Financial Costs and Environmental Outcomes of the Michigan Agriculture Environmental Assurance Program (MAEAP)

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Executive Summary

Nutrient management has become increasingly important for Michigan livestock producers. The challenge for producers has been to reduce their operation's environmental impact and to manage farm nutrients in an environmentally sound manner, while at the same time maintaining economic viability. In 1998, a voluntary program, the Michigan Agriculture Environmental Assurance Program (MAEAP), was created by multiple Michigan industry, university, and governmental agencies to assist livestock producers with their nutrient management. MAEAP verification occurs after the Michigan Department of Agriculture (MDA) verifies that the farm has an accurate and complete Comprehensive Nutrient Management Plan (CNMP) and that the producer has or will implement the pollution prevention practices or improvements presented in the CNMP.

To determine the effectiveness of MAEAP, interviews were conducted with MAEAP-verified farm operators. These operations were not representative of all Michigan farms, as this set only included livestock producers that were MAEAP verified, or nearly MAEAP verified, as of January 1, 2005. The 29 livestock operators interviewed in this research represented 63 percent of all MAEAP-verified livestock operators. The interviews gave researchers a better understanding of the magnitude and incidence of specific costs associated with the record keeping, plan writing, managerial changes, and capital investments required to implement and maintain MAEAP verification. Farm-specific CNMPs were collected and analyzed to determine the environmental changes that resulted from MAEAP verification on specific operations.

This thesis research examined three questions. First, what were the barriers faced by and motivations of the livestock producers who became verified in the voluntary, education-based program? Second, what costs were incurred by those operators who had become verified under MAEAP? Finally, what environmental impact did MAEAP verification have on the phosphorus mass balance and phosphorus index of those MAEAP-verified operations? This thesis research was original in that neither farm-level financial, nor environmental impacts associated with MAEAP verification were undertaken by previous evaluations (Farrell, 2002 and USDA-NRCS, 2003).

The first research question examined the barriers and motivations livestock producers faced when becoming MAEAP verified. The largest barrier for the majority of operations (41 percent) was the availability of land for manure spreading, whether it was associated with the amount of cropland, phosphorus levels on the land, crop rotations, or driving distance. Financial stress was not identified as a strong barrier. It should be noted, however, that 74 percent of the producers interviewed received cost-share funds to help pay for their CNMP, and 28 percent received cost-share funds to help pay for their capital investments.

While 58 percent of producers interviewed in this research became verified because of their expectations with respect to regulations affecting their size or type of farm, all of the 29

producers agreed that they would maintain and update their CNMP. The positive feedback and desire to maintain and update their farm-specific CNMP suggested that producers should maintain the management scheme changes that already had been made and will update the CNMP to follow new laws and regulations. Neither a concern about the drinking water on the farm nor a landlord or agricultural lender encouraging or requiring a CNMP motivated livestock producers (N = 0) to become MAEAP verified. It was surprising that 1) more time dedicated to farm management, 2) insurance discounts, and 3) community awareness motivated few producers (3, 6, and 13 percent respectively).

The second research question examined the costs incurred by livestock operators to achieve MAEAP verification. Results indicated by the average producer spent $104,423 in total or $14,709 annually on capital investments and managerial changes to maintain MAEAP verification; see Table 1. At the same time, some producers revealed that verification resulted in a modest savings that offset these costs. The savings were realized through the use of less commercial fertilizers ($2,792 annually) and insurance discounts ($61 annually), but the savings did not, on average, exceed the annual cost of the capital investment (Table 2) and management (Table 3) changes ($14,709). The largest average cost incurred was for the addition of phytase to swine and poultry diets (phytase enables swine and poultry to digest phosphorus more efficiently, excreting less phosphorus in the manure), at an average annual cost of $4,022.

Livestock producers who applied for MAEAP verification were eligible for cost-share assistance through the Environmental Quality Incentive Program (EQIP), distributed by the Natural Resources Conservation Services (NRCS). The average total cost-share funds given to the interviewed operators through EQIP, including the opportunity cost of free CNMPs, was $16,177 or $790 each year (Table 4). Eighty-five percent of the small and medium operations, AFOs[1], received some form of cost-share to assist with the cost of writing the CNMP or adding specific capital investment changes[2]. On average, AFOs received $113.07 per animal unit to assist with the costs, while CAFOs received an average of $7.10 per animal unit. Even with the substantial amount of cost-share received per animal unit, AFOs on average, paid $12.11 per animal unit per year to become and maintain MAEAP verification. CAFOs paid only $3.75 per animal unit per year for verification.

The average producer spent $7.53 per animal unit annually, and used 0.76 percent of their annual gross farm revenue to become MAEAP verified. Poultry operators spent the most money per animal unit annually ($12.89) to become MAEAP verified followed by the beef producers ($9.71), swine producers ($6.16), and dairy producers ($5.97).

The third research question regarding the environmental impact of MAEAP on the phosphorus mass balance and phosphorus index of MAEAP-verified operations revealed that verified operations did reduce their phosphorus pollution potential. Ninety-two percent of 25 operations surveyed were in mass balance after they became MAEAP verified. With operations in mass balance, the potential phosphorus build up in the soil on these farms was diminished. The 12 high risk operations had a P-Index score above the threshold (18) before they became MAEAP verified. As a result of implementing additional agronomic field management practices

[1] An AFO produces fewer than 1,000 animal units annually, while a CAFO produces more than 1,000 animal units. One animal unit is the same as: 1 feeder calf, heifer, or steer; or .7 mature dairy cow (whether a milking or dry cow); or 25 swine weighing over 55 pounds; or .5 horse; or 10 sheep or lambs; or 55 turkeys; or 100 laying hens or broilers when the facility has unlimited continuous flow watering systems; or 30 laying hens or broilers when facility has liquid manure handling system (MDEQ, 2005).

[2] Capital investments that were eligible for EQIP cost-share funds included: manure storage, drainage, gutters, fences, buildings, roofs, grass waterways, buffers, and drives/berms.

and reducing the amount of field erosion, these high-risk livestock operations reduced their field P-Index score average to below 15. The P-Index score of these operations, after becoming MAEAP verified, was below the threshold, which indicated that a low risk of phosphorus runoff potential from a field had been achieved.

Interviews with livestock producers who implemented the CNMP also provided some additional noteworthy insights. The impression gained by the interviewer from the producers was that the producers believed there were some intangible benefits that accompanied MAEAP verification. For example, several producers felt that they were making a difference in their community, in the environment, and across the state by becoming MAEAP verified. Many producers wanted to help their colleagues understand the benefits to environmental stewardship. Nearly all producers (86 percent) stated that they would have become MAEAP verified without EQIP cost-share funds, but the "money certainly helped lower the financial strain." Some producers stated that they were more motivated by how they could make their operation more efficient and productive due to MAEAP verification. Many of the operators began the MAEAP verification process before the current regulations were in place, however, some were disgruntled with the "moving target" they were required to attain. A few operators thought a legislative change would be appropriate so that, if a lawsuit was filed against a MAEAP-verified livestock producer, the person bringing the suit would be responsible for paying for legal fees, should the livestock producer win the case.

MAEAP has not been growing rapidly in numbers of verified producers. There are 53,315 farms (USDA-NASS, 2002) in the state and over than 200 MAEAP-verified operations (Wilford, personal communication, January 2006). However, the first phase of MAEAP verification, the education portion, has had over 3,000 participants since 2001. Many of the changes implemented on an operation were due to an increased knowledge and understanding of agronomy, water flow, record keeping, animal management, and environmental regulations. It is possible that environmental stewardship could be increasing all over the state regardless of the number of verified operations, because of the number of livestock operators attending the informational sessions. MAEAP's additional verification phases increases the probability that the knowledge gained from the informational sessions is implemented.

Also, there was a decreased risk of phosphorus runoff on the high risk operations and nearly all operations were in cropland mass balance after they became MAEAP verified. Environmentally, MAEAP has had an impact, but on a small scale. Perhaps the addition of the Progressive Planning[3] initiative will involve more livestock producers in pollution prevention. As of December 31, 2005, there were 218 livestock producers that had signed up for this new initiative (Wilford, personal communication, January 2006).

[3] MAEAP Progressive Planning was introduced January 1, 2004 as a formal method to "enroll" in MAEAP, or begin the process of MAEAP verification. Each producer works with a partner to help act as a clearinghouse of information, assist in any resource needs, and answer any questions that arise during the verification process. A schedule is developed by the producer and his/her partner to assist the livestock producer in reaching specific goals to complete his/her CNMP and with the ultimate goal of becoming MAEAP verified.

Table 1: Annual Cost for Producers to become MAEAP Verified

	Beef	Dairy	Poultry	Swine	Total	CAFO	AFO
	2004 Dollars per Operation per Year						
Annual producer managerial cost	-8,952	7,348	54,504	1,867	11,078	19,338	1,048
Standard deviation	16,878	11,562	96,131	4,926	41,192	54,868	3,589
Annual producer capital investment cost	1,222	5,326	6,903	1,625	3,631	4,659	2,382
Standard deviation	670	5,748	6,881	2,864	4,960	5,554	3,968
Annual producer cost	-7,730	12,673	61,407	3,492	14,709	23,997	3,430
Standard deviation	16,885	12,345	99,596	4,381	43,182	57,204	5,089
Annual producer cost/ A.U.	2004 Dollars per Animal Unit						
Average	9.71	5.97	12.89	6.16	7.53	3.75	12.11
Standard Deviation	29.84	3.23	15.25	10.64	12.07	8.49	14.36
Minimum*		1.13	-0.31	-8.14	-24.74	-24.74	-8.14
Maximum		11.32	38.13	34.45	38.13	13.20	38.13
N	3	10	5	13	31	17	14

Table 2: Producer's Capital Investment Changes for MAEAP Verification, Cost per Year

Capital Investment Change	Beef	Dairy	Poultry	Swine	Total	CAFO	AFO
	2004 Dollars						
Manure storage	119	3,958	1,400	391	1,678	2,773	348
Equipment to spread manure	434	685	0	494	470	569	350
Drainage	211	250	0	21	110	163	45
Fences	0	76	0	191	105	191	0
Grass waterways	119	51	3	1	29	7	55
Gutters	126	33	0	1	23	18	29
Manure transportation	0	100	5,500	56	943	926	964
Buildings	91	4	0	460	203	3	447
Drives and berms	122	18	0	0	18	8	29
Buffers	0	150	0	6	51	1	112
Roofs	0	0	0	1	0	0	1
Producer's annual capital investment cost	1,222	5,326	6,903	1,625	3,631	4,659	2,382
N	3	10	5	13	31	17	14

Table 3: Producer's Managerial Changes Associated with MAEAP Verification, Cost per Year

Managerial Change	Beef	Dairy	Poultry	Swine	Total	CAFO	AFO
	2004 Dollars						
Recordkeeping labor	458	1,322	1,083	1,237	1,164	1,462	803
Crop consultant/TSP	188	2,470	495	806	1,233	1,801	544
Fertilizer bought (nitrogen)	-7,397	-5,550	11,000	-2,827	-1,918	-2,564	-1,132
Fertilizer bought (phosphorus)	-2,940	-1,381	0	-343	-874	-1,554	-48
Manure testing frequency	36	92	11	12	42	69	13
Spreading labor	584	3,130	530	677	1,435	2,393	273
Fuel use (hauling manure)	0	4,514	11,416	1,727	4,022	7,056	337
Insurance premium	-13	-101	-60	-43	-62	-88	-29
Soil testing frequency	0	602	308	142	304	453	122
Equipment usage costs	87	1,341	4,006	92	1,126	2,043	12
Supervision hours	0	451	432	231	312	482	106
Manure sold	0	0	-4,500	0	-726	-1,324	0
Feed additives or diet change	0	0	19,000	58	3,089	5,630	3
Energy & utilities	0	0	10,000	0	1,613	2,941	0
Producer's annual managerial costs	-8,952	7,348	54,504	1,867	11,078	19,338	1,048
N	3	10	5	13	31	17	14

Table 4: Total Cost-Share Received for MAEAP Verification

	Beef	Dairy	Poultry	Swine	Total	CAFO	AFO
Total cost-share	2004 Dollars						
Average	36,907	11,988	30,675	9,039	16,177	15,994	16,400
Total cost-share/A.U.	2004 Dollars per Animal Unit						
Average	405.98	9.26	9.22	26.69	54.96	7.10	113.07
N	3	10	5	13	31	17	14

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