Staff Paper

Understanding Citizen Complaints Regarding Michigan Agricultural Operations

J.C. Hadrich and C.A. Wolf

Staff Paper 2009-04 **April 2009**

Department of Agricultural, Food and Resource Economics
MICHIGAN STATE UNIVERSITY
East Lansing, Michigan 48824

Understanding Citizen Complaints Regarding Michigan Agricultural Operations

J.C. Hadrich and C.A. Wolf
Michigan State University
Agricultural Economics Staff Paper 2009-04

Corresponding author: J.C. Hadrich, Department of Agricultural, Food, and Resource Economics, Michigan State University, East Lansing, MI 48824-1039, hadrichj@msu.edu

INTRODUCTION

In 1981 enactment of the Michigan Right to Farm Act defined a set of generally accepted agricultural management practices (GAAMP) to provide agricultural producers with guidance on properly managing agricultural resources while considering environmental implications. The Michigan Right to Farm Program was created with the Michigan Right to Farm Act to provide a form of voluntary program support to help ensure agricultural producers were following specified environmental guidelines. In 1986 a complaint response program was initiated through the Right to Farm Program to address citizen complaints related to environmental concerns on Michigan agricultural operations. Under this program, inspections are completed on all farms receiving a complaint. Upon inspection completion, the complaint is classified as verified or non-verified. Verified complaints are those farm operations where a valid environmental concern was found and corrective practices were required to mitigate the complaint to regain nuisance protection from the Right to Farm Program. Non-verified complaints are instances where the farm was found to be in compliance with all specified GAAMPs, and hence no corrective practice is required. The complaint response program provides a source of data pertaining to the individual characteristics of those farms receiving complaints and the corrective practices required to mitigate them to regain nuisance protection provided by the Right to Farm Program. The objectives of this paper are to summarize Michigan Right to Farm Complaint Response data to determine the relationship between individual farm characteristics and citizen complaints and to examine the corrective practices required to mitigate verified complaints.

DATA

Environmental citizen complaint data were collected from the Michigan Department of Agriculture's Right to Farm Program for the period from October 1998 through December 2007 resulting in 1,309 observations. The reports detailed individual characteristics of the farm

inspected including: date of complaint and completed inspection, zip code and county of both complainant and livestock operation, type of livestock enterprise, herd size in animal units (AU)[1], type of manure storage, current manure analysis, soil tests, existence of comprehensive nutrient management plan (CNMP) or manure management system plan (MMSP) and whether either plan was under development or updating, manure incorporation, corrective practices implemented to respond to verified complaints, days required to implement corrective practices, and the number of follow-up inspections required to ensure corrective practices were implemented.

Environmental citizen complaints were categorized as relating to air, ground water, surface water, combination, or "other" complaints which include flies, dust, and pro-active complaints. Over the approximately ten year period examined, the most common complaint types were air (40%) and surface water (35%) which together accounted for 75% of all complaints (Table 1). Dairy producers (32%), beef producers (16%), and horse facilities (16%) received the largest share of complaints. Poultry operations received the lowest share of complaints (6%). Dairy and swine operations received the largest share of odor complaints. Similarly dairy, beef, and equine enterprises were the focus of the majority of surface water complaints.

[1] An "animal unit" is a metric of manure generation used to assess the size of operations across animal species. One animal unit was defined as: one feeder calf, heifer, or steer; 0.7 mature dairy cows (whether a milking or dry cow); 25 pigs weighing over 55 pounds; 0.5 horses; 10 sheep or lambs; 55 turkeys; 100 laying hens or broilers when the facility has unlimited continuous flow watering systems; 30 laying hens or broilers when facility has liquid manure handling system (MDA, 2008b).

Table 1. Number of Complaints by Complaint Type and Livestock Enterprise

	Complaint Type					
Livestock Enterprise	Odor	Ground-water	Surface Water	Combo*	Other	Total
Beef	41	19	121	16	9	206
Crops	45	9	26	6	12	98
Dairy	164	39	156	57	3	419
Equine	52	34	82	26	7	201
Poultry	37	4	8	11	13	73
Swine	105	6	20	17	3	151
Combination	23	5	30	10	3	71
Other	46	6	13	4	10	79
Total	513	122	456	147	60	1298

*Combo=Combination complaint

By complaint status 45% were classified non-verified and 55% were classified verified. Figure 1 presents the number of complaints by complaint status classification and livestock enterprise. Dairy, beef and equine farms received more verified complaints whereas as the reverse held for poultry and swine farms.

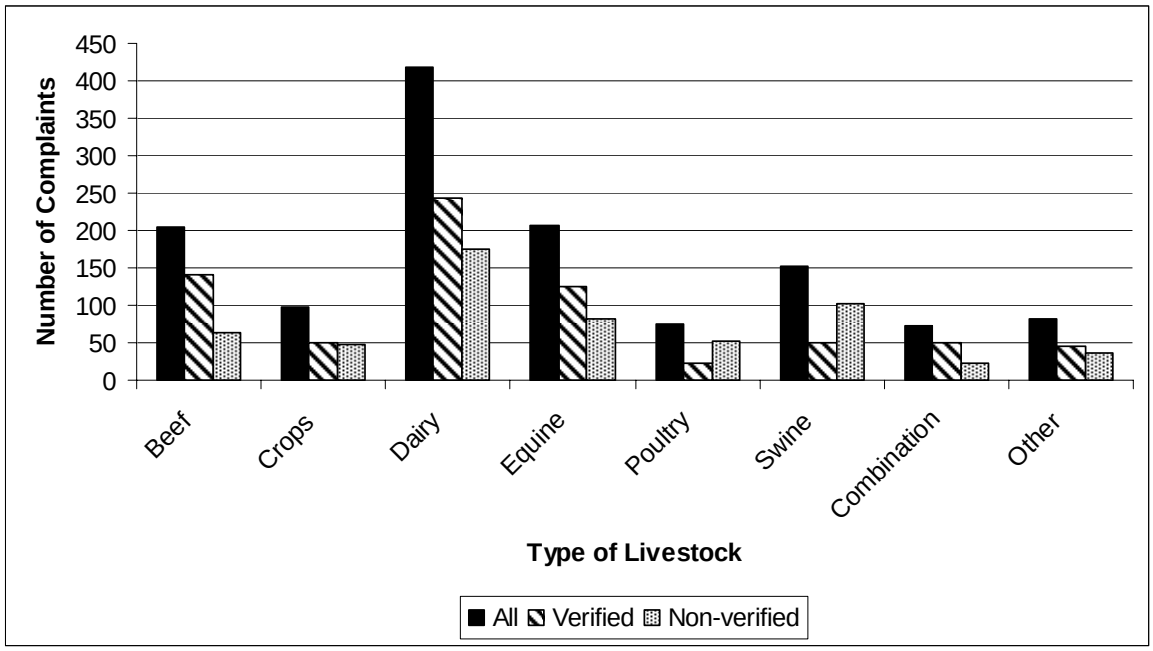

Figure 1. Complaint classification by livestock enterprise

Summary statistics were computed for animal units and farm acres across farms receiving a complaint and for each complaint classification (verified vs. non-verified) to allow for comparison across groups (Figure 2). The number of observations was not constant across variables since individual farm characteristics were not available for all farms. The average number of animal units (*AU*) across all farms receiving complaints was 548 AU. The average herd size for farms with verified complaints was 360 AU whereas farms with non-verified complaints had 820 AU. Average farm size (*acres*) followed a similar pattern with farm size being smaller for verified compared to non-verified complaints.

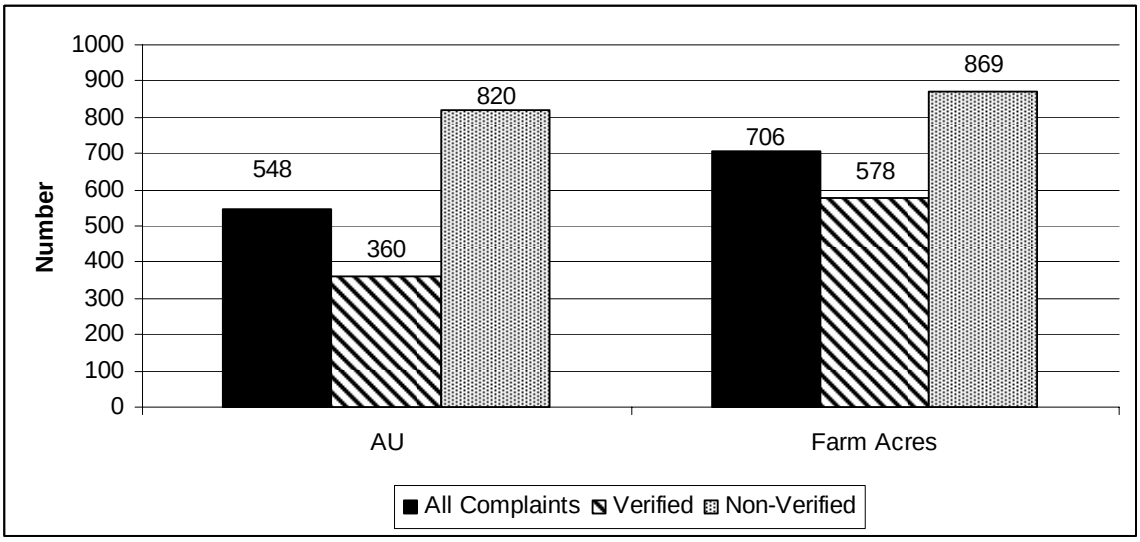

Figure 2. Average AU and Farm Acres across Complaint Classifications

Odor is not regulated in Michigan (or in most other states). However, the underlying issue(s) causing odor may be regulated. Air quality issues are typically handled through corrective measures such as incorporating manure into soil within forty-eight hours of application, limiting manure application on the weekends, or developing a manure management system plan in accordance with Michigan GAAMP standards.

The number of citizen complaints pertaining to odor was greatest during spring, summer and fall seasons (Figure 3). Neighbors and local community members tend to be more active outdoors during these seasons where odor may be more noticeable. Similarly, agricultural producers are outdoors preparing fields for planting in the spring, harvesting alfalfa and wheat crops during the summer, and harvesting other crops during the fall.

Surface water complaints were the most common complaint issued during winter. While spreading on frozen manure is highly discouraged in the GAAMPs, but allowable on soil with less than a six degree slope, applying manure may lead to potential surface water problems with frequent thaws during the winter months (Michigan Department of Agriculture, 2008b).

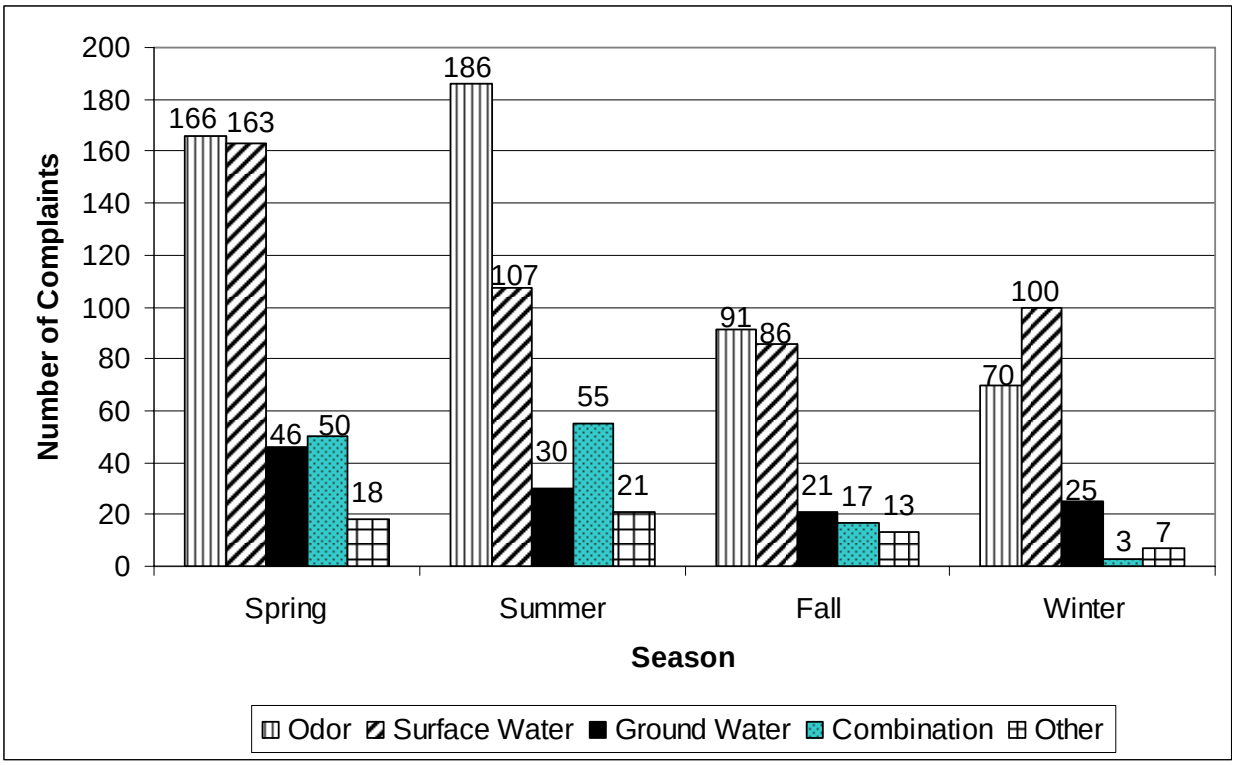

Figure 3. Number of complaints by season and complaint type

SUMMARY STATISTICS

In order to understand the relationship between individual farm characteristics and citizen complaints we must consider factors that may influence complaint classification. These items include complaint type, farm characteristics, county characteristics, and seasonal factors. Summary statistics of these variables are presented in Table 2.

Complaint type included odor, ground water, surface water, combination, and "other" complaints as defined previously. About forty percent of all complaints were odor complaints. Surface water complaints were also common (35%).

Farm characteristics included livestock enterprise, manure storage, animal units, and distance between complainant and farm. Distance between complainant and farm was represented as a dummy variable coded as one for those complainants that resided at a different zip code than the farm in question. It was hypothesized that complaints from other zip codes would more likely be verified since those complainants would be less likely bothered by nuisance issues. About half of the complaints were received from people with the same zip code.

Manure storage can be categorized into three groups. No storage meant the farm did not have manure storage requiring, in the case of dairy farms, hauling manure on a daily basis. Short-term storage was defined as manure storage for less than six months and included stockpiling on dirt and cement as well as manure stored in barns and lots. Long-term manure storage was defined as adequate for six months or more. Earthen and concrete manure pits as well as composting were examples of long-term storage for beef, dairy, swine, and poultry operations. Long-term manure storage for equine operations included stockpiling of manure. The most common type of manure storage on farms receiving complaints was long-term storage. Of course, this is highly correlated with operation size.

Livestock enterprise types were beef, crops, dairy, equine, poultry, swine, a combination of two or more groups, and “other” livestock. Crop complaints referred to fertilizer practices, soil erosion, and crop production practices. The “other” livestock category included complaints concerning by-products from fruit and vegetable processing, sheep, goats, deer, and elk. Dairy operations were by far the most common enterprise subject to complaint comprising almost one-third of all complaints. Equine, beef, and swine operations received significant percentages of complaints in descending order.

Seasonal factors and the year the complaint was issued were also available. About 70% of the complaints were received in the Spring and Summer months.

Table 2. Definition and Summary Statistics, All Complaints

Variable	Obs.	Mean Value	Std Dev.	Definition
Verified Complaint	1307	0.554	--	Verified complaint (0/1)
Complaint Type				
Odor	1297	0.396	--	Odor complaint (0/1)
Groundwater	1297	0.094	--	Groundwater complaint (0/1)
Surface water	1297	0.352	--	Surface water complaint (0/1)
Combination complaint	1297	0.113	--	More than one environmental concern issued in the complaint (0/1)
Other complaint	1297	0.045	--	Other complaints-flies, noise, dust (0/1)
Farm Characteristics				
Distance	1310	0.498	--	Zip code between complainant and farm is different (0/1)
AU	1097	548.4	1182.0	Animal units on farm (AU)
Days	646	172.4	166.6	Days used to implement corrective practices
Manure Storage				
No storage	1029	0.080	--	No manure storage (0/1)
Short-term	1029	0.245	--	Short-term manure storage (0/1)
Long-term	1029	0.490	--	Long-term manure storage (0/1)
Livestock Enterprise				
Beef	1310	0.157	--	Beef cattle (0/1)
Dairy	1310	0.320	--	Dairy cattle (0/1)
Swine	1310	0.116	--	Swine (0/1)
Equine	1310	0.158	--	Equine (0/1)
Poultry	1310	0.057	--	Poultry (0/1)
Crop	1310	0.075	--	Crops (0/1)
Other Livestock	1310	0.062	--	Goat, sheep, other livestock types (0/1)
Combination Livestock	1310	0.055	--	More than one livestock type (0/1)
Seasonal factors				
Spring	1310	0.340	--	Complaint issued in April, May, June (0/1)
Summer	1310	0.309	--	Complaint issued July, August, September (0/1)
Fall	1310	0.175	--	Complaint issued in Oct., Nov., Dec. (0/1)
Winter	1310	0.175	--	Complaint issued in Jan., Feb., March (0/1)
Year	1310	2003	2.6	Time trend (years)

FACTORS RELATED TO VERIFIED COMPLAINTS

Following the summary of all complaints, we consider the common factors between verified and non-verified complaints. As shown in Table 3, 73% of surface water complaints

were classified as verified. Fifty-seven percent of odor complaints were classified as non-verified whereas the majority of groundwater and combination complaints were classified as verified. Complaint types that could be visually observed, for example waste run-off from a surface water complaint, were more likely to be verified than odor complaints. We suspect that most Michigan citizens were unaware that there were no explicit odor regulations pertaining to livestock operations.

Table 3. Complaint Classification by Complaint Type

	Complaint Type					
Complaint Classification	Odor	Ground water	Surface Water	Combo*	Other	Total
			Number			
Non-verified	294	56	124	57	39	570
Verified	218	65	331	90	20	724
Total	512	121	455	147	59	1,294

*Combo=Combination Complaint

We expected a large percent of verified complaints to be on farms using no manure storage or short term storage (Table 4). However, 48% of the verified complaints were on farms using long-term manure storage. Long-term manure storage was defined as adequate storage greater than six months, but also included up stockpiling of manure for equine operations. Of the 504 verified complaints using long-term storage, 88 were equine operations (~18%).

Table 4. Complaint Classification by Manure Storage Type

Complaint Classification	No Storage	Short-term Storage	Long-term Storage	Total
		Number		
Non-verified	28	192	219	439
Verified	53	252	285	590
Total	81	444	504	1029

Swine and poultry operations had less verified complaints than non-verified (Table 5). Swine operations with a verified complaint housed 601 AU whereas those swine operations with a non-verified complaint housed 947 AU. Poultry operations had 918 AU and 2,547 AU with a verified and non-verified complaint, respectively. Non-verified complaints were found on larger confinement operations which indicate these operations were following specified management practices. Odors generated by swine and poultry may be more objectionable than cattle or horse operations resulting in a larger number of nuisance (non-verified) complaints.

Table 5. Complaint Classification by Enterprise Type

	Livestock Enterprise								
Complaint Classification	Beef	Crops	Dairy	Equine	Poultry	Swine	Combo	Other	Total
	Number								
Non-verified	64	48	176	82	52	103	22	36	583
Verified	140	50	243	124	23	49	50	45	724
Total	204	98	419	206	75	152	72	81	1307

The average number of animal units (AU) was 820 AU for non-verified complaints and 360 AU for verified complaints (Table 6). This seems surprising since large animal operations appear to be the focus of many environmentally related controversies. Michigan Department of Agriculture's Site Selection GAAMPS require new and expanding operations to complete an intensive site selection review which can identify potential manure management concerns to prevent future citizen complaints. However, this site selection can not prevent nuisance complaints.

Table 6. Complaint Classification by Animal Unit Level

	Percentile (%)				
Complaint Classification	10	25	50	75	90
	Animal Units (AU)				
Non-verified	2	8	115	960	2,444
Verified	3	14	64	360	890

Sixty percent (395 of 605) of verified complaints were issued by complainants who were not located in the same zip code as the farm.[2] This may indicate that people passing by are more likely to call only when noticing a potentially serious violation. Or it may indicate a hesitation on the part of neighbors to report others in close proximity with whom they are likely to have future interaction.

Complaints issued during the Fall were more likely non-verified (Table 7). Complaints issued in the spring, summer and were winter were more likely verified. People tend to be more active during the Spring and Summer creating opportunities for complaints. During Fall months farmers are harvesting crops and often incorporating manure shortly after harvest, a practice which would decrease the likelihood of a verified complaint.

Table 7. Complaint Classification by Season

	Complaint Type				
Complaint Classification	Spring	Summer	Fall	Winter	Total
	Number				
Non-verified	196	187	119	81	583
Verified	248	218	111	147	724
Total	444	405	230	228	1,307

Population density, the number of farms, median household income, and percent of the county population with a high school level education or higher at the county level were not found to vary much for non-verified versus verified complaints (Table 8).

[2] Only 605 of the 1,307 observations reported a zip code for both the complainant and farm.

Table 8. Complaint Classification by County Level Characteristics

	Percentile (%)					
Count Characteristics	10	25	50	75	90	Average
Population density			people/mile^2			
Non-verified	46	78	126	260	435	212
Verified	42	75	126	271	503	240
Farms			Number			
Non-verified	478	808	1139	1291	1446	1036
Verified	395	877	1139	1260	1446	1020
Household Income			$			
Non-verified	34,704	37,262	41,264	45,813	52,374	42,474
Verified	34,704	37,218	40,774	45,980	52,374	42,350
High School Educ.			%			
Non-verified	78.7	81.2	83.2	86.6	89.0	83.6
Verified	78.6	81.2	83.1	86.1	89.2	83.3

CORRECTIVE PRACTICES

Corrective practices were required for those farms with a verified complaint. Corrective practices included developing a manure management system plan (MMSP) or a more formal comprehensive nutrient management plan (CNMP), soil analysis, manure analysis, incorporating applied manure, manure stockpile utilization, installing stream bank fencing, and controlling waste run-off. Completing and filing an MMSP or CNMP entails submitting an official document outlining manure production, utilization, and application on the farm.[3] Manure stockpile utilization required the farm to remove manure stockpiles either through manure application or disposal through other arrangements, such as potentially giving it away to neighboring farms. Installing stream bank fencing included controlling water access for

[3] A MMSP must be filed with the Right to Farm Program for AFOs. Soil and manure analysis are needed as well as a formal document outlining manure management. CNMP are a requirement for the National Pollution Discharge Elimination System for CAFOs. CNMP must be certified whereas MMSP do not require certification.

livestock near lakes, rivers, and streams. Controlling waste run-off required the farmer to install appropriate waste storage for manure as well as milk waste water for dairy operations.

Table 9 displays corrective practices implemented to mitigate verified complaints across all livestock enterprises. Dairy and swine operations were most often required to develop a MMSP whereas equine and "other" livestock operations were frequently required to remove stockpiled manure. "Other" livestock groups were typically small farms (less than 10 acres) with goats or sheep who typically did not have a large land base on which to dispose of manure. In Michigan, beef cow and feeder operations typically use a pasture-based system. Over fifty percent of beef operations with verified complaints were required to install stream bank fencing indicating Michigan's increased efforts to exclude livestock from waterways. Cropping operations were most commonly required to provide soil analysis and install vegetative buffers to prevent waste run-off.

Table 9. Corrective Practices Required to Mitigate Verified Complaints

	Beef	Crops	Dairy	Equine	Poultry	Swine	Comb.[1]	Other
Corrective Practice				Percent (%)				
Soil analysis	11.54	37.21	14.22	17.86	31.82	22.92	0.00	30.30
MMSP	19.23	4.65	47.25	18.75	31.82	43.75	28.57	9.09
CNMP	0.77	2.33	3.21	0.89	9.09	4.17	2.38	0.00
Manure incorporation	2.31	6.98	14.68	4.46	13.64	18.75	4.76	12.12
Stockpile utilization	4.62	13.95	1.38	22.32	9.09	0.00	16.67	39.39
Stream bank fencing	53.08	0.00	10.09	16.07	0.00	4.17	30.95	3.03
Vegetative buffer	3.85	32.56	1.83	13.39	0.00	2.08	9.52	3.03
Control run-off structure	4.62	2.33	7.34	6.25	4.55	4.17	7.14	3.03

[1]Comb.=Combination livestock

CONCLUSIONS

We evaluated the relationship between citizen complaints, livestock production characteristics, and county level characteristics on Michigan farms. Farms that received surface water and combination complaints as compared to odor were more likely to have a verified complaint. In contrast an increase in the number of animal units decreased the probability of a verified complaint. Larger operations continue to receive increased public attention due to their size while the results of the analysis demonstrate larger operations are following specified management guidelines.

References

Hadley, G., S. Harsh, and C. Wolf. "Managerial and Financial Implications of Major Dairy Farm Expansions in Michigan and Wisconsin." *Journal of Dairy Science* 85,8(August 2002):2053-2064.

Michigan Information Center, State Budget Office. "Estimates Population of Michigan Counties, 1990-1999." April 2000.

Michigan Department of Agriculture. Michigan Commission of Agriculture. "Generally Accepted Agricultural and Management Practices for Site Selection and Odor Control for New and Expanding Livestock Production Facilities." March 2008a.

_____. Michigan Commission of Agriculture. "Generally Accepted Agricultural and Management Practices for Manure Management and Utilization." March 2008b.

United States Census Bureau. State Population Datasets-County Population Datasets. 1997, 2002. Online. Available at http://www.census.gov/popest/datasets.html. [Accessed December 2007.]

United States Department of Agriculture. U.S. Census of Agriculture. State and County Reports. 1997, 2002. Online. Available at http://www.agcensus.usda.gov/. [Accessed December 2007.]

United States Department of Agriculture-National Agricultural Statistics Service (USDA-NASS). 2007 Equine Survey Summary. NR-08-04, Lansing, MI, January 2008.