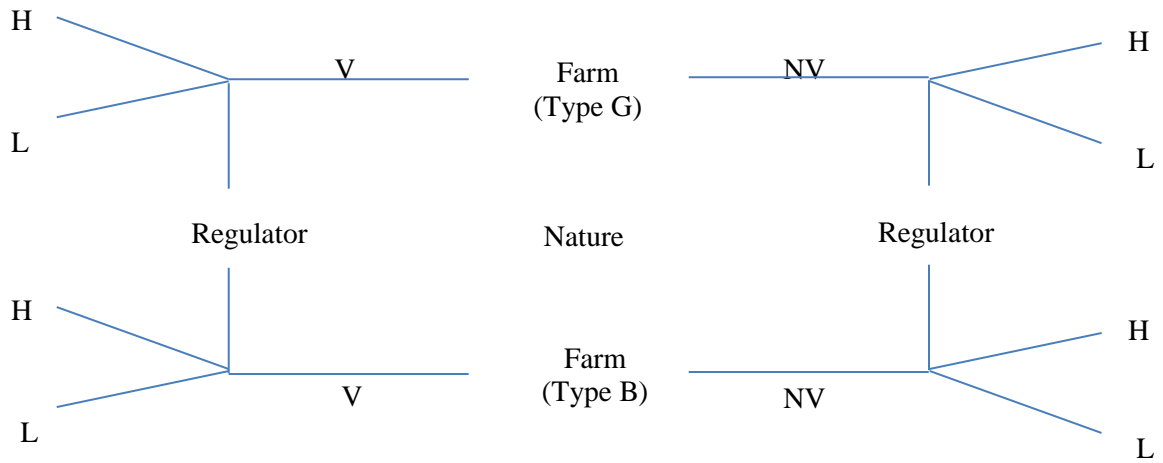
The sequence of the game is as follows. At the beginning, nature decides on the farmer type T_i : type G or type B. The proportion of type G farmers in the population is $P(G)$. The farmer knows his own type. The farmer then decides to send a signal in the form of either obtaining MAEAP verification or not (verified=V, or not verified =NV). Here MAEAP

⁵ We use farmer and farm interchangeably in this modeling section, because while the farmer makes the MAEAP certification decision, it is the farm that is actually MAEAP certified.

⁶ This contrasts with the previous theoretical study of Segerson & Miceli (1998) which assumes that the regulator has perfect information of the type of participating firms and only good firms accept the voluntary agreement. Therefore, the regulator does not impose strict regulation and enforcement if the firms participate in voluntary environmental programs.

certification is treated as a signal because it does not give perfect information about the actual environmental performance of the farm, but only an indication of the farmer/farm type. The regulator reads (receives) the signal and then decides on the regulatory effort, stylized as high regulation (H) or low regulation (L). The game ends there and players receive their payoffs.

Figure 5: The signaling game between the regulator and livestock farmers.



We assume that the Regulator's utility is a function of the environmental quality Q achieved and the regulatory effort R

$$U_r = Q - R$$

The farmer's utility is a function of the cost to the farm of regulation (E) and MAEAP verification (signaling) costs (M).

$$U_f = -E - M$$

The structure of the payoffs is as follows:

1. Type G farms would generate environmental quality worth Q_{gh} to the Regulator, with High enforcement, and Quality worth Q_{gl} with Low enforcement effort.
2. Type B farms would generate environmental quality worth Q_{bh} with High enforcement effort and Q_{bl} when the Regulator uses Low enforcement effort.
3. Incremental cost of High enforcement is R_h to the Regulator and high enforcement also imposed incremental costs of E_h on the farms.
4. Incremental costs of MAEAP certification are M_g for the type G farms and M_b for the type B farms.

Regulator's decision:

Let the following be the prior beliefs of the Regulator:

- Probability that the farm is the type G farm given that farm has received MAEAP certification = Prob [G|V]
- Probability that the farm is the type B farm given that farm has received MAEAP certification = Prob [B|V]
- Probability that the farm is the type G farm given that farm has not received MAEAP certification = Prob [G|NV]
- Probability that the farm is the type B farm given that farm has not received MAEAP certification = Prob [B|NV]

But

$$\text{Prob [G|V]} + \text{Prob [B|V]} = 1$$

$$\text{Prob [G|NV]} + \text{Prob [B|NV]} = 1$$

Given that these are the beliefs of the Regulator, the choice of action (high enforcement or low enforcement) must maximize Regulator's expected utility.

The possible strategies for the Regulator are:

R1: High enforcement regardless of MAEAP certification signal

R2: Low enforcement regardless of MAEAP certification signal

R3: High enforcement on MAEAP certified farms, Low enforcement on non-MAEAP certified farms

R4: High enforcement on non-MAEAP certified farms, Low enforcement on MAEAP certified farms.

A. Suppose the signal is MAEAP certification (V)

Regulator's expected utility with high enforcement is = $\text{Prob } [G|V]*(Q_{gh}-R_h) + \text{Prob } [B|V]*(Q_{bh}-R_h)$.

Regulator's expected utility with low enforcement is = $\text{Prob } [G|V]*(Q_{gl}) + \text{Prob } [B|V]*(Q_{bl})$

Regulator will choose high enforcement of MAEAP certified farms if

$$\text{Prob } [G|V]*(Q_{gh}-R_h) + \text{Prob } [B|V]*(Q_{bh}-R_h) > \text{Prob } [G|V]*(Q_{gl}) + \text{Prob } [B|V]*(Q_{bl}) \quad (1)$$

And Regulator will choose low enforcement of MAEAP certified farms if

$$\text{Prob } [G|V]*(Q_{gh}-R_h) + \text{Prob } [B|V]*(Q_{bh}-R_h) < \text{Prob } [G|V]*(Q_{gl}) + \text{Prob } [B|V]*(Q_{bl}) \quad (2)$$

B. Suppose the signal is no MAEAP certification (NV),

Regulator's expected utility with high enforcement is = $\text{Prob } [G|NV]*(Q_{gh}-R_h) + \text{Prob } [B|NV]*(Q_{bh}-R_h)$.

Regulator's expected utility with low enforcement is = $\text{Prob } [G|NV]*(Q_{gl}) + \text{Prob } [B|NV]*(Q_{bl})$

Regulator will choose high enforcement of non-MAEAP certified farms if

$$\text{Prob [G|NV]}*(Q_{gh}-R_h) + \text{Prob [B|NV]}*(Q_{bh}-R_h) > \text{Prob [G|NV]}*(Q_{gl}) + \text{Prob [B|NV]}*(Q_{bl}) \quad (3)$$

And Regulator will choose low enforcement of non-MAEAP certified farms if

$$\text{Prob [G|NV]}*(Q_{gh}-R_h) + \text{Prob [B|NV]}*(Q_{bh}-R_h) < \text{Prob [G|NV]}*(Q_{gl}) + \text{Prob [B|NV]}*(Q_{bl}) \quad (4)$$

Farmer's decision

The Farmer has the initial choice of MAEAP certification and the Regulator can respond with either high enforcement or low enforcement.

The possible strategies for the Farmer are:

F1: obtain MAEAP certification regardless of type [Pooling in MAEAP certification];

F2: do not obtain MAEAP certification regardless of type [Pooling in non-MAEAP certification];

F3: obtain MAEAP certification if the type G farm, and do not obtain MAEAP certification if the type B farm;

F4: do not obtain MAEAP certification if the type G, and obtain MAEAP certification if the type B farm.

The Farmer will choose either to obtain MAEAP certification or not obtain MAEAP, based on his utility from certification keeping in view the Regulator's optimal response. A signaling equilibrium is established if these conditional probabilistic beliefs are confirmed by new data relating to MAEAP adoption and level of environmental responsibility of the farmer.

4.2 Hypothesis development

4.2.1 Potential equilibrium outcomes of interest

Because it is empirically observed that only some farms obtain MAEAP certification, we are primarily interested in equilibrium outcomes where farmers either choose strategy F3 or F4, i.e. separating equilibrium where either only the type G farms get MAEAP certification or only the type B farms get MAEAP certification. Similarly the interesting equilibrium outcomes are where regulators selectively choose their enforcement effort depending on whether the farm is MAEAP certified or not. In the other potential equilibrium outcomes, signaling (MAEAP certification) is ineffective and of little discrimination value.

We propose that the equilibrium outcome where type B farms choose to obtain MAEAP certification and in turn regulators employ high regulatory effort on MAEAP certified farms represents a ‘regulatory preemption scenario’. We also propose that the equilibrium outcome where type G farms choose to obtain MAEAP certification and in turn regulators employ low regulatory effort on MAEAP certified farms represent a ‘differentiation scenario’.

4.2.2 Regulatory Pre-emption Scenario

Under a ‘regulatory preemption’ scenario,’ firms engage in voluntary pollution reduction through VEPs when faced with potentially stringent future regulations. High pollution levels create community and political pressures on regulatory agencies and legislators for more stringent future regulations. The highly polluting firms then voluntarily choose to reduce their pollution levels by participating in VEPs, which in turn increases organizing costs for environmental groups and reduce pressures on regulators and legislators to promulgate more stringent regulations, thereby preempting future regulation. Under a ‘regulatory preemption’ scenario’, it is expected that those firms which are most likely to be affected by anticipated

future stringent regulations will participate. Furthermore, the regulatory preemptive VEPs are designed to meet the minimum level of environmental performance that is considered adequate to reduce the possibility of more stringent future regulations. Because of the preemptive nature of the VEPs, participants in preemptive VEPs are likely to be firms that have a high level of pollution and are likely to be subject to proposed future regulations. Since the regulators recognize: the pre-emptive nature of the VEPs and that firms that are most likely participate are those most likely affected by future regulations, and that the VEP performance level is set at the minimum acceptable level to preempt regulations, they will perceive participation in VEP as a signal of firms operating at the margin of acceptable levels of pollution. As a result VEP participants will face higher regulatory enforcement scrutiny, and the VEP participating firms will also perceive higher enforcement effort. However, these firms will continue to participate in VEPs because the costs of VEP participation, including costs associated with increased regulatory scrutiny are lower than the expected benefits from pre-emption of more stringent future regulations. Similar to regulators, other stakeholders such as community and environmental organizations also recognize the preemptive nature of VEP participation and view participants less favorably and participants recognize such an unfavorable perception.

Based on the above discussion, we propose the following hypotheses with reference to the MAEAP participation under a ‘regulatory preemption scenario.

Hypothesis 1: Livestock farms that are interested in preempting future regulations are more likely to be MAEAP-verified in their operations.

Hypothesis 2: Livestock farmers that were currently regulated under a NPDES permit are more likely to have participated in MAEAP.⁷

Hypothesis 3: Livestock farmers that perceive higher enforcement effort from regulators are more likely to have participated in MAEAP.

Hypothesis 4: Livestock farmers that perceive negative reactions from other stakeholders are more likely to have participated in MAEAP.

4.2.3 Differentiation Scenario

Under a ‘differentiation’ scenario, firms that are already type G firms would like to send a signal about their environmental responsibility to regulators and/or environmentally conscious consumers. The goal is to differentiate themselves and to capture additional returns—either in the form of higher prices from consumers or in reduced regulatory costs. The signaling VEPs are designed so that participation in them is costly enough that it provides a ‘credible signal’ i.e. the standards under the VEP are stringent enough that it is relatively very costly for type B firms to meet the standards. Under appropriate conditions a signaling equilibrium outcome will be where the type G firms tend to participate and others will not (because participation is costly) and correspondingly, the regulators (and consumers) believe the participating firms are type G firms and reward participating firms with reduced regulatory enforcement, or higher product prices, or access to other resources. These confirm the a priori beliefs of favorable perception of the VEP participants.

⁷ We use current regulation under NPDES as another indicator of the threat of regulations faced by the farm.

Based on the above discussions, we propose the following hypotheses with reference to the MAEAP participation under a ‘differentiation’ scenario.

Hypothesis 1a: Livestock farms that are interested in preempting regulations are less likely to be MAEAP-verified in their operations.

Hypothesis 2a: Livestock farmers that were currently regulated under a NPDES permit are less likely to have participated in MAEAP.

Hypothesis 3a: Livestock farmers that perceive lesser enforcement effort from regulators are likely to have participated in MAEAP.

Hypothesis 4a: Livestock farmers that perceive positive reactions from other stakeholders are likely to have participated in MAEAP.

Hypothesis 5: Livestock farmers that perceive better ability to differentiate or brand their products in the marketplace are likely to have participated in MAEAP.

Hypothesis 6: Livestock farms that perceive increased access to other resources and financial benefits are likely to have participated in MAEAP.

It should be noted that these hypotheses are stated under two different scenarios, and inferences will be drawn about the extant scenario based on the results of the hypotheses tests. Also as discussed in the next section, since the empirical analysis uses data from a survey of livestock farmers (both MAEAP participants and non-participants) the hypotheses are stated in terms of livestock farmer perceptions only, and do not cover regulator’s perspectives.

V. DATA AND MODEL ESTIMATION

5.1 Data

To test these hypotheses empirically, this research uses data from a mail survey of Michigan livestock producers conducted in 2010 by Miller et al (2010) to investigate farmer participation in the MAEAP. The survey sampled two groups of Michigan livestock producers; (i) the general population of Michigan livestock producers and (ii) the participants in the MAEAP Phase I educational events, during 2006-2009. The goal of sampling the 2nd group was to ensure sufficient number of MAEAP verified participants in the sample. The Michigan Field Office of the National Agricultural Statistics Service (Michigan NASS) prepared the sample for the first survey. A total of 326 responses out of 1,040 mailed surveys were received from the population i.e. a response rate of 31 percent. The second survey was sent to 270 livestock farmers who had attended at least one MAEAP-Phase 1 sponsored educational event within the past three years, but were not already sampled in the first survey (these numbered 57). A total of 72 responses were received from the 270 in the second survey i.e. a response rate of 26%. Since we are interested only in farmers who were aware of the MAEAP program, our final sample consists of 129 livestock farmers who had attended at least one MAEAP educational event. Out of the 129 responses received, 74 were complete and were used in the empirical estimations. The final 74 included 42 farms that had completed all the steps and received MAEAP verified certification⁸.

⁸ According to MDARD about 10,000 people have attended MAEAP education events, and a total of 877 farms have received MAEAP verification till 2011. Hence our sample has higher representation of verified farms, but verification rates for livestock farms have been much higher. However this sampling bias is unlikely to affect the conclusions.

The characteristics of the sample in the estimation model are shown in Table 5.1. In terms of commodity type, MAEAP-verified livestock farms tend to be dairy farms and poultry operations. The 14 large livestock farms are MAEAP-verified while there are only 3 large livestock farms are not MAEAP-verified. Most of the small/medium livestock farms with a NPDES permit are MAEAP-verified.

Table 1. The characteristics of the sample in the estimation model

MAEAP-verified livestock farms						
Description	MAEAP certified					
	Dairy	Beef	Poultry	Swine	Other	All farms
Large livestock farms	10	4	0	0	0	14
Small/medium livestock farms with a NPDES permit	0	0	8	0	0	8
Small/medium livestock farms	7	1	8	4	0	20
Total	17	5	16	4	0	42
Livestock farms with no MAEAP certification						
Description	No MAEAP certification					
	Dairy	Beef	Poultry	Swine	Other	All farms
Large livestock farms	1	2	0	0	0	3
Small/medium livestock farms with a NPDES permit	0	1	0	0	0	1
Small/medium livestock farms	13	4	8	2	1	28
Total	14	7	8	2	1	32

5.1.2 Dependent variable

As all our hypotheses are about farmer participation in MAEAP, our dependent variable is participation in MAEAP. In order to achieve verification, livestock farmers are required to attend a MAEAP-sponsored educational session, complete a Comprehensive Nutrient Management Plan (CNMP) or Livestock*A*Syst, and pass an on-farm audit. After completing the verification process, livestock farmers are eligible to place a MAEAP sign at their farmstead. The dependent variable Y_i is assigned a value of 1 if livestock farm i completes the entire MAEAP process and a value of 0 if it does not.

5.1.3 Explanatory variables

The main explanatory variables correspond to the specific hypotheses proposed in the previous section. We model the decision of livestock farms to become MAEAP-verified as a function of regulatory preemption, prior regulation under a NPDES permit, perceived favorableness of treatment by the regulator, perceived degree of success with communication of environmental stewardship to societal stakeholders, perceived success with product differentiation/premium pricing, and other financial benefits of participating in MAEAP such as cost-share funds, insurance premium reduction.

Respondents were asked their level of agreement with the provided statements using a 5-point Likert scale by choosing among strongly disagree, disagree, neutral, agree, or strongly agree. The measurement is based on livestock farmers' perceptions.

To operationalize the regulatory preemption motive, livestock farmers were asked their level of agreement with the following statement "The existence of MAEAP may help preempt future regulation of livestock producers".

To measure perceived favorability of treatment by the regulator, livestock farmers were asked their level of agreement with the following statement: “the regulatory (DEQ) personnel views MAEAP verified livestock farms favorably”.

Effective communication of environmental stewardship to societal stakeholders was measured by asking livestock farmers’ level of agreement with the following statements: “MAEAP is effective in communicating that MAEAP-verified livestock producers are responsible stewards of the environment to: a) neighbors, b) other farms, c) environmental activists”.

The degree of perceived success in product differentiation was measured by the level of agreement with the following statement: “MAEAP participants are better able to differentiate or brand their products in the marketplace”.

MAEAP livestock farms can receive additional resources that act as complementary resources to support livestock farms to become MAEAP-verified. These perceived financial benefits were measured by asking livestock farmers their level of agreement with the following four statements: a) there exist sufficient cost-share opportunities for farms to become or to continue to be MAEAP-verified; b) MAEAP verification helps in obtaining farm loans; c) insurance premiums are lower for MAEAP verified farms; and d) participation in MAEAP will likely increase the value of my property if it should ever be sold.

The variable of being regulated under a NPDES permit was measured by asking livestock farm that whether livestock farm currently operates under the NPDES permit or not. Under the Clean Water Act, large livestock farms (CAFOs), that operate more than 1,000 animal units, are required to operate under the NPDES permit. Small and medium farms (AFOs), that operate less

than 1,000 animal units, are required by the regulation to operate under the NPDES permit if they had an illegal discharge in the past. Therefore, three types of livestock farms are large livestock farms (CAFOs), small/medium livestock farms regulated under the NPDES permit, and small/medium livestock farms not regulated under the NPDES permit. Large livestock farms and small/medium livestock farms regulated under the NPDES permit were included in the estimation model as dummy variables while small/medium livestock farms not regulated under the NPDES permit were omitted in the estimation model to deal with the multicollinearity problem. The variable of large livestock farms was assigned = 1 if the samples were large livestock farms (CAFOs) and zero otherwise. The variable of small/medium livestock farms regulated under the NPDES permit was assigned = 1 if the samples were small/medium livestock farms (AFO) being operated under the NPDES permit and zero otherwise.

5.1.4 Control Variables

To control for the potential variation in the planning horizon of the farmers, the respondents were asked whether they expect to be raising livestock in next 10 years on their current property or not. This variable was included in the estimated model as a dummy variable which was assigned = 1 if the samples answered that they will be raising livestock in next 10 years on your current property and zero otherwise. Another control variable was the dummy variable of the main type of animal raised in the livestock farm. The main types of animals were dairy cows, beef cows, hogs, poultry/layers and turkeys, and other types of animals such as horse and sheep. These variables were included in the estimated model as dummy variables which were assigned = 1 if this variable is the main type of animals raised in the livestock farms and zero otherwise. The variable for other types of animals was omitted in the estimation model to deal with the singularity problem.

Table 2. Definition of all variables used in the estimation model

Variable	Definition
Dependent variable	
MAEAP verified livestock farms	Livestock farms that complete the entire MAEAP process are assigned = 1, while livestock farms that attended a MAEAP-sponsored educational session but not complete the entire MAEAP process are assigned =0.
Explanatory variables	
<u>Perceptions of livestock farmers</u>	
(1) Regulatory preemption	The existence of MAEAP may help preempt future regulation of livestock producers
(2) Perceived favorability of treatment by the regulator	The regulatory (DEQ) personnel view MAEAP-verified farms favorably.
(3) Perceived degree of success with communication of environmental stewardship to societal stakeholders	MAEAP is effective in communicating that MAEAP-verified livestock producers are responsible stewards of the environment to: a) neighbor b) other farmers, c) Environmental activists.
4) Perceived degree of success with product differentiation	MAEAP participants are better able to differentiate or brand their products in the marketplace.
(5) Perceived degree of access to other financial benefits of participating in the program	
Access to farm loan	MAEAP verification helps in obtaining farm loans.
Insurance premium reduction	Insurance premiums are lower for MAEAP verified farms.
Land value appreciation	Participation in MAEAP will likely increase the value of my property if it should ever be sold.
Cost-share opportunities	There exist sufficient cost-share opportunities for farms to become (or continue to be) MAEAP-verified.

Variable	Definition
<u>Types of livestock farm operations</u>	
(6) Large livestock farms (CAFOs)	Large livestock farms (CAFOs) are assigned = 1 otherwise = 0.
(7) Small/medium livestock farms (AFO) regulated under the NPDES permit	Small/medium livestock farms (AFOs) that operate under the NPDES permit are assigned = 1, otherwise = 0.
Control variables	
(8) Being in livestock business in next 10 years	Livestock farms that will be in livestock business in next ten year are assigned = 1, otherwise = 0.
(9) main type of raised animals in livestock farms	
- Dairy Cows	Livestock farms that the main type of animal is dairy cows are assigned = 1, otherwise = 0.
-Beef cows	Livestock farms that the main type of animal is beef cows are assigned = 1, otherwise = 0.
-Hogs	Livestock farms that the main type of animal is hogs are assigned = 1, otherwise = 0.
-Poultry/layers and turkeys	Livestock farms that the main type of animal is poultry/layers and turkeys are assigned = 1, otherwise = 0.

5.2 Estimation model

A probit regression model is estimated to assess factors influencing MAEAP-verification decisions by livestock farms, which is of the form:

$$Prob(Y_i = 1 | X) = F(X_i\beta),$$

where Y_i is the dependent variable the livestock farm i is MAEAP-verified, $F(\cdot)$ is the normal cumulative distribution function, X_i is the set of explanatory variables. The general form of the estimated probit regression model is as follows:

$$P_i = \beta_0 + \beta_1(\text{Regulatory preemption})_i + \beta_2(\text{Large livestock farms CAFO regulated under NPDES permit})_i + \beta_3(\text{Small/medium livestock farms regulated under a NPDES permit})_i + \beta_4(\text{Perceived favorability of treatment by the regulator})_i + \beta_5(\text{Neighbors})_i + \beta_6(\text{Other farmers})_i + \beta_7(\text{Environmental activists})_i + \beta_8(\text{Product Differentiation})_i + \beta_9(\text{Access to farm loans})_i + \beta_{10}(\text{Insurance premium reduction})_i + \beta_{11}(\text{Land value appreciation})_i + \beta_{12}(\text{Cost-share opportunities})_i + \beta_{13}(\text{Being in livestock business in next ten years})_i + \beta_{14}(\text{the main types of animals in a farm})_i$$

where P_i is the probability of the livestock farms' decision to become MAEAP-verified.

Hypothesized Predictions

The predictions correspond to the hypotheses presented in section 4 under the two scenarios. If MAEAP participation is primarily driven by the regulatory pre-emption motive, then we predict that β_1 will be positive, β_2 will be positive, β_3 will be positive, β_4 will be negative, β_5 will be negative, β_6 will be negative, β_7 will be negative, β_8 will be negative, β_9 will be negative, β_{10} will be negative, β_{11} will be negative, β_{12} will be negative. Conversely if MAEAP participation is primarily driven by differentiation motive then we predict that β_1 will be negative, β_2 will be negative, β_3 will be negative, β_4 will be positive, β_5 will be positive, β_6

will be positive, β_7 will be positive, β_8 will be positive, β_9 will be positive, β_{10} will be positive, β_{11} will be positive, β_{12} will be positive.

The correlations and descriptive statistics for each of variables in the estimation model are shown in Table 5.3. Variance inflation factors (VIFs) were in the range between one to three and much less than the recommended maximum threshold of 10, indicating that multicollinearity between the explanatory variables is not a concern (Kennedy, 2003).

Table 3. Correlation and descriptive statistics

	1	2	3	4	5	6	7	8	9	10	11	12
1 Regulatory preemption	1.00											
2 Large livestock farms (CAFOs)	0.17	1.00										
3 Small/medium livestock farms (AFO) regulated under the NPDES permit	0.04	0.12	1.00									
4 Perceived favorable view from the regulator	-0.17	0.00	0.00	1.00								
5 Neighbor	0.12	0.18	0.13	-0.01	1.00							
6 Other farmers	-0.19	0.02	-0.07	-0.07	-0.15	1.00						
7 Environmental activists	-0.20	-0.16	0.02	-0.18	-0.51	-0.14	1.00					
8 Product differentiation	-0.14	-0.23	-0.10	-0.13	-0.22	0.16	0.01	1.00				
9 Access to farm loan	-0.19	0.19	0.04	-0.16	0.02	-0.02	0.06	-0.28	1.00			
10 Insurance premium reduction	-0.03	-0.07	0.01	0.03	0.09	0.19	-0.27	0.10	-0.45	1.00		
11 Land value appreciation	0.13	-0.04	0.08	-0.16	-0.05	-0.25	0.20	-0.16	-0.19	-0.40	1.00	
12 Cost-share opportunities	-0.28	0.03	-0.03	-0.05	-0.11	-0.06	-0.04	0.03	0.27	0.08	-0.40	1.00
Mean	3.46	0.22	0.11	3.69	3.82	4.20	3.32	3.05	3.05	3.22	3.03	3.09
Std. Dev	0.91	0.41	0.31	0.92	0.93	0.74	1.34	0.92	0.86	0.98	0.91	0.95
Variance inflation factors	1.53	1.19	1.26	1.55	1.74	1.74	1.49	1.84	1.95	1.53	2.15	1.31

VI. RESULTS

The summary statistics of the probit model that estimates the factors influencing MAEAP verification decision by livestock farmers are presented in table 6.1. The likelihood ratio test of this model equals 50.04, which reject the null hypothesis $H_0: all \beta_i = 0$ at the 0.01 level of significance.

Regulatory preemption has a positively significant relationship on the MAEAP-verification decision at a 10% level of significance (β_1 is positively significant). Livestock farmers higher degree of agreement with the following statement, “MAEAP verification helps preempt future regulation of livestock producers” are more likely to complete the entire MAEAP process. The result supports Hypothesis 1 that livestock farmers that are interested in preempting regulations are more likely to seek MAEAP verification.

The results indicate that *large livestock farm (CAFO)* has a positively significant relationship with the MAEAP-verification decision at a 1% level of significance (β_2 is positively significant), while the variable of *small/medium livestock farms (AFOs) regulated under a NPDES permit* is positively significant with the MAEAP-verification decision at a p-value of 0.127. The marginal effect of the variable of large livestock farms (CAFO) indicates that the probability of completing the entire MAEAP process will increase by 60% if farms are large livestock farms (CAFO). The marginal effect of the variable of small/medium livestock farms regulated under a NPDES permit indicates that the probability of completing the entire MAEAP process will increase 40% if livestock operations are small/medium livestock farms regulated under a NPDES permit. These findings support Hypothesis 2 that livestock farms that are currently regulated under a NPDES permit are more likely to have participated in MAEAP.

Table 4. The results of Probit regression model of the decision to be MAEAP-verified

Variables	Coefficient	standard error	Marginal effect
<u>Explanatory variables</u>			
Regulatory preemption	0.611*	0.353	0.224
Large livestock farms (CAFO)	3.073***	0.912	0.597
Small/medium livestock farms (AFO) regulated under a NPDES permit	2.193	1.436	0.421
Perceived favorability of treatment by the regulators	-0.542*	0.304	-0.198
Effective communication of environmental stewardship to societal stakeholders			
- Neighbors	0.632	0.399	0.231
- Other farmers	0.468	0.358	0.171
- Environmental activists	-0.351	0.250	-0.128
Product differentiation	-0.0700	0.348	-0.0256
Access to farm loans	0.390	0.454	0.143
Insurance premium reduction	0.602*	0.361	0.221
Land value appreciation	-0.444	0.399	-0.162
Cost-share opportunity	0.188	0.297	0.0689
<u>Control Variables</u>			
Being in livestock business in next 10 years	2.066***	0.783	0.671
Dairy Cows	-0.155	0.960	-0.0571
Beef cows	-1.792	1.157	-0.621
Hogs	0.910	1.025	0.299
Poultry/layers and Turkeys	2.067*	1.238	0.392
Constant	-6.677***	2.230	
<u>Regression Diagnostics</u>			
Chi-square	50.04		
Probability > Chi-square	0.000		
Pseudo R-square	0.4920		
Observations	74		74

The dependent variable is livestock farms that complete the entire MAEAP process.

*** Significance at the 1% level, ** Significance at the 5% level, * Significance at the 10% level.

The *perceived favorability of treatment by the regulators* has a negatively significant relationship with the MAEAP-verification decision at a 10% level of significance (β_4 is negatively significant). A negative relationship indicates that farmers who had higher level of

disagreement with the following statement: “The regulatory (DEQ) personnel view MAEAP-verified farms favorably” were more likely to enroll in MAEAP. This indicates MAEAP-verified that farmers are more likely to have perceived less favorable treatment towards MAEAP certified livestock farms, and higher regulatory scrutiny of their farms. The results support Hypothesis 3 that livestock farmers that perceive higher enforcement effort from regulators are more likely to have participated in MAEAP.

The variables relating to *communication of environmental stewardship to societal stakeholders* are not significantly associated with the MAEAP-verification decision. However, the variable of communication of environmental stewardship to neighbors is statistically significant ($p\text{-value} = 0.113$). Livestock farmers who agree that MAEAP verification helps communicate their environmental stewardship to neighbors are more likely to complete the entire MAEAP process. It seems MAEAP verified livestock farms perceive that neighbors view their MAEAP verification favorably but do not anticipate that other farmers or environmental organizations will view MAEAP verification as a signal of environmental stewardship. The result supports Hypothesis 4 that livestock farmers that perceive negative reactions from other stakeholders (other than neighbors) are more likely to have participated in MAEAP.

Under the differentiation scenario, MAEAP verified livestock farmers are potentially able to use the environmental quality attribute of their products as a way to differentiate themselves from other competitors in the market, i.e. capture additional returns in the form of a price premium from environmentally conscious consumers. However, the estimation results suggest that product differentiation is not significantly related with the MAEAP-verification decision by livestock farmers, and MAEAP-verified livestock farmers do not perceive any rewards by customers in the form of higher product prices or increased sale volume. The result rejects

Hypothesis 5 that livestock farmers that perceive better ability to differentiate or brand their products in the marketplace are likely to have participated in MAEAP.

Other financial benefits of participating in the program are also examined, including access to loans, insurance premium reduction, land value appreciation, and cost-share opportunity. Among these variables, only the insurance premium reduction is positively significant at a 10% level of significance, while other financial benefits are not statistically significant. Participants appear to perceive lower environmental risks hence lower insurance rates, but participants do not perceive increased access to other resources and financial benefits.

The estimation results of control variables show that livestock farms that plan to be in the livestock business in the next 10 years are more likely to participate in MAEAP. The reason is that participation in the program requires a high investment cost in the form of facility improvement. Livestock farmers who plan to stay longer in the livestock business can expect to amortize their investment cost over a longer period. For the dummy variables for the main types of animal raised, the results show that poultry/turkey farms are more likely to be MAEAP-verified at a 10% level of significance.

VII. SUMMARY AND CONCLUSION

The research question addressed by this thesis is why do livestock farmers participate in VEPs such as MAEAP? Existing economic literature identifies two major motives for participation in VEPs: regulatory preemption and differentiation. Under a ‘regulatory preemption’ scenario, firms engage in voluntary pollution reduction through VEPs when faced with potentially stringent future regulations. Under a ‘differentiation’ scenario, firms that are already proactively engaged in environmentally responsible activities would like to send a signal about their environmental responsibility to regulators, other stakeholder and/or environmentally conscious consumers. The goal of program participation of environmentally more responsible firms is to differentiate themselves and to capture additional returns—either in the form of higher prices from consumers or of reduced regulatory investigation.

Evolution of the MAEAP program can be characterized by three phases. In the initial period various stakeholders including farmers, MDARD, MDEQ, and civic and environmental groups together attempted to develop a voluntary environmental stewardship program aimed at education and improved environmental performance. The second period where USEPA was attempting to develop permitting systems for livestock farms, farmer groups were facing an immediate threat of NPDES regulations, and perceived an opportunity to use MAEAP as a substitute for the proposed NPDES permits, and ECOS agreement was negotiated for using MAEAP verification in lieu of NPDES permits. During this period, DEQ officials and several environmental groups appeared to have been alienated from MAEAP. Miller et al (2010) report similar findings from their interviews of DEQ officials. Vollmer-Sanders et.al. (2011) found that during the time that MAEAP verification was allowed in lieu of obtaining NPDES permits, the primary motivation of the MAEAP verification decision by livestock farmers was the concern

about current or future environmental regulations affecting their farm operations. In the third phase of the MAEAP, with the conclusion of the ECOS Agreement in 2007, MAEAP verification in lieu of a permit is no longer an option available to Michigan livestock producers; the loss of this option may have eliminated a prior major motivator for participation in MAEAP and changed it more toward the ‘differentiation’ motive. Further on March 8, 2011, Public Acts 1 and 2 were signed by Governor Rick Snyder, establishing MAEAP in law and a MDARD program initiative.

This thesis investigates what factors influence the decision of livestock farms to be MAEAP-verified now that MAEAP verification can no longer be used in lieu of CAFO permits. We develop a conceptual model of strategic interaction between a regulator and a farmer, drawing on ‘signaling’ models in economics, and testable hypotheses about MAEAP participation under each of these scenarios. The results from the probit model estimation suggest that livestock farmers who are interested in regulatory preemption are more likely to be MAEAP-verified while the differentiation motive does not appear to have a significant effect on program participation at the time of the survey. According to the results, MAEAP certified livestock farmers (i) were likely interested in preempting regulations, (ii) were currently regulated under a NPDES permit and expected subsequent regulation, and (iii) perceived higher enforcement effort from regulators. These results are similar to those found by Vollmer-Sanders et.al. (2011) and indicate that regulatory preemption continues to be a motivator for MAEAP participation by livestock farmers. However, it is not clear if this is the lingering effect of prior NPDES pre-emption motive, or if the farmers still continue to perceive threat of more/other regulations.

This thesis also finds that livestock farmers who perceive positive reaction from neighbors are more likely to be MAEAP-verified in their operations. This result is not similar to the finding found by Vollmer-Sanders et.al. (2011) that neighbors are not likely to influence livestock farmers to be MAEAP-verified during the ECOS agreement period. This suggests that after the end of the ECOS agreement, neighbors and community may have developed better perceptions about MAEAP verified livestock farms and their environmental stewardship efforts.

There are some caveats and limitations of this study that should be mentioned. First, these results reflect one particular period in MAEAP history. The mail survey of this study was conducted in 2010 during the time that MAEAP verification could no longer be used in lieu of CAFO permits. However, MAEAP has been changed since the time of the survey. On March 8, 2011, Public Acts 1 and 2 were passed by the Michigan legislature and signed by Governor Rick Snyder, establishing MAEAP in law. These Public Acts set up the MAEAP Advisory Council to provide advice on the implementation of MAEAP, including recommendations on MAEAP standards and protocols for farm verification. The MAEAP Advisory Council is composed of representatives of farmers, agricultural commodity groups, state and federal agencies, Michigan State University, and conservation and environmental groups.

The establishment of the MAEAP Advisory Council is likely to alter regulators' belief about MAEAP-verified livestock farms because the regulators (USEPA, MDEQ) will participate in the design of MAEAP. Specifically, MAEAP standards are being strengthened so that participation in MAEAP is costly enough that it provides a 'credible signal', i.e. the standards are stringent enough that it is relatively costly for type B farms to meet the standards. Further processes and standards for reverification/de-verification are being formalized. As a consequence, the regulators' beliefs about MAEAP-verified livestock farms are changing and

correspondingly regulators' responses and stringency of regulatory enforcement of MAEAP-verified livestock farms. Therefore, the results of this study may not hold true in the future.

Second, since the expiration of the special agreement negotiated between the USEPA and the state government changed the institutional environment in which farmers currently seek MAEAP verification, farmer motivations for becoming MAEAP verified likely differ from those that existed when our survey was conducted.

Third, the results might be different for other commodities (i.e. crops, fruits and vegetable). The MAEAP verification applies to three different types of agricultural activities, including livestock, farmstead, and cropping. Regulations and enforcement of compliance with environmental directives, environmental impacts, and customers' characteristics vary across different agricultural activities. Therefore, farmers in other agricultural activities most likely have different motivations of program participation.

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Michigan Agriculture Environmental Assurance Program (MAEAP)

Survey of Livestock Producers

April 14, 2010

Center for Economic Analysis

Department of Agricultural, Food and Resource Economics

Michigan State University

East Lansing, MI 48824

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Environmental compliance and the desire to be environmental stewards can be important factors to all Michigan livestock producers. The Michigan Agriculture Environmental Assurance Program (MAEAP) is a voluntary and non-regulatory program for Michigan livestock producers. Your opinion on Michigan environmental regulations, environmental concerns and MAEAP is important to us. Regardless of the size of your operation, or your participation in MAEAP, your opinions are important in helping us convey industry needs to policy makers. Please respond so that this program, founded by many agricultural partnering organizations, can better serve you and your neighbors in the future. All responses will be kept confidential and no individual will be identified from this survey.

MICHIGAN STATE
UNIVERSITY



About MAEAP:

MAEAP provides a voluntary structure under which Michigan farmers can be assured they are effectively following all applicable Right to Farm Generally Accepted Agricultural and Management Practices (GAAMPs) and are working to comply with state and federal environmental laws specific to each system of the program.

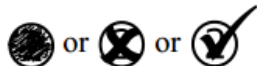
The steps for MAEAP verification are:

- Attend Educational meeting
- Complete Progressive Planning and/or develop a Comprehensive Nutrient Management Plan (CNMP)
- Address environmental risks and apply for MAEAP verification

You can find more information about MAEAP at this web site: <http://www.maeap.org/>

How to complete this survey

1. If your operation is divided into multiple unique enterprise units where each individual unit requires a separate MAEAP verification and/or Comprehensive Nutrient Management Plan, we ask that you consider your largest enterprise when completing the questions below.
2. Select the answer that is most appropriate. There are no right or wrong answers.
3. Make all responses dark using ink or pencil, and complete as shown in the example below.



4. Survey questions are written on the front and back of each sheet. Be sure to turn each sheet over to answer those questions on the back.
5. Feel free to write any comments or explanations on this survey.

Example Question

1. First, we'd like you to tell us how much you agree or disagree with the following statements.

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
A. Citizens' views should be included when designing programs that could affect their health.	①	②	③	④	⑤

Example Question

2. To what extent does public opinion influence local governance?

①	②	③	④	⑤
None	A little	Some	A fair Amount	A great deal

Thank you for participating in this survey. The survey starts on the next page.

I. We would like to learn about your familiarity with and participation in the Michigan Agriculture Environmental Assurance Program (MAEAP):

1. Have you heard of MAEAP?

① Yes: **Continue to Question 2**
 ② No: **Skip to section IV of this survey on Page 6**
2. Have you ever participated in a MAEAP program?

① Yes: **Continue to Question 3**
 ② No: **Skip to section III of this survey on Page 2.**

3. Have you attended a MAEAP-sponsored educational session in the last 3 years?
 (Please select Yes or No below and follow the instructions in bold letters)

② No: **Skip to Section III of this survey on Page 2.**

① Yes: **Please rate the following in terms of how important a factor they are in your decision to participate in MAEAP by attending a MAEAP Educational meeting.**

	Unimportant	Somewhat important	Important	Very important	Not Applicable (N/A)
A. Ensuring that my farm attains environmental standards for future generations.	①	②	③	④	⑤
B. Desire to farm in an environmentally-friendly manner.	①	②	③	④	⑤
C. Neighborhood concerns or pressure.	①	②	③	④	⑤
D. Conforming to current regulatory standards so farm can remain in agriculture for the future.	①	②	③	④	⑤
E. Opportunity of obtaining technical assistance and/or cost-share for environmentally-friendly farming practices.	①	②	③	④	⑤
F. Encouraged by someone to become involved in MAEAP.	①	②	③	④	⑤
G. Opportunity to use MAEAP verification in lieu of DEQ permit.	①	②	③	④	⑤
H. Prefer to be involved in a voluntary program now rather than wait for potential future regulations.	①	②	③	④	⑤
I. Positive regulatory (DEQ) agency recognition of MAEAP participation and verification.	①	②	③	④	⑤
J. Other: _____	①	②	③	④	⑤

Continue to Question 4

II. We would like to know about your level of participation in MAEAP. Please respond to the following statements as they apply to you:

4. I am through the entire MAEAP process, my farm has been verified by an on-farm visit and I am eligible to place a MAEAP sign at my farmstead.
 ① Yes **Skip to Question 9**
 ② No **Continue with Question 5**
5. I have completed a Comprehensive Nutrient Management Plan (CNMP) and the plan provider and I have signed it.
 ① Yes **Skip to Question 9**
 ② No **Continue with Question 6**
6. I am working with a consultant to develop a CNMP. ① Yes ② No
7. I have signed up for Progressive Planning through MAEAP. ① Yes ② No
8. I plan on completing MAEAP verification for my farm. ① Yes ② No
9. Irrespective of the stage of MAEAP at which you are, what influenced your decision to participate or not participate in MAEAP?

III. Now, we would like to know what you think about the effectiveness of MAEAP and the costs and benefits of participation:

10. Please indicate your level of agreement with the following: MAEAP is effective in communicating that MAEAP-verified livestock producers are responsible stewards of the environment to:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Don't Know
A. The state legislature	①	②	③	④	⑤	⑥
B. The Department of Environmental Quality (DEQ)	①	②	③	④	⑤	⑥
C. The Department of Agriculture (MDA)	①	②	③	④	⑤	⑥
D. Food processors	①	②	③	④	⑤	⑥
E. Food retailers	①	②	③	④	⑤	⑥
F. Your neighbors	①	②	③	④	⑤	⑥
G. The general public	①	②	③	④	⑤	⑥
H. Other farmers	①	②	③	④	⑤	⑥
I. Environmental activists	①	②	③	④	⑤	⑥

Comments: _____

11. Regardless of your level of involvement in MAEAP, Please indicate your level of agreement with the following statements.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	I don't know/NA
A. Participating in MAEAP will add benefits to farms.	①	②	③	④	⑤	⑥
B. The benefits of MAEAP participation will likely exceed the costs for farms.	①	②	③	④	⑤	⑥
C. Farmers of MAEAP-verified farms are more likely to practice environmental stewardship.	①	②	③	④	⑤	⑥
D. MAEAP provides farmers with the resources to be responsive to changes in the market for livestock products dictated by environmental concerns.	①	②	③	④	⑤	⑥
E. MAEAP participants are better able to differentiate or brand their products in the marketplace.	①	②	③	④	⑤	⑥
F. The regulatory (DEQ) personnel view MAEAP-verified farms favorably.	①	②	③	④	⑤	⑥
G. DEQ is less likely to audit operations that are MAEAP-verified.	①	②	③	④	⑤	⑥
H. I am comfortable with Michigan Dept. of Ag visiting my farm.	①	②	③	④	⑤	⑥
I. MAEAP verification reduces farm liability in the event of an environmental accident.	①	②	③	④	⑤	⑥
J. The MAEAP logo is well recognized in my community.	①	②	③	④	⑤	⑥
K. The MAEAP verification sign lends credibility to farms.	①	②	③	④	⑤	⑥
L. The existence of MAEAP may help preempt future regulation of livestock producers.	①	②	③	④	⑤	⑥
M. MAEAP participants are more prepared for any future regulatory changes.	①	②	③	④	⑤	⑥
N. There exists sufficient cost-share opportunities for farms to become (or continue to be) MAEAP-verified.	①	②	③	④	⑤	⑥
O. There exist sufficient financial incentives for my farm beyond cost share to become (or continue to be) MAEAP-verified.	①	②	③	④	⑤	⑥
P. Participation in MAEAP will likely increase the value of my property if it should ever be sold.	①	②	③	④	⑤	⑥
Q. MAEAP verification helps in obtaining farm loans.	①	②	③	④	⑤	⑥
R. Insurance premiums are lower for MAEAP verified farms.	①	②	③	④	⑤	⑥
S. I am not concerned that MAEAP verification will draw additional unwanted attention/scrutiny to my farm operation.	①	②	③	④	⑤	⑥
T. Due to my participation in MAEAP, I have made changes to my livestock operation that protect the environment.	①	②	③	④	⑤	⑥
U. Due to my participation in MAEAP, I can better manage my farm for environmental and regulatory matters.	①	②	③	④	⑤	⑥
V. The MAEAP program is not likely to cease within the next 5 years.	①	②	③	④	⑤	⑥
W. I would be willing to participate more (or renew my verification) if I was offered a reduction in property tax of at least _____ percent. (Please enter minimum tax reduction acceptable to you.)						

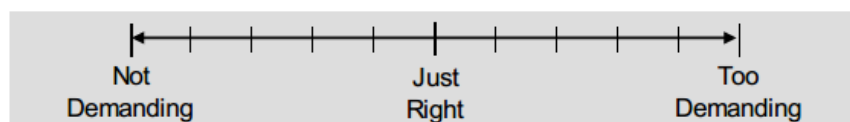
12. In this question, we are attempting to understand what may cause Michigan livestock producers to not participate in MAEAP. Please indicate your level of agreement with the following statements concerning potential barriers to MAEAP participation for livestock producers.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	I don't know/NA
A. MAEAP is confusing and it is hard for livestock producers to fully understand the process.	①	②	③	④	⑤	⑥
B. Livestock producers generally lack interest in environmental protection.	①	②	③	④	⑤	⑥
C. Livestock producers are discouraged by the loss of the ability to use MAEAP verification in lieu of DEQ permit for CAFOs.	①	②	③	④	⑤	⑥
D. Livestock producers encounter too much hassle or “red tape” in their effort to become MAEAP-verified.	①	②	③	④	⑤	⑥
E. Adequate technical assistance is lacking for livestock producers participating in MAEAP.	①	②	③	④	⑤	⑥
F. The costs of on-farm changes necessary for livestock operations to become MAEAP-verified are too high.	①	②	③	④	⑤	⑥
G. The size of many livestock operations is too small to justify investment in MAEAP verification.	①	②	③	④	⑤	⑥
H. Developing a CNMP occupies too much of producers’ time.	①	②	③	④	⑤	⑥
I. MAEAP does not fit every producer’s circumstance, nor does everyone value it for their farm.	①	②	③	④	⑤	⑥
J. MAEAP is not openly supported by regulatory (DEQ) agencies.	①	②	③	④	⑤	⑥

13. Are there other additional barriers to participation or other reasons not to participate? ① Yes
② No

a. If **Yes**, please list or explain them:

14. Some livestock producers believe that MAEAP requirements are too demanding, too inflexible and/or too expensive. Others argue the opposite. Please take a moment to provide your opinion by indicating your belief below. **(Please mark an X on the line below at a point corresponding to your belief).**



15. What modifications to MAEAP do you think will encourage more livestock producers to participate in MAEAP or continue on to become verified?

	Yes	No	Don't Know
A. More assistance by the CNMP provider to help with verification process.	①	②	③
B. More recognition of MAEAP verification by the regulatory community (DEQ).	①	②	③
C. More access to funds for manure storage and related technologies.	①	②	③
D. More funding for environmental improvements to meet the CNMP requirements.	①	②	③
E. Streamlining the CNMP requirement and process.	①	②	③
F. Making the CNMP document more relevant to daily farm operations.	①	②	③
G. Making MAEAP verification mandatory rather than voluntary.	①	②	③
H. Having MAEAP administered by ag. Commodity groups as opposed to Michigan Dept. of Agriculture.	①	②	③
I. More recognition of MAEAP by the processing and retail food industries.	①	②	③

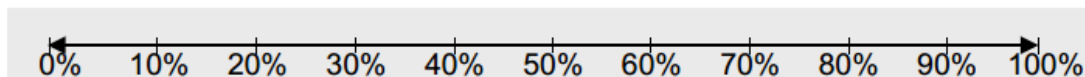
J. Other (Please list): _____

16. Regardless of the size of your farm, or whether you have a CAFO permit, we would like to know your opinion on how MAEAP verification compares with the Department of Environmental Quality (DEQ) permit for CAFOs with respect (A) to pollution prevention outcomes and (B) to the cost of implementation.

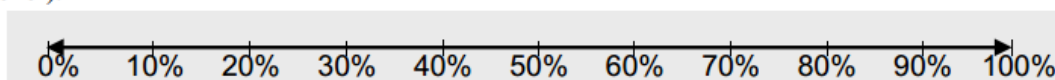
	MAEAP is less effective than the DEQ permit ①	MAEAP is the same as the DEQ permit ②	MAEAP is more effective than the DEQ permit ③	Don't Know ④
A. Pollution prevention				
	MAEAP is more costly than the DEQ permit ①	MAEAP costs the same as the DEQ permit ②	MAEAP is less costly than the DEQ permit ③	Don't Know ④
B. Cost of implementation				

Comments: _____

17. On a scale of 0% (impossible) to 100% (certain), please indicate your belief of the chance that small livestock producers will be required to comply with stricter environmental regulation in the near future (5-10 years)? (Place an X on the line below at a point corresponding to your belief).



18. On a scale of 0% (extremely weak) to 100% (extremely strong), please indicate your belief of the message that MAEAP verification is sending to DEQ about livestock producers' efforts at ensuring environmental stewardship. (Place an X on the line below at a point corresponding to your belief).



19. Do you think that having more livestock producers participate in MAEAP will result in:

	Yes	No	Don't Know
A. More recognition accorded MAEAP by regulatory agencies?	①	②	③
B. Increased effectiveness of MAEAP in ensuring environmental stewardship?	①	②	③
C. Higher prices paid to livestock producers?	①	②	③
D. Increased likelihood of branding of livestock products by retailers and/or processors?	①	②	③

IV. We would like to know your views about contemporary issues confronting livestock producers

20. Please indicate your degree of concern about the following factors

	Not Concerned	Slightly Concerned	Somewhat Concerned	Very Concerned
a. Changes in laws governing manure discharge	①	②	③	④
b. Uncertainty in commodity prices	①	②	③	④
c. Changes in consumer preferences for agricultural products	①	②	③	④
d. Lawsuits arising from environmental discharge	①	②	③	④
e. Ability to adopt new technology	①	②	③	④
f. Limitations to growth opportunities	①	②	③	④
g. Potential of polluting groundwater	①	②	③	④
h. Environmental groups encroaching on farm operations	①	②	③	④

21. Please indicate your degree of agreement on the following statements.

	Strongly Disagree	Disagree	Agree	Strongly agree
a. Environmental regulations affecting livestock production are fair.	①	②	③	④
b. The cost of being in environmental compliance is not prohibitively expensive.	①	②	③	④
c. I trust regulators to be fair	①	②	③	④
d. I have good relations with my neighbors.	①	②	③	④
e. I am not fearful of individuals or groups monitoring my operations.	①	②	③	④
f. My neighbors and community are likely to work with me to find solutions to environmental concerns about my operations.	①	②	③	④
g. Neighbors' attitudes are not a limiting factor in the growth of my operations.	①	②	③	④

V. Now, we would like to know about your livestock operations:

22. What is the number of head of animals on your farm today? (If you operate multiple unique enterprises, please add up all enterprises.)

Livestock Type	No. of Mature Animals Today
① Dairy cows (mature and milking)	No. _____
② Beef cows, and other cattle	No. _____
③ Hogs (number of sows and or finishers)	No. _____
④ Poultry/layers & meat/Turkeys	No. _____
⑤ Sheep/Goats	No. _____
⑥ Horses	No. _____
⑦ Other: _____	No. _____

23. Is it probable that you will be raising livestock in 10 years on your current property?

① Yes

② No **Please complete 24 directly below**

24 If you selected No, is this because:

- ① you plan to sell your farm for agricultural use?
- ② you plan to sell your farm for non-agricultural use?
- ③ you plan to transfer ownership to a relative or relatives?
- ④ Other: _____

25. Do you currently operate under the Michigan Department of Environmental Quality (DEQ) permit for a Concentrated Animal Feeding Operation (CAFO)?

① Yes

② No

VI. Now, we would like to know more about your farm:

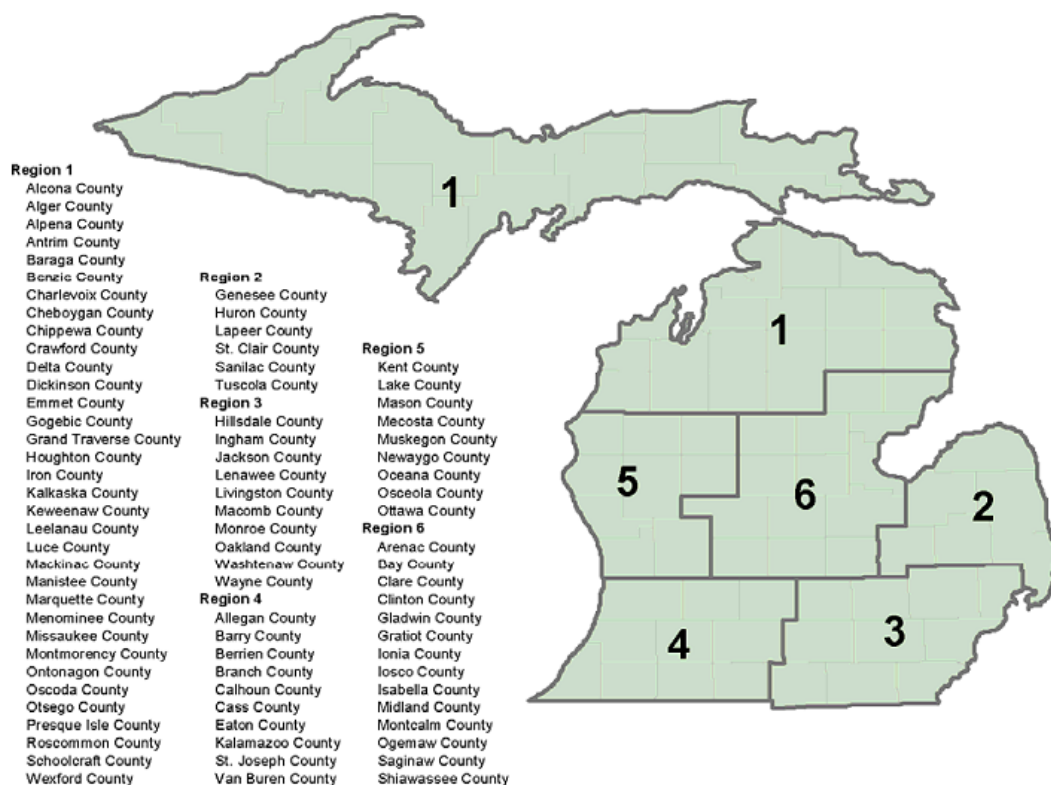
26. How many acres do you operate (both owned and rented)? _____ acres

27. Which, if any, of following Natural Resources Conservation Service (NRCS) environmental programs do you participate in? (Please select all that apply)

NRCS Programs

- ① Conservation Reserve Program (CRP)
- ② Conservation Reserve Enhancement Program (CREP)
- ③ Conservation Security Program (CSP)
- ④ Environmental Quality Incentives Program (EQIP)
- ⑤ Grassland Reserve Program (GRP)
- ⑥ Wetlands Reserve Program (WRP)
- ⑦ Wildlife Habitat Incentives Program (WHIP)

28. The map of Michigan is shown below. Please circle the number on the map corresponding to the region where your farm is located.



Please feel free to add additional comments here:

Thank you for participating in this survey. The results of the survey will be available by June 15, 2010. To learn about the results, please visit the following web site: <http://cea.msu.edu/>.