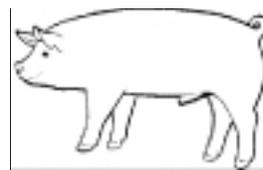




**MSU**

# Pork Quarterly



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## **USDA Surveillance of Animal Handling at Auction and Processing Facilities**

Dr. Glynn Tonsor, Dept. of Agricultural, Food, and Resource Economics

As noted in prior Pork Quarterly issues, Drs. Glynn Tonsor and Christopher Wolf at Michigan State University have been conducting research examining an array of issues underlying animal handling and welfare pressures facing the livestock industry. This short note highlights resident preferences for governmental surveillance of animal handling at auction markets and processing facilities in the U.S. based upon an online survey completed by 2,001 U.S. residents in November 2008.

This issue is of particular importance following, the high profile incident initiated on January 30, 2008 when the Humane Society of the United States (HSUS) released an undercover video of downer cows being (mis-)handled at the Westland/Hallmark processing plant in Chino, CA. This controversial event led to the largest meat recall in history and spurred both the USDA and HSUS to each call for the livestock industry to completely ban the slaughter of non-ambulatory cattle that go down after initial governmental inspection. The Westland/Hallmark event also triggered USDA to investigate their entire meat inspection service system, including consideration of creating a separate entity for food safety and adjusting surveillance procedures to increase the amount of time devoted to animal handling activities.

In our survey, the majority (77%) of residents indicated they would vote for a referendum expanding USDA surveillance of auction and processing facilities. However most (62%) removed support once explicitly encountered with tax implications of the referendum. This stark reversal of responses may suggest that residents believe additional surveillance should be achievable given their current tax situation. Alternatively, this may suggest residents generally believe enough surveillance exists, but that in an environment of “free voting” they are willing to support additional surveillance. Nonetheless, responses to the initial question reflect actual referendum voting environments typically characterized by no explicit mention of costs, suggesting such a referendum would likely pass if raised.

Besides estimating aggregate public support and the corresponding implications of removing a “voting is free”  
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perception from voters' minds, it is important to consider the type of individuals most supportive of such a referendum. Females, lower income households, and individuals consuming more meals without meat or eggs appear willing to pay (WTP) more (higher taxes) to support additional USDA surveillance. Moreover, individuals perceiving consumer groups (i.e., HSUS) to provide accurate animal welfare information are more WTP for additional surveillance. Conversely, those viewing livestock industry groups to provide accurate animal welfare information are less WTP. This difference in information perception impacts documents the need for the livestock industry to provide correct information trusted and believed by the public, as well as the inherent importance of "relative accuracy" the public sees in industry and consumer group information on animal welfare issues.

Individuals interested in additional information on these survey findings or related issues currently being examined in ongoing research are encouraged to contact Dr. Tonsor (gtonsor@msu.edu).

### **Environmental Stewardship of Dairy Producers in MAEAP**

Dr. Abdul Abdulkadri and Dr. Steve Miller, Center for Economic Analysis, Dept. of Agricultural, Food and Resource Economics

Dr. Sandra Batie and Dr. Satish Joshi, Dept. of Agricultural, Food and Resource Economics

**Editor's note: This articles discusses the survey results of livestock producers regarding their participation in MAEAP**

Most livestock farmers are aware of the growing interests shown by stakeholders such as regulators, food processors, consumers, neighbors and environmental activists in their operations, and many are themselves making environmental stewardship a high priority in the management of their operations. Results from a recent survey of dairy farmers in Michigan by the Michigan State University Extension Dairy Team (1) suggest that Michigan dairy producers are proactive about their environmental stewardship and are interested in demonstrating this stewardship to government entities and others. The results also indicate a willingness of producers to seek information on improved environmental stewardship practices as well as on current environmental regulations. One avenue to achieve these priorities is through participation in the Michigan Agriculture Environmental Assurance Program (MAEAP).

This article presents the results of a survey of Michigan livestock producers who participate in MAEAP. The article shows that MAEAP-verified dairy producers identified tangible benefits to their operations as a result of participating in MAEAP. Our findings offer insights for the realization of the dairy industry's priorities as they relate to environmental stewardship and regulation and provide evidence that suggests that these priorities are achievable when producers are MAEAP-verified.

#### **MAEAP**

MAEAP is a voluntary program that affords farmers the opportunity to be proactive about their environmental stewardship. It provides education and on-farm risk assessment in order to equip the farmer to implement an approved management plan to address identified risks. MAEAP covers livestock, farmstead, and cropping systems and most producers participating in MAEAP strive to become MAEAP-verified. For livestock systems, MAEAP verification is attained after an independent farm inspection to confirm that the producer is following and implementing their individually approved Comprehensive Nutrient Management Plan or CNMP (2). Currently there are 209 MAEAP-verified livestock producers. Of these, 112 also hold a Michigan Department of Environmental Quality (MDEQ)/National Pollutant Discharge Elimination System (NPDES) permit because

they are Concentrated Animal Feeding Operations (CAFOs).

### **Results of MAEAP Survey**

As part of an ongoing research study at Michigan State University (MSU), a pilot survey of MAEAP-verified livestock (dairy, beef, hogs, poultry/turkeys, sheep/goats, and horses) producers was carried out in the summer of 2008. This survey sought to gather information on producers' motivation for participating in MAEAP and the benefits they derive from participation. The findings of this survey offer insights into the attainment of the dairy industry priorities as they relate to environmental stewardship and regulation. These findings are summarized in this article.

Survey questionnaires were mailed to 197 MAEAP-verified livestock producers and 49% returned completed surveys. A total of 95 surveys were usable in the data analysis.

Twenty-two percent of the respondents (21 farmers) had dairy operations. These 21 dairy operations ranged in size from 40 to 5000 dairy cows with 43% of them having an inventory of 500 or more dairy cows. Only 28% of dairy producers in the sample indicated that they currently operate under a MDEQ/NPDES permit for CAFOs compared to 52% of non-dairy livestock producers who so indicated.

Respondents were asked to rate different factors in terms of how important they are in their decision to participate in MAEAP. Factors listed on the survey, relating particularly to environmental stewardship or regulation, included the following:

- ensuring that my farm attains environmental standards for future generations
- desire to farm in an environmentally-friendly manner
- conforming to current regulatory standards so farm can remain in agriculture for the future
- prefer to be involved in a voluntary program now rather than wait for potential future regulations
- neighborhood concerns or pressure

The percentages of dairy producers and other livestock producers who rated each of these factors as being important or very important in their decision to participate in MAEAP were compared. In all cases, the proportion of dairy producers who were motivated by each of these factors was not statistically significant from that of other livestock producers. All surveyed dairy operators felt that it is important or very important for them to participate in MAEAP in order to ensure that their farm attains environmental standards for future generations. Similarly, all surveyed dairy operators felt that it is important or very important for them to participate in MAEAP because of their desire to farm in an environmentally-friendly manner. Respondents also attached a high level of importance to MAEAP participation in helping them to conform to environmental regulations for the future success of their farm operation.

The need to communicate effectively with the legislature and government agencies featured prominently among the top priorities of Michigan dairy producers on an earlier survey (1). In a similar manner, opinions of MAEAP-verified livestock producers were sought on the current survey, as to the effectiveness of MAEAP

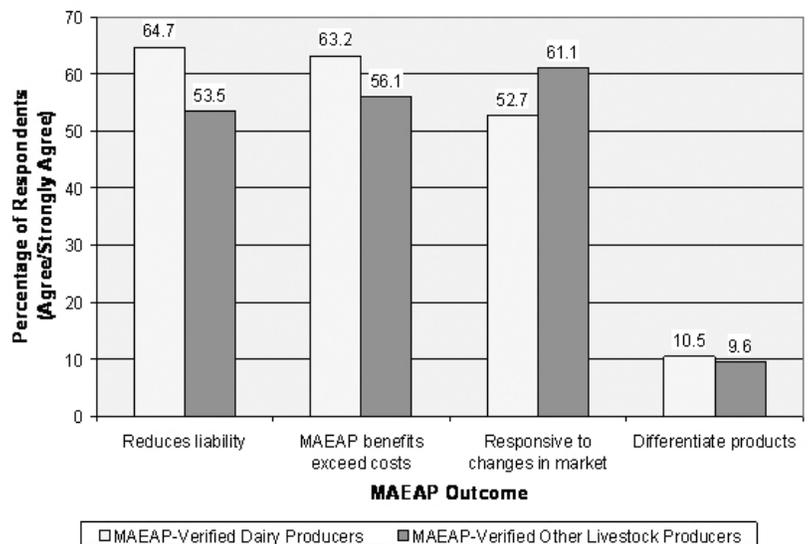


Figure 1. Short-term Benefits of MAEAP Participation

(Continued on Page 4)

participation in communicating that live-stock producers are responsible stewards of the environment to different stakeholders including the state legislature, Michigan Department of Agriculture (MDA), MDEQ, food processors, environmental activists and farmers' neighbors. Again, the percentages of dairy operators and other livestock operators who agreed or strongly agreed that "MAEAP participation is effective in communicating that livestock producers are responsible stewards of the environment" were compared. In general, high proportions of dairy producers and other livestock producers, respectively, who were surveyed, agreed or strongly agreed that MAEAP participation is effective in conveying to the MDA (89% vs. 95%) and the state legislature (78% vs. 79%) that they are responsible stewards of the environment, although there is a wide gap between the proportion of dairy producers (67%) and other livestock producers (78%) who thought that MAEAP is effective in communicating their environmental stewardship to their neighbors. On the other hand, greater proportions of dairy producers than other livestock producers thought that MAEAP participation is effective in conveying their environmental stewardship to MDEQ (61% vs. 41%) and environmental activists (37% vs. 28%). Just about half of dairy and other livestock producers thought that MAEAP is effective in conveying to food processors that they are responsible stewards of the environment.

Several statements on potential benefits of MAEAP were listed on the survey instrument and respondents were asked to indicate their level of agreement with these statements. A sample of these statements, relating to either short-term or long-term benefit of MAEAP, is as follows:

**Short-term Benefits**

- MAEAP reduces my liability if there is an environmental accident on my farm.
- The benefits of MAEAP participation exceed the costs for my farm.
- MAEAP participation will allow me to be responsive to changes in the market for livestock products dictated by environmental concerns.
- MAEAP participation is helping me to differentiate or brand my products in the marketplace.

**Long-term Benefits**

- Due to my participation in MAEAP, I have made changes to my livestock operation that protect the environment.
- Due to my involvement in MAEAP, I can better manage my farm for environmental and regulatory matters.
- By being a MAEAP participant, I will be more prepared for any future regulatory changes.
- The existence of MAEAP may help preempt future regulation of livestock producers.

Figure 1 shows the results for surveyed dairy producers and other livestock producers for the four statements pertaining to short-term benefits. The difference in the percentages of respondents between the two groups who agreed or strongly agreed with each of the statements was not statistically significant. There was low agree-

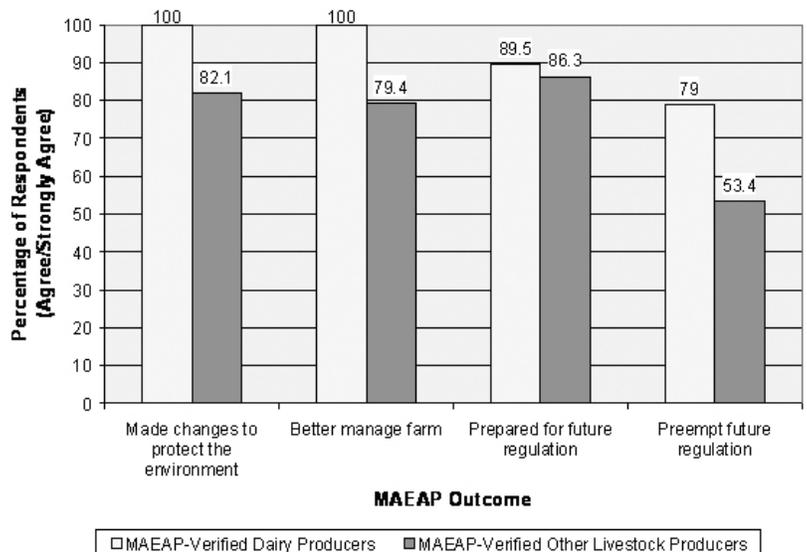


Figure 2. Long-term Benefits of MAEAP Participation

ment among producers on the statement about MAEAP participation helping producers to differentiate or brand their products in the market place; on the other hand, more than 50% of dairy and other livestock producers surveyed were in agreement that MAEAP reduces their liability if there is an environmental accident on their farm, that the benefits of MAEAP participation exceed the costs for their farm, and that MAEAP participation will allow them to be responsive to changes in the market for livestock products dictated by environmental concerns. Figure 2 shows a clearer and statistically significant distinction between dairy producers and other livestock producers on their perception of the long-term benefits of MAEAP. All dairy producers agreed or strongly agreed that, due to their participation in MAEAP, they have made changes to their operations that protect the environment compared with 82% of other livestock producers who did. Similarly, all dairy producers agreed or strongly agreed that due to their involvement in MAEAP, they can better manage their farm for environmental and regulatory matters compared to 79% of other livestock producers who so indicated. A higher percentage of dairy producers (79%) compared to other livestock producers (53%) agreed or strongly agreed that the existence of MAEAP may help preempt future regulation of livestock producers. Only on the issue of farmers being more prepared for any future regulatory changes did similar proportions of dairy (90%) and other livestock (86%) producers agree or strongly agree that MAEAP participation will enable them to be prepared.

### **Conclusions**

Results of the MAEAP pilot survey indicate that all surveyed MAEAP-verified dairy producers were motivated by the need to ensure that their farm attains environmental standards for future generations and by the desire to farm in an environmentally-friendly manner. In addition, high proportions of surveyed MAEAP-verified dairy producers agree that MAEAP participation is effective in communicating that they are responsible stewards of the environment to the Michigan Department of Agriculture and the Michigan Department of Environmental Quality as well as the Michigan state legislature. These desires for environmental stewardship and farm viability as well as a realization of active interaction with government agencies match the priorities identified in the 2008 Michigan dairy industry survey (1). Our results also provide evidence that MAEAP-verified dairy producers perceive benefits that are long-term in nature. Such long-term benefits include producers making changes in their dairy operation that protect the environment and acquiring improved management skills resulting in better environmental management of their farms. Therefore, participating in MAEAP provides potential for dairy producers to achieve their industry priorities relating to environmental stewardship.

### **Acknowledgements**

The MAEAP pilot survey was funded by the Elton R. Smith Endowment in the MSU Department of Agricultural, Food and Resource Economics. We wish to thank livestock producers who participated in the survey, Jan Wilford, Natalie Rector, Dale Rozeboom, Wendy Powers and Gary Trimmer.

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**This article first appeared in the January 2009 issue of the Michigan Dairy Review.**

## How Much “Root Zone” is Needed for Livestock Nutrients?

Dr. Dale Rozeboom and Dr. David Beede, Michigan State University Specialists

Mass balance is the balance between the inputs and outputs within a system. In manure management, phosphorus mass balance is used to estimate the acres of land or the amount of “root zone” needed to use livestock manure nutrients. Simply, P balance = P imported – P exported. Environmental risk to surface and ground waters is increased if the amount of P brought onto the farm (e.g., from fertilizers, feed, and animals) exceeds the amount of P leaving the farm (e.g., crops, animals, manure, or animal products such as milk, meat, eggs, and fibers). Mass balance estimates shown in the table below were derived using standard diets, animal performance, and 50 lbs. /A. P<sub>2</sub>O<sub>5</sub> crop removal. Estimates do vary among farms.

Table 1. Examples of phosphate (P<sub>2</sub>O<sub>5</sub>) excretion and land bases needed for various livestock enterprises per 1000 head of production.

Livestock Enterprise	Pounds P <sub>2</sub> O <sub>5</sub> Excreted	Acres needed
Growing-Finishing Beef	17,500	350
Horses	22,000	440
Lactating Dairy Cows	86,000	1,720
Dairy Heifers	27,000	540
Laying Hens	1,200	24
Cow-Calf Beef	48,000	960
Sheep	13,500	270
Swine Breeding Herd with phytase	37,000	740
Swine Growing-Finishing with phytase	3,600	72
Turkeys with phytase	1,300	26

Farms may consider moving manure off site, but when not feasible, potential feeding strategies to reduce needed land base include:

- Diets should be formulated based on “available P.” Pigs and birds are able to absorb only part of the P in feeds. Grains for swine and poultry can vary from 14 to 50% available P whereas over 90% of P is available in cattle and sheep feeds due to microbes in the rumen.
- Formulate rations to meet the animal’s P exact requirements for maintenance, lactation, growth and pregnancy. For lactating dairy cows, 1 gram of P for each pound of milk produced generally is sufficient and is fed when dietary P ranges from 0.32 to 0.38% (dry matter basis).
- Routinely complete laboratory analyses of feeds and rebalance rations.
- Cattle rations may not need P supplementation to meet the animals’ requirements. Discontinuing P supplementation may reduce land base by 25 to 50% (depending on the amount of over-supplementation in the original feeding program).
- If typical rations (corn silage, soybean meal, alfalfa, and corn grain) contain more P than needed to meet requirements, and if land base is limiting, alternative feedstuffs should be considered. The cost of using alternative feedstuffs may be less than the cost of using common “least-cost” feeds and managing excess manure P.
- Phytase in corn-soybean meal based-diets for swine and poultry increases the P availability so that 25 to 35% less total P is required in the feed.

- Pellet and reduce the particle size of rations to increase the efficiency of P use by pigs and poultry by 5 to 10%.
- Formulate rations for specific production phases, genotypes and gender. “Phase-feeding” programs for growing swine and lactating dairy cows can reduce P by 5 to 10%.

Visit [www.rootzone.msu.edu](http://www.rootzone.msu.edu) for more details on P ration reduction strategies.

This article first appeared on the Michigan State University Animal Agriculture and the Environment Website ([www.animalagteam.msu.edu](http://www.animalagteam.msu.edu)).



Reducing phosphorus in rations reduces land base requirements for manure applications.



## Swine Management Program in the Institute of Agricultural Technology

### Accepting Applicants

Ashley Bushman, Dept. of Animal Science

Certificate programs offered through the Institute of Agricultural Technology (IAT) at Michigan State University provide students with practical training in on-campus courses and off-campus internship experiences. Several off-campus programs are offered in conjunction with community colleges around the state. The Swine Management program is two semesters in length and begins during the fall semester. They allow men and women the opportunity to specialize in the area of swine management with a one-year intensified program.

Students enrolled in the swine management program will develop a greater knowledge of swine enterprise management. The program includes a clerkship requirement which provides a thorough “hands-on” experience with members of farm staff to accomplish day-to-day, standard procedures. The swine clerkship at the MSU Swine Teaching and Research Center is designed to develop skills in modern swine production. In addition to clerkship, students are required to complete courses with faculty and staff in the Department of Animal Science and a variety of elective areas.

Learning goes beyond the classroom and the clerkship for the swine management students as they participate in internships. Internships are a form of placement training, compelling students to apply what they have learned in the classroom and through clerkships. They must interact with talented and experienced people in their field, from whom they continue to learn. Internships are an extremely valuable portion of the Ag Tech programs, providing students with the opportunity to broaden their knowledge of the swine industry, along with development of professional skills. In addition, the internship experience earns the students credit toward their certificate.

For admission to the Institute of Agricultural Technology ([www.canr.msu.edu/agtech](http://www.canr.msu.edu/agtech)), contact the office in 120 Agriculture Hall, East Lansing, MI, 48824, or call (517) 355-0190. Admission is determined by the Institute. You may also contact Ms. Ashley Bushman, Coordinator of the Swine Management Program, at (517) 432-1389 or via e-mail at [bushmana@msu.edu](mailto:bushmana@msu.edu). Additional information can be obtained on the Department of Animal Science website ([www.canr.msu.edu/dept/ans/index.html](http://www.canr.msu.edu/dept/ans/index.html)) at Michigan State University.



## Carbon Market Opportunities for Agriculture

Dr. Dave Beede, Dept. of Animal Science

Dr. Wendy Powers, Depts. of Animal Science and Biosystems and Agricultural Engineering

Carbon credits generated by agriculture are a relatively new commodity. They are generated on the farm by using management practices that reduce emissions of greenhouse gases (GHG; such as methane, nitrous oxide and carbon dioxide). Carbon credits generated on a farm are measured and verified, typically by an independent third-party verifier. They are sold in markets to other businesses as a means of offsetting environmental pollution created in their manufacturing processes.

A carbon credit is a metric ton (2,204 pounds) of carbon dioxide equivalent (CO<sub>2</sub>e). It is the currency for trading of GHG emissions that are reduced, destroyed (e.g., burned), removed from the air or never produced. Carbon markets have been established because GHG polluters either voluntarily (as in most of the United States currently) or through mandatory legislation (e.g., cap-and-trade laws) purchase carbon offsets to enable them to emit in excess of their defined cap limits. Cap-and-trade legislation and carbon markets have existed in Europe and other countries for years. Though there is no national cap-and-trade system currently in the United States, California recently instituted a state cap-and-trade system.

Primary goals of carbon markets are to reduce GHG emissions using an organized, competitive, market-driven mechanism that, over time, reduces the absolute quantity of GHG emissions. Demand for carbon offsets occurs when a cap-and-trade system and/or a carbon tax is implemented. Also, while carbon trading is going on among sellers and buyers, polluters are required by legislation to reduce absolute emissions over time.

Currently carbon credits from agriculture can be generated by carbon sequestration in trees (forests), tillage practices or capture of methane in anaerobic digesters. Methane it can be flared off to produce carbon dioxide (which is 21 times less potent as a GHG than methane), used to generate electricity, or, cleaned and compressed to natural gas to produce power or heat. Other potential practices to reduce carbon emissions and produce carbon credits are being researched (e.g., reduction in digestive tract methane production by ruminants).

The market price for carbon offsets depends on demand. In June 2008, carbon offsets were worth about \$7.50 per metric ton of CO<sub>2</sub>e on the Chicago Climate Exchange. In December 2008, the market price was just over \$1 per metric ton. When a federal cap-and-trade system is implemented and demand for offsets increases, U.S. prices are projected to increase to \$10 to \$12 per metric ton by 2012, \$20 by 2020 and \$45 by 2030 as markets develop.

A farm manager who wants to develop a system to generate and sell carbon credits can work with a carbon broker or aggregator who understands carbon markets. A broker also facilitate on-farm measurement of credit generation, third-party verification, and bundling of credits from several farms to help market carbon credits.

Carbon markets provide a financial opportunity to adopt conservation and mitigation technologies and practices to reduce GHG. They also offer some agricultural businesses the potential to generate revenue and to help compensate for additional on-farm costs associated with voluntary and/or future mandatory air quality improvements and energy management.

**This article first appeared on the Michigan State University Animal Agriculture and the Environment Website ([www.animalagteam.msu.edu](http://www.animalagteam.msu.edu)).**

## PRRS Regional Elimination Project – Michigan

Dr. Barbara Straw, Extension Swine Veterinarian, Michigan State University

Allegan and Ottawa counties are one of the intensive swine raising areas of Michigan. Given the intense production in a relatively small geographical area, similar to other areas of intensive swine production, these farms have had to deal with recurrent PRRS infections. Yet this area, because of a unique combination of regional barriers (both natural and man made) and a history of producer cooperation holds promise for the elimination of the disease.

MSU Extension and veterinary practitioners in the area have received a USDA PRRS CAP2 grant to undertake a PRRS Regional Elimination Project in this area. This grant will cover testing to determine herd status and also provide support for veterinary assistance in developing herd stabilization and elimination plans.

A unique feature of this area is the existence of substantial natural and man-made barriers. To the west (the direction of the prevailing wind) is Lake Michigan. To the south is the Allegan State Forest and to the east is a large urban area (Grand Rapids). These barriers serve to isolate these counties from outside infection.

### Goals of the project

- Document the prevalence and severity (reflecting any on-going outbreaks) of PRRS infection in the area
- Compare strains of PRRSV to detail the source of infection for herds – whether from the sow herd supplying pigs or regional spread
- Assist producers to stabilize and then eradicate PRRS from breeding herds.
- Facilitate communications among participants and provide a forum for sharing current program progress.

This project will begin in April, 2009. Producers in these counties have been contacted to participate in this venture. If you as a producer have not been contacted please contact one of the following persons: Barbara Straw, 517-432-5199, straw@cvm.msu.edu; Jerry May, 989-875-5233, mayg@msu.edu; Beth Franz, 269-445-4438, franzeli@msu.edu.

## At What Age Should Gilts be Exposed to Boars?

Ronald O. Bates, State Swine Specialist, Michigan State University

### Introduction

Much of the work determining age in puberty in gilts was completed decades ago. Since that time pigs have become leaner and later maturing. However, much of the research regarding attainment of puberty has not been repeated to determine how onset of puberty may have changed over time. Recently a large study (Amaral Filha et al., 2009) evaluated gilt age at initial boar exposure in relation to attainment of puberty.

### Study Description

This study was completed during a start-up of a 2,400 sow farm in Brazil. Gilts were delivered to the farm in approximate 200 head lots, with 12 groups delivered to the farm. Eight of those groups, 1,486 gilts, were included in this study. Gilts were PIC Camborough 22® crossbreeds. Ambient temperature during this study ranged from 86-97° F for day-time highs and 45-65° F for overnight lows. When temperature within the barn reached 77° F, a cooling regimen that included increased ventilation and misting was initiated. Within 3 days of delivery, gilts were weighted and backfat was measured. Gilt age at delivery was 147 ± 8.3 days. Estrous de-

tection commenced within the first 5 days after delivery. The first observed estrus after delivery was designated as a gilt's pubertal estrus. Estrous detection continued after gilts attained their first observed estrus to determine their recycling rate. Gilts were classified by age at delivery into two groups, Younger (130-149 days of age) and Older (150-170 days of age), and within each age group, growth rate, calculated as weight per day of age (WDA) was classified into three different groups (Table 1).

### **Results**

There was an age at puberty difference due to gilt age at initiation of boar exposure (Table 1). Gilts that began boar exposure at a younger age did have a younger age at puberty (162.2 days of age) than gilts that were older at first boar exposure (172.3 days). Within the younger age boar exposure group, there was a difference in age at puberty dependent on the gilt's growth rate classification. Gilts that were faster growing were approximately 3.5 days younger at puberty than gilts that were intermediate or slower growing. However age at puberty was not influenced by growth rate among gilts that were approximately 20 days older when boar exposure first began.

There was a difference in synchrony of estrous achievement dependent on age at when boar exposure began. Within the first 10 days of boar exposure, 44.5% of the gilts that were 150 to 170 days of age at first boar exposure were observed in estrus, compared to 30.9% of gilts that were 130 to 149 days old at first boar exposure. There was a difference in synchrony of estrus due to growth rate classification among gilts that were exposed to boars at 130-149 days of age. Among faster growing gilts, 38.1% were observed in heat compared 28.5% of those that were classified as intermediate or slow growing.

This difference in attainment of estrus persisted through 30 days of estrous detection. For gilts that were 150-170 days old at first boar exposure, 82.4% were observed in estrus after 30 days of boar exposure. However, for gilts which were 130-149 days of age when first exposed to boars, only 70.5% had an observed estrus within the first 30 days of heat detection. This discrepancy in percentage in estrus by age classification at first boar exposure was still persistent, somewhat at 40 days after first boar exposure (Table 1).

Table 1. Puberty Attainment by Growth Rate at Different Times of Boar Exposure. <sup>d</sup>

	Age at boar exposure					
	130-149 days			150-170 days		
Weight/day of age, lb	1.2-1.4	1.43-1.6	1.61-1.83	1.2-1.4	1.43-1.6	1.61-1.83
Item						
No. of gilts	170	40	181	201	349	185
Estrus by 10 days, %	27.6 <sup>a</sup>	29.0 <sup>a</sup>	38.1 <sup>b</sup>	44.3 <sup>b</sup>	45.3 <sup>b</sup>	43.2 <sup>b</sup>
Estrus by 20 days, %	48.2 <sup>a</sup>	48.7 <sup>a</sup>	59.7 <sup>b</sup>	63.7 <sup>b,c</sup>	67.3 <sup>b</sup>	63.8 <sup>b</sup>
Estrus by 30 days, %	70.6 <sup>a,b</sup>	67.5 <sup>a</sup>	76.2 <sup>b,c</sup>	83.6 <sup>c</sup>	81.7 <sup>c</sup>	82.7 <sup>c</sup>
Estrus by 40 days, %	82.3 <sup>a,c</sup>	79.2 <sup>a</sup>	85.6 <sup>a,b</sup>	88.6 <sup>b,c</sup>	89.7 <sup>b</sup>	89.2 <sup>b,c</sup>
Pubertal Females, %	90.0 <sup>a</sup>	89.2 <sup>a</sup>	91.7 <sup>a</sup>	93 <sup>a</sup>	93.1 <sup>a</sup>	96.2 <sup>a</sup>
Age at Puberty, days, %	164.8 <sup>a</sup>	162.2 <sup>a,b</sup>	159.6 <sup>b</sup>	172.1 <sup>c</sup>	171.5 <sup>c</sup>	174.0 <sup>c</sup>

<sup>a,b,c</sup>Means with different letters within a row differ ( $P < 0.05$ ).

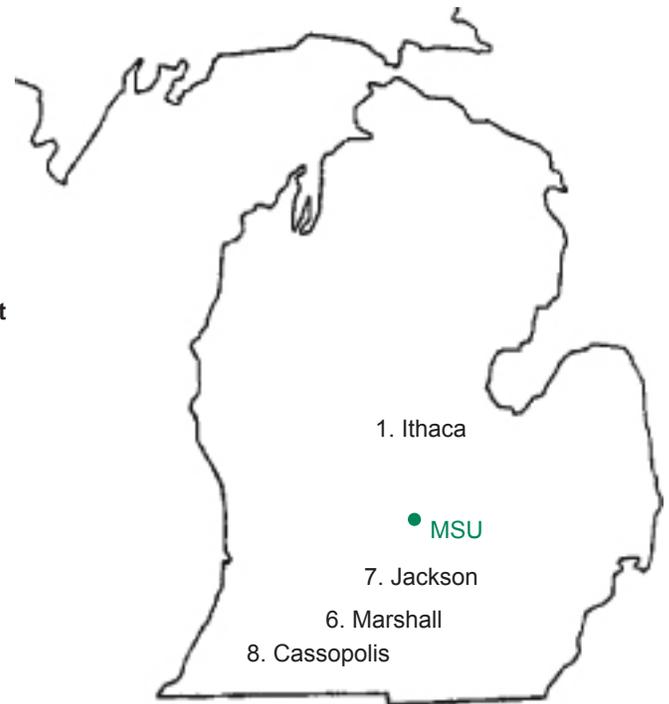
<sup>d</sup>Adapted from Amaral Filha et al, 2009.

(Continued on Page 12)

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EXTENSION



## Recycling

Once gilts did exhibit an initial estrus, 97% did achieve a second recorded estrus. Percentage of gilts recycling did not differ between the two groups that differed in age at first boar exposure. However, there were differences in recycling rate when comparing the three different growth rate groups. Low growth rate gilts (1.2-1.4 WDA) had a recycling rate of 94.3% whereas gilts that were classified as Intermediate (1.43-16.0 WDA) or high (1.61-1.83 WDA) growth rate recycled at a rate of 97.8%.

## Conclusion

This study demonstrates that a high percentage of maternal gilts (92%) should achieve estrus, if boar exposure and estrous detection are provided adequately. Gilts that are older at first boar exposure will be more synchronous in the expression of first estrus than gilts that are younger at first boar exposure. If within the herd gilt introduction plan, the objective is to breed gilts at their second or later estrus, initiating boar exposure at a later age will allow for a more synchronous pubertal estrus. This should lead to more predictable percentages of gilts to be introduced into the breeding herd. If gilts are to be mated at a specified weight within the gilt introduction program, initiating boar exposure at a younger age may be more desirable so that gilts may have progressed through more estrous cycles before initial mating.

## Literature Cited

Amaral Filha, W.S.A., M.L. Bernardi, I. Wentz, and F.P. Bor-tolozzo. 2009. Growth rate and age at boar exposure as factors influencing gilt puberty. *Livestock Sci.* 120:51-57.