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Thorn Apple Valley Revisited

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Thorn Apple Valley's (TAV) 1998 closure of its Detroit pork harvest operations came just as the magnitude of the nation's hog crisis was revealing itself. It was considered by many to be the "straw that broke the camel's back" as record market hog numbers met with more harvest capacity reductions. An earlier article (2001) examined the impacts of TAV's closure on Michigan hog prices relative to the rest of the Eastern Corn Belt with respect to price levels and price variability. We revisit the TAV plant closing with a focus on geographical market relationships and the long run impact on the landscape of market hog production in Michigan.

Long Run Questions

Seven years out from the TAV plant closing and the 1998 U.S. hog crisis, long term impacts for Michigan are becoming apparent. Here, we examine the nature of changing price relationships between Michigan market hog prices and hog prices in the rest of the Eastern Corn Belt. Specifically, we ask:

- Has Michigan's price advantage rebounded from the initial decrease experienced in the post-TAV closing period or has the impact lingered?
- How did events outside the Eastern Corn Belt impact Michigan's price relative to the Eastern Corn Belt?
- How has the landscape of market hog production in Michigan been impacted?

Background

From a Michigan perspective, Thorn Apple Valley's exit from pork harvest changed the regional market structure. IBP-Logansport's entry and proximity to TAV's Detroit plant put the two plants in direct competition with one another for Michigan hogs during the period when TAV's Detroit harvest plant was open, leading to the price advantage that Michigan producers enjoyed. Empirical evidence suggests that Michigan's price advantage over Eastern Corn Belt counterparts prior to TAV's plant closure ranged from \$1.39 to \$0.63 per cwt, depending on the quarter. In theory, TAV's closure took away that advantage. Previous studies are not in agreement as to the long term impact of harvest plant closings and some studies suggest that prices will slowly rebound (Love and Shuffett, 1965; Ward, 1983; and Hayenga, Deiter and Montoya, 1986). This raises the question of whether the price impacts of TAV's closing were short-lived or still are lingering.

To conduct the analysis, the Eastern Corn Belt (ECB) region was divided into Michigan and a second region termed ROECB, consisting of Indiana, Illinois and Ohio. We define P_{ROECB}, as a weighted average (based on percentages of region's total monthly harvest) of Indiana, Illinois and Ohio prices as reported

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What's Inside ...

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by USDA-National Agricultural Statistics Service. The Michigan price, P_{MI}, is the monthly average price reported by Michigan Agricultural Statistics. The relative price difference is defined as $P_{MI} - P_{ROECB}$; thus, positive values imply a price advantage for Michigan producers while negative values imply a disadvantage. We also include monthly harvest capacity utilization in the Eastern Corn Belt market, excluding Michigan, to determine whether fluctuations in capacity impact the price relationship. Additionally, we include the ratio of Michigan market hog production to ROECB market hog production as a relative measure of "local supply" versus "distant supply" available to ROECB packers.

From a regional perspective, events in other geographical regions could impact Michigan pork producers, inducing a change in the general relationship between the two regions' live hog prices. Visual examination of the price difference between Michigan and ROECB average monthly live hog prices supports the idea that geographical price relationships changed in the ECB live hog market. Figure 1 reveals that Michigan producers have, in general, enjoyed a positive price difference over their ECB counterparts. In fact, in the pre-TAV closing period, the price difference was positive in 38 of 44 months. In the post-TAV closing period, the price difference becomes more variable and is negative in 27 of 49 months. It becomes consistently negative beginning in March 2001. Empirical tools suggest possible structural change at or near: (1) when IBP-Logansport entered the regional market (July through October 1995), (2) a period before and after TAV's plant closure, which included two strikes at Ontario pork harvest plants (April 1998 through April 1999), (3) August 1998, the month following TAV's closure, and (4) a period following the April 2000 closure of Farmland's Dubuque, Iowa pork harvest plant (June 2000 through May 2001). Likely, the impacts of Ontario strikes were short-lived and we are restricted by data availability in the periods prior to IBP-Logansport's entry into the market. Further examination suggests that the TAV closing and the Dubuque closing, however, are significant and should be included in the final analysis.

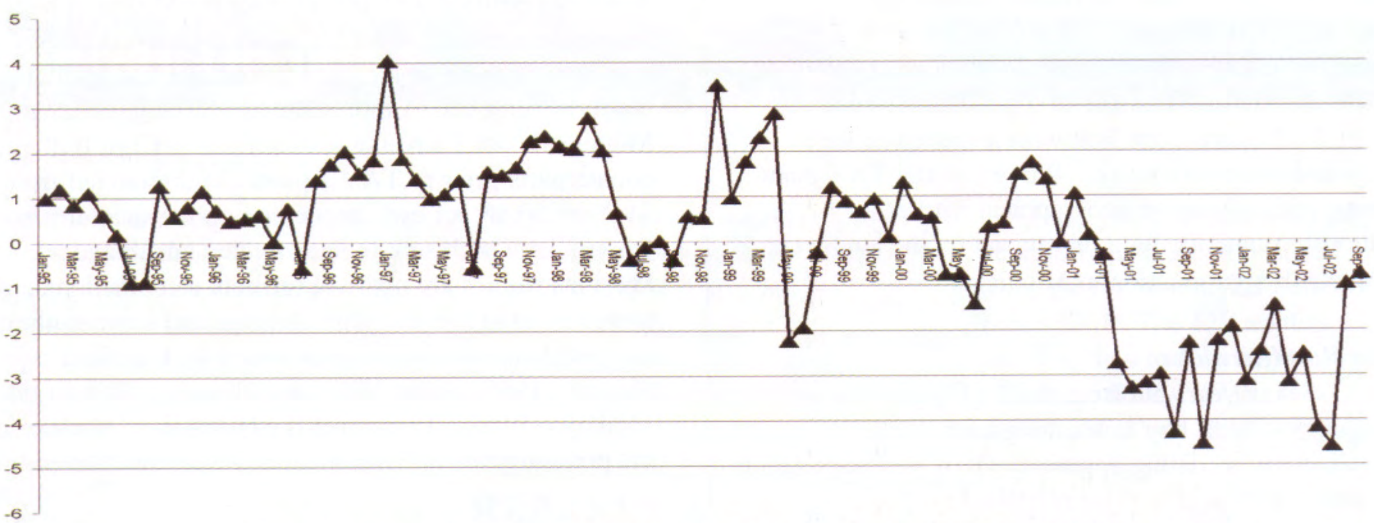

Figure 1. Average Monthly Price Differences for Michigan live hog price - Eastern Corn Belt live hog price.

Price Impacts

Recall that Michigan producers' price advantage over their ECB counterparts prior to TAV's plant closure ranged from \$1.39 to \$0.63 per cwt, depending on the quarter. We estimate the impact of TAV's closure to be -\$1.10 per cwt, confirming that Michigan producers did lose much of their price advantage in the post-closing period when a major buyer exited the geographical market.

Additionally, though Farmland's Dubuque, Iowa harvest plant was in the Western Corn Belt, its closing had a significant impact on Michigan's market hog prices relative to the rest of the Eastern Corn Belt. Though the Dubuque plant likely did not compete directly for Michigan hogs, its closure likely pushed Western Corn Belt hogs into some ECB harvest plants. This is supported by ECB's climbing capacity utilization numbers, in spite of steady Michigan and ECB market hog volumes. Results suggest that Michigan pork producers lost an additional \$1.24 per cwt when the

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Dubuque plant closed, bringing the total loss in basis relative to ECB producers to $2.34 per cwt over the period studied.

Geographical Implications

When TAV exited harvest, Michigan's price advantage initially diminished, but remained positive. As the nation's pork industry adjusted to the 1998 hog crisis, Michigan's price advantage disappeared and the Michigan-ECB live hog price difference became consistently negative. This change in price advantage may well have negative implications for the long-term viability of Michigan's pork industry. In fact, Michigan market hog numbers fell by nearly 10% from 1997 to 2002 and, astoundingly, the state lost 34% of its pork producers during that same period as producers either exited, consolidated or retired. (National Agricultural Statistics Service).

Relative to producers located near TAV's plant in southeastern metropolitan Michigan, producers located in southwestern Michigan have traditionally had more market outlets because of closer proximity to Eastern Corn Belt markets. This proximity likely translates to a lower price impact for these producers. A brief look at county level market hog production data gives some insight as to the impact within the state. Not only have Michigan market hog numbers fallen since 1997, but the in-state geographical distribution has shifted as well. County-level market hog production data from the National Agricultural Statistics Service reveals that market hog production in Huron County in Michigan's "Thumb" area fell by 60% from 1997 to 2002. Huron County was the state's largest producing county in 1997 and is geographically near to TAV. By 2002, they dropped to the ninth largest Michigan county in terms of market hog production. In fact, Michigan's Thumb area lost 45% of its market hog production during that 5 year time period. Southeastern Michigan counties, also geographically near to TAV, lost 48% of their market hog production from 1997 to 2002. By contrast, southwestern and central Michigan counties (which are more geographically centered between TAV and IBP-Logansport) gained 51% and 35% in terms of market hog production over that same period. Clearly, other environmental, social, and financial factors also contributed to these geographic changes in Michigan market hog production, but nevertheless, there is a strong correlation between producer proximity to packers and producer profits.

Conclusions

A primary contributor to the 1998 hog market collapse was a significant imbalance between hog supply and packer capacity. Undoubtedly, TAV's harvest plant closure contributed to that imbalance, perhaps at the worst possible time, as record hog numbers were coming to market. Its implications for Michigan, in particular, were intensified by the fact that it was the state's only major pork packer and that alternative packers were not geographically near to all of Michigan's producers. Our results provide evidence that TAV's exit did impact Michigan's live hog price relative to the rest of the ECB and that Michigan producers ultimately lost their price advantage. In the post-TAV period, evidence also suggests that the closure of Farmland's Dubuque, Iowa plant further exacerbated Michigan producer's price problems by forcing Michigan hogs to compete with Western Corn Belt hogs in some ECB harvest plants, such as IBP-Logansport. Thus, not only did the impact of TAV's closing linger, but our results also suggest that the overall price decline continued in this case, likely due to the complicating factor of the 1998 hog crisis and the ensuing market adjustments in both hog volume and harvest capacity nationwide. Changes in the in-state distribution of market hogs suggests that the impact of TAV's closure was not uniform across Michigan's major hog producing areas. Michigan's in-state market hog production distribution has shifted away from production in areas geographically near to TAV and has grown in southwestern counties geographically closer to alternative packers since TAV's closure. The changing in-state distribution of market hogs for Michigan highlights the importance of pork producer access to harvest capacity for long term viability.

Cited References

Hayenga, Marvin, Ronald Deiter and Cristobal Montoya. "Price Impacts Associated with the Closing of Hog Slaughtering Plants." *North Central Journal of Agricultural Economics* 8(July 1986):237-242.

Love, Harold G. and D. Milton Shuffett. "Short-Run Price Effects of a Structural Change in a Terminal Market for Hogs." *Journal of Farm Economics* 47(1965):803-812.

United States Department of Agriculture. *Livestock, Meat and Wool Weekly Summary and Statistics,* Various issues.

Ward, Clement E. "Price Impacts of a Structural Change in Pork Processing - A Case Study in Oklahoma." *Current Farm Economics* 56(1,March 1983):3-8. Oklahoma Agricultural Experiment Station, Stillwater, Oklahoma.

Niche Pork Producers Conference

Beth Franz, Extension Pork Educator, Cass Co. Cassopolis

Pork Producers that are evaluating or producing an alternative pork product have an educational opportunity to examine niche pork market potential by attending the Michigan Niche Pork Producers Conference on February 17th, 2006 at the Fetzer Conference Center on Western Michigan University's campus in Kalamazoo, Michigan.

Michigan State University Extension and National Pork Board have partnered to bring scientific based information to producers that are interested in identifying and supplying pork to specific groups of consumers in the way that these consumer prefer and in a method that the consumer sees value in. "There are consumers who are looking for specific types of pork – whether that is a different breed, locally-grown or pork raised using a unique production method and there are producers who are willing to meet that market need," says Larry Cizek, Director of Culinary and Niche Markets for the National Pork Board. "Conferences like these help those producers" states Cizek. Niche pork production plans do not use the traditional commodity market channel and work to develop and maintain relationships between the producer, retailer and consumer.

By using Michigan State University Extension resources, with support from the National Pork Board and conference sponsorship by Michigan Integrated Food and Farming Systems (MIFFS) and the Michigan Pork Producers Association (MPPA) the Niche Pork Producers Conference will allow producers a chance to identify the steps they need to market a successful niche pork product, further refine their business plans and improve their niche pork production skills. Producers will be able to hear from industry experts, study consumer research and learn from one another, as non-traditional commodity markets are discussed. "By conducting the Niche Pork Producers Conference in Michigan, Michigan State University Extension and National Pork Board will be able to provide cutting-edge educational information and materials to this growing audience of producers. Everyone interested in niche marketing opportunities, current producers as well as the inquisitive will be exposed to leaders in their field and learn progressive techniques that will help increase their probability of success" says Beth Franz, Michigan State University Extension Pork Educator.

This conference will focus on three different areas of niche production including; how to get started in alternative pork markets; marketing your alternative pork product; and production skills for alternative pork production systems. Conference participants will also have the opportunity to hear from Dan Wyant, president of the Edward Lowe Foundation as he addresses the entrepreneurial spirit and stages that an entrepreneurial business venture should be prepared to undertake.

This one-day conference is an excellent educational opportunity for producers interested in or involved with alternative pork production as it gives them a chance to add to their knowledge of their business venture or to open doors to other alternative markets. The pre-registration fee for the conference is $30.00 which includes refreshments, program proceedings and materials and a plated noon meal. At the door registration will be $35.00 and the noon meal for at the door registrants cannot be guaranteed. For more information or to register for the conference please contact Beth Franz, Michigan State University Extension–Cass County, 120 North Broadway Street Suite 209, Cassopolis, MI 49031, phone 269-445-4438.

What is NichePORK?

NichePORK marketing has been defined as "supplying unique pork and pork products in a way that specific customer segments prefer or value." While traditional commodity market channels are not used, niche marketing can be done on any scale and does not necessarily mean small.

NichePORK Conference Agenda*

9:00 a.m. — **WELCOME & OPENING REMARKS**

9:10 a.m. — **DEFINING AND SERVING A NICHE MARKET**

Dan Wyant, President of the Edward Lowe Foundation and past Director of the Michigan Dept. of Agriculture

9:50 a.m. — **THE IMPORTANCE TO CONSUMERS OF SELECTED NICHE PORK ATTRIBUTES**

R. Parker & Associates/Ashcraft Research Study Results

10:30 a.m. — **MORNING BREAK**

Sponsored by NSR Commercial Solutions

10:45 a.m. — **BREAKOUT SESSIONS**

(attend one of three)

GETTING STARTED IN NICHE PORK

- Are You Ready to Take the Plunge? Customer Value/Product Differentiation and the Role of Business Planning, Tom Kalchik, MSU Product Center for Agriculture and Natural Resources
- The Ins and Outs of Loan Applications, Kate Winkel, Greenstone Farm Credit Services
- Grant Resources, Susan Smalley, MSUE Extension Specialist

MARKETING YOUR NICHE PORK PRODUCT

- Beeler's Naturally Pure Pork, Tim Beeler, Brunsville, Iowa
- Albright Swine Farms, Pat Albright, Union City, Michigan
- Marketing Strategies for Pasture-Raised Pork, Dave Conner, C.S. Mott Group for Sustainable Food Systems, MSU

NICHE PORK PRODUCTION PRACTICES

- Alternatives for Winter Farrowing, Mark Boggess, Director-Animal Science, National Pork Board
- Herd Health Recommendations, Barb Straw, Pork AoE Team, MSUE

12:15 p.m. — **LUNCH**

- Lunch speaker – Jerry May, Pork AoE Team, MSUE

1:15 p.m. — **BREAKOUT SESSIONS**

(attend one of three)

GETTING STARTED IN NICHE PORK

- Are You Ready to Take the Plunge? Customer Value/Product Differentiation and the Role of Business Planning, Tom Kalchik, MSU Product Center for Agriculture and Natural Resources
- Financing Niche Markets, Kate Winkel, Greenstone Farm Credit Services
- Finding Grants & Writing Proposals, Susan Smalley, MSUE Extension Specialist

MARKETING YOUR NICHE PORK PRODUCT

- Niman Ranch, Paul Willis, Thornton, Iowa
- Albright Swine Farms, Pat Albright, Union City, Michigan
- Overview of Demand for Alternative Pork Markets, Bill Knudson, MSU Strategic Marketing Institute

NICHE PORK PRODUCTION PRACTICES

- Manure Nutrient Management – Enhancing Your Farm's Environmental Image, Jerry May, Pork AoE Team, MSUE
- Understanding Water Quality Issues and Your Right to Farm, Jane Herbert, MSUE Land & Water Program
- Breeding Systems for Meat Quality and Alternative Pork Chains, Ron Bates, MSU

2:45 p.m. — **AFTERNOON BREAK**

Sponsored by Michigan Integrated Food & Farming Systems (MIFFS)

3:00 p.m. — **CLOSING COMMENTS**

** schedule of topics and speakers is subject to change*

NichePORK Conference Registration

$30 per person pre-registration
(must be received by February 10, 2006)

$35 per person registration at the door (cannot guarantee lunch reservations if not pre-registered)

To pre-register, please complete this card and return by February 10, 2006 with enclosed check. Make check payable to Michigan State University Extension - Cass County.

Send to: Beth Franz
Michigan State University Extension
120 North Broadway, #209
Cassopolis, MI 49031

For further information call
269-445-4438 or e-mail franzeli@msu.edu

# of people attending in your party ______________
(Please list each individual attendee)

Name(s): ______________

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Company name *(if applicable)*: ______________

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Address: ______________

City: ______________

State: ______________ **Zip:** ______________

Phone : ______________

E-mail: ______________

Also Sponsored by
Michigan Integrated Food & Farming Systems (MIFFS)
NSR Commercial Solutions
Michigan Pork Producers Association

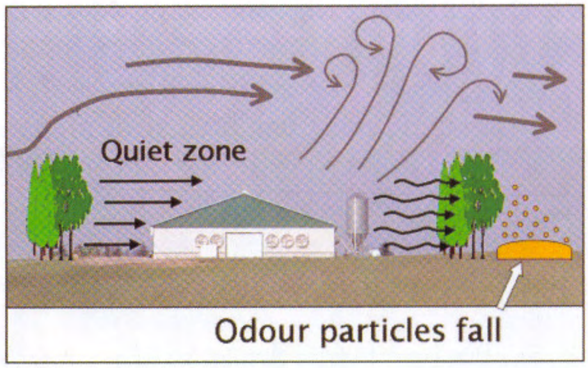
Odor: Give Your Neighbors a Break – A Windbreak

Dann Bollinger, MSU Extension Educator - Dairy & Manure, Clinton County, St Johns and Gerald May, MSU Extension Educator - Pork, Gratiot County, Ithaca

In 2004 the Michigan Department of Agriculture received one hundred eleven Right to Farm complaints covering all resource concerns (MDA, 2005). Of those complaints, 47% were air quality concerns associated with odors from livestock production and another 12% were combination complaints, the majority of which were air quality along with surface water resource concerns. According to MDA, nearly 60% of all Right to Farm complaints are filed by neighbors. In order to maintain amicable community relations, it is in a producer's best interest to manage odors associated with their production facilities. Unfortunately, there are not a large number of management options for odor control that are both effective and economical. There is, however, one such practice that is readily available that not only abates odor complaints, but can improve a farmer's overall environmental image within the community. That practice is shelterbelts or windbreaks. While establishing a shelterbelt will not totally eliminate odor problems, it does provide an effective management tool that should be considered when developing a farm's odor control practices.

1. Lifting and Mixing
   On windy or breezy days, shelterbelts create turbulence forcing air movement up, mixing odorous air with fresh air. The resulting dilution of small dust particles and odorous compounds reduces the odor offensiveness prior to it reaching any odor sensitive areas.

2. Settling of Odorous Particles
   On relatively calm days, shelterbelts may slow air movement. As the wind approaches the vegetative buffer some of the air will be slowed and pass through the buffer. The remaining wind will be lifted over the buffer in a churning motion resulting in a mixing current on the leeward side of the shelterbelt. Wind passing through, and over the shelterbelt, results in a wind speed reduction extending well beyond the buffer, up to 30 to 50 times the height of the vegetation. Reduced wind speeds allow dust particles and any odorous compounds that are attached to them to precipitate out of the wind current.



Queen's Printer for Ontario, 2004. Reproduced with permission

Windbreaks located downwind of livestock production barns allow settling of odorous wind-borne dust particles. Windbreaks should be located 75 to 100 feet away from barns.

How Shelterbelts Work

Establishing vegetative shelterbelts has become an accepted odor control practice across the United States (MWPS, 2002, Schmidt, et al, 2004, NRCS-Missouri, 2004). The use of trees and other vegetation to control odor has long been an intuitive practice; however, scientific support of the practice had been lacking until lately. Shelterbelts differ in height, depth, porosity, and tree species but all implement the same principles. Recent investigations have concluded that when designed and implemented properly shelterbelts can be effective in odor reduction through five mechanisms (Schmidt et al, 2002 and Leuty, 2004):

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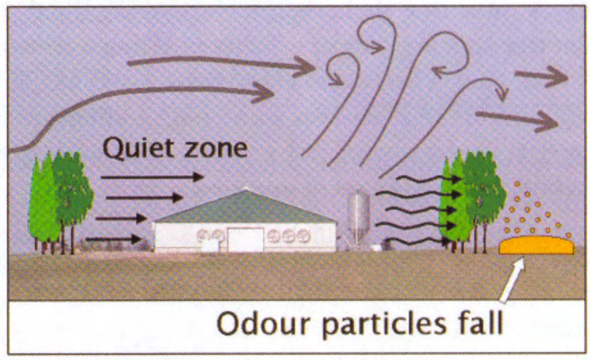
3. Filtering of Odorous Particles
Shelterbelts act as a filtering device in which dust particles are captured on the surfaces of the leaves. For this reason, pines and spruce with their greater total leaf surfaces and year round vegetation are considered excellent filters in established shelterbelts.

4. Breakdown of Odorous Compounds
Some odorous compounds, besides dust particles, may adhere to the leaf surfaces where they are broken down by microbial activity. Volatile organic compounds (VOCs) are among the compounds of greatest interest and concern within environmental watch groups and regulatory agencies concerned with air emissions and odors from livestock facilities. Just as the dust particles are filtered out of the air and attach to the leaves of the shelterbelt vegetation, VOCs also adhere to the plants. Research has established that the vegetative buffers will then break down many odor causing VOCs (Tyndall and Colletti, 2000). Since VOCs have affinity for the lipophilic membranes that cover plant leaves and needles, they accumulate on the leaf surfaces. This allows the micro-organisms that dominate plant surfaces to metabolize and breakdown the VOC's reducing the odor offensiveness.

5. Aesthetics
Some people say "Image is everything", and image has its place in odor control as well. Shelterbelts can significantly improve the aesthetics of the farm by creating a visual barrier to the barns. Planting trees may also indicate to neighbors that the farm's owners and managers are concerned about not only protecting our natural resources but enhancing them.

Installing a Shelterbelt
The effectiveness of a shelterbelt depends on the physical characteristics of the vegetation. Vegetative buffers should have a porosity of 40 -60% (Tyndall and Colletti, 2000, NRCS-Missouri, 2004). Porosity expresses how dense the foliage is and is quantified by the simple ratio of plant surface area to the total area. Effective shelterbelts meet porosity guidelines and have reached a minimum height to create the mixing and wind speed reduction necessary. Tyndall and Colletti



Queen's Printer for Ontario, 2004. Reproduced with permission

Windbreaks located downwind of livestock production barns allow settling of odorous wind-borne dust particles. Windbreaks should be located 75 to 100 feet away from barns.

(2000) suggest that vegetative buffer height must reach 20 – 30 feet before the shelterbelt will become fully effective.

When installing a shelterbelt there are some general guidelines that should be followed relative to location on livestock facility premises, setbacks from odor source structures, and the design and plant species of the actual shelterbelt (Ward, 2005). For specific recommendations for your geographic location, soil type, and situation visit your local NRCS or Soil Conservation District.

Location: Windbreaks are most effective when paired with a shelterbelt on either side of the odor source. Locate the vegetative shelterbelt 75' to 100' both upwind and downwind from the odor source. Since Michigan is subject to weather fronts from all directions, ideally the shelterbelt should extend around the entire perimeter of the odor source.

Setbacks: The possibility of roots penetrating the liner of earthen manure storages or disturbing other facilities is remote. By locating the shelterbelt the minimum 75' from the odor source it is unlikely that the roots will extend to the odor source during the lifetime of the vegetative buffer (50 – 80 years). For naturally ventilate buildings the shelterbelt should be a minimum of 100' from the building to allow for sufficient airflow for ventilation.

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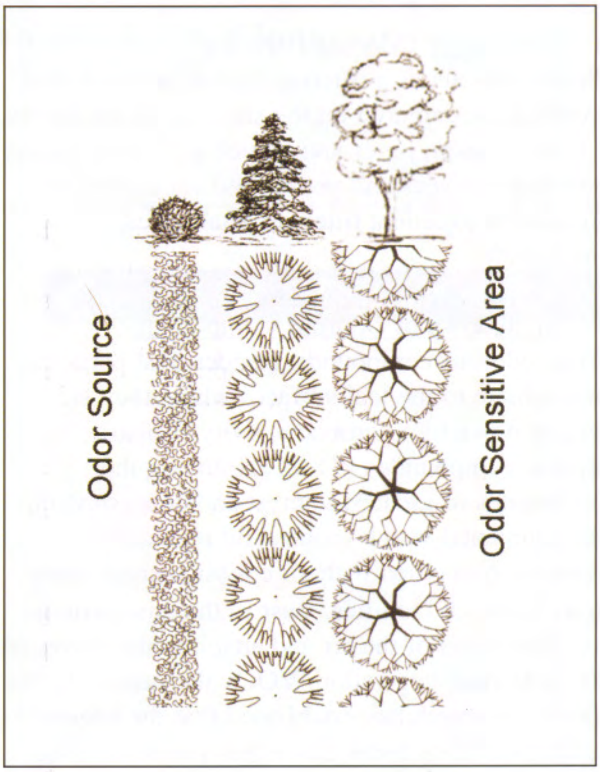
Species: A three row shelterbelt incorporating three different tree species is most effective. Using a row of shrubs (*e.g.* chokecherry and elderberry, a roll of tall growing conifers (*e.g.* eastern white pine and northern white cedar), and a row of fast growing deciduous trees (*e.g.* hybrid popluar) is recommended.

The shrubs nearest the odor source divert and filter air nearest the ground surface that might otherwise pass underneath the foliage of trees.

The tall growing conifers in the middle row provide long-term, year-round excellent windbreak and air filtering protection.

The tall, fast growing deciduous trees in the shelterbelt offer quick odor control results while the slower growing conifers mature. Generally, these rapid growing trees do not live as long as conventional species, but that is okay. By the time the last row of trees expire, the middle row of trees will have reached adequate maturity to provide an effective shelterbelt without them.

Similar to making field crop planting decisions, winter is the time to plan for establishing vegetative shelterbelts next spring. Local NRCS Offices regularly hold tree sales in February and March with an early spring delivery. These tree sales are an excellent resource for young trees and shrubs appropriate for your area. While young trees fail to meet the height and porosity requirements for an effective shelterbelt, by incorporating a fast maturing deciduous trees they will provide quick results with the greatest height in the least amount of time.



Shelterbelts are effective because they mix and dilute odor compounds, they capture dust particles with odor compounds attached, and they contain micro-organisms that metabolize odor compounds. When developing a plan to mitigate odor concerns from a livestock facility of any type, shelterbelts should receive substantial consideration. Shelterbelts are not only effective at odor control, but project the farm's concern for the environment in general.

Resources:

Leuty T. 2004. *Using Shelterbelts to Reduce Odors Associated with Livestock Production Barns.* online at: http://www.omafra.gov.on.ca/english/crops/facts/info_odours.htm

Michigan Department of Agriculture (MDA). 2005. *Right to Farm Program Fiscal Year 2004 Report.* online at: http://www.michigan.gov/documents/MDA_RTFFY04Annualreport_117010_7.pdf

MidWest Plan Service (MWPS). 2002. *Manure Management Systems Series - Outdoor Air Quality.* MidWest Plan Service, Iowa State University, Ames, Iowa.

National Resource Conservation Service (NRCS-Missouri). 2004. *Using Windbreaks to Reduce Odors Associated with Livestock Production Facilities.* online at: http://efotg.nrcs.usda.gov/treemenuFS.aspx?Fips=29027&MenuName=menuMO.zip

Schmidt, D., K. Janni, L. Jacobson, J. Bicudo, J. Zhu, R. Nicolai, M. Moscato. 2004. *Animal Agriculture and Air Quality.* University of Minnesota, St. Paul, MN

Tyndall J. and J. Colletti. 2000. *Air Quality and Shelterbelts: Odor Mitigation and Livestock Production – A Literature Review.* Iowa State University, Ames, Iowa.

Ward, Tom. April 2005. *Windbreak/Shelterbelt Establishment (380)* – DRAFT. Natural Resources Conservation Service, Michigan.

Sorting through Non-Productive Days

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

Improving female productivity and efficiency on sow farms can be broken into two major components. The obvious one is improving litter size. The second is improving (decreasing) the number of days a sow is not productive. Productive days are those days when a sow is either gestating or lactating. Non-productive days are those days when a sow is not gestating or lactating. This would include, days from entry into the sow herd until pregnancy, days from detected not pregnant to mating or culling, days from weaning until mating and so forth. Accumulation of non-productive days is expensive. Typically a non-productive sow day is worth $1.25 to $1.75 per day. Thus for every 10 days a sow accumulates in non-productive days it costs the farm $12.50 to $17.50.

In a recent study[a] a data set that included 95 sow farms was evaluated for farm-to-farm differences in non-productive days. Table 1 includes a summary of the descriptive statistics from these farms. Farms were sorted by pig weaned per mated female per year. The top 25% of these farms were categorized as "High-Performing" farms while the rest were categorized as "Ordinary" farms. Non-productive days were broken down into six categories. These were;

1. Gilt first mating to pregnancy interval
2. Gilt first mating to culling interval
3. Sow unmated weaning to culling interval
4. Sow weaning to first mating interval
5. Sow first mating to pregnancy interval
6. Sow first mating to culling interval.

Table 1. Descriptive statistics of farms

Item	All farms	High Performing	Ordinary
Pigs weaned per mated female per year	20.8	23.6	19.6
Litters per mated female per year	2.24	2.39	2.19
Pigs weaned per litter	9.27	9.88	9.10
Farrow rate, %	79.9	84.6	78.3
Percent re-mated females	12.7	9.39	13.9
Percent farrow records without a mating	.20	.04	2.17
Average Non-productive days	57.9	42.3	63.4

The overall average for the above 6 categories along with the averages for the "High Performing" and "Ordinary" farms are in Table 2. Non-productive days associated with gilt records comprised 17.1% of the total non-productive days while non-productive days associated with sow records made up 82.9% of the total non-productive days.

When evaluating the non-productive days associated with gilt records, it is apparent that farms included in this data set, did not record gilt entry into the sow herd until gilts were ready for breeding and near the estrus at which they were mated. However, there still were differences between "High Performing" and "Ordinary" farms when evaluating non-productive days associated with gilt records. "High Performing" farms had shorter gilt non-productive day intervals than 'Ordinary" farms. This may suggest better heat detection methods for "High Performing" farms and more stringent gilt culling protocols.

[a]Koketsu, Y. Six component intervals of non-productive days by breeding-female pigs on commercial farms. J. Anim. Sci. 83:1406-1412.

(Continued on page 10)

Table 2. Non-productive days by category and farm description

Item	All farms	High Performing	Ordinary
Overall Non-productive days	57.9	42.3[a]	63.4[b]
Gilt first mating to pregnancy interval, d	5.69	3.37[a]	6.52[b]
Gilt first mating to culling interval, d	4.83	2.76[a]	5.57[b]
Sow unmated weaning to culling interval, d	4.00	3.2	4.27
Sow weaning to first mating interval, d	14.9	14.2[a]	15.1[b]
Sow first mating to pregnancy interval, d	11.5	6.92[a]	13.1[b]
Sow first mating to culling interval, d	17.0	11.9[a]	18.8[b]

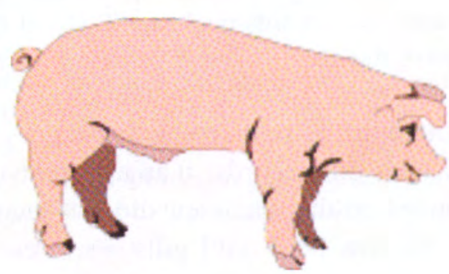
[a,b]Means with differing superscripts infer significant difference ($P<0.05$) between farm classifications

The three categories of; "sow first mating to culling interval", "sow first mating to pregnancy interval" and the "sow weaning to first-mating interval", made up 76% of the total non-productive days and were significantly different between "High Performing" and "Ordinary" farms. For the "sow first mating to pregnancy interval" and the "sow first mating to culling interval", the difference between farm classifications was 6.18 and 9.9 days , respectively with "High Performing" farms having shorter (more desirable) intervals than "Ordinary" farms. For the most part the "first mating to pregnancy interval" and the "first mating to culling interval" can be improved by either improved heat detection both after mating and at 21 day estrous check after mating. In addition a well-managed pregnancy detection program is also important. This would include checking pregnancy with B-mode or "real-time" ultrasound and checking pregnancy at 21 to 30 days after mating, at 45 days after mating and at 60 days after mating.

Improving the "interval of weaning to first mating" takes a combination of breeding management and lactation management. For sows to express heat after weaning they must be fed appropriately during lactation. If sows are "milked down" and are too thin at weaning their return to estrus could be delayed and their expression of "standing heat" may be poor which can reduce the ability of the stock person to catch these sows in heat. In addition a well-managed heat detection program is necessary to observe behavioral standing heat in sows. A poorly managed heat detection program will result in a lower percentage of sows detected in behavioral standing heat even though a higher percentage of sows may have actually cycled. Poor estrous detection procedures cause the average for the "interval of weaning to mating" to increase. This is due to sows which cycled but were not found in heat after weaning to be detected in heat at 24-30 days after weaning on their next heat cycle.

Conclusion

Non-productive days can vary from farm to farm and can impact the production efficiency of the sow herd. For most farms trying to improve (decrease) non-productive days their efforts can initially center around three management areas; 1) Evaluation and improvement in estrous detection for both gilts and sows, 2) Evaluation and improvement of pregnancy detection and culling regimens and 3) Lactation feeding management. Improving non-productive days should improve sow herd efficiency, reduce sow herd feed costs and possibly decrease the annual number of replacement gilts needed.



Water Intake and Water Wastage by Growing-Finishing Pigs

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Introduction

Providing an adequate water supply to all pigs in each respective phase of production is an absolute necessity. Although, when considering intensive pork production, the large quantities of water used and the amount of slurry produced from these pig units are important considerations in regard to environmental stewardship and cost related issues such as labor to haul manure. Minimizing water waste from your water delivery system would decrease both water use and slurry volume. It has been reported that growing-finishing pigs may waste up to 60% of the water from a poorly managed nipple drinker. It is also well documented that that low height and high flow rates of nipple drinkers increase the amount of water spillage. Therefore, it is recommended that drinker height and flow rates be adjusted on a regular basis. In a commercial setting, many producers may find this impractical and consider the adjustment of drinker height and flow rate a tedious task.

A study involving three separate experiments conducted by Li et al. (2005) was designed to evaluate the water intake, wastage, and drinking behavior of pigs at recommended nipple heights and flow rates (Exp. 1); how nipple height and flow rate affect water intake and wastage (Exp. 2); and the effectiveness of drinker management in decreasing water wastage under commercial conditions (Exp. 3).

Methods

In Experiment 1, 48 female growing-finishing pigs were studied for two periods weighing on average of 115 lbs. for Period 1 and 158 lbs. for Period 2 at the start of each respective period. The height of the bottom of the nipple drinker was set at 2 inches above the shoulder height of the smallest pig in each pen. Flow rates were adjusted to approximately 0.4 ounces/sec. (1 cup/20 sec.) for Period 1 and approximately 0.6 ounces/sec. (1 cup/13.5 sec.) for Period 2.

Experiment 2 consisted of 32 female pigs being studied with an average starting body weight of 33 lbs. Four treatment combinations were used in Experiment 2 over the 8 week experimental period, which included: unadjusted nipple heights (13 inches) or nipple heights 2 inches above the shoulder height (adjusted every 2 weeks) of the smallest pig in every pen, and flow rates of 0.28 ounces/sec.(1 cup/28.5 sec.) or 0.6 ounces/sec.(1 cup/13.5 sec.).

For Experiment 3, a total of 288 pigs (18 pigs per pen) were randomly allocated to a respective pen where they would remain for 12 weeks during the experiment. Average starting body weight was 70 lbs. Four drinker treatments were utilized. Treatment 1 (recommended) was a nipple drinker that was adjusted to 2 inches above the shoulder height of the smallest pig in each pen every 2 weeks according to body weight of the pigs. Treatment 2 (unadjusted) was a nipple drinker set at a height of 19 inches for the entire 12 week experimental period. Treatment 3 (stepped) consisted of a nipple drinker mounted at approximately 28 inches above a concrete step (14 in. wide x 14 in. long x 9 in. tall) throughout the 12 week experiment. Treatment 4 was a bowl drinker mounted at 19 inches.

Results

Experiment one results revealed that the largest proportion of drinking time was by a frontal approach (58%) to the nipple for Periods 1 and 2 when compared to other behaviors such as side drinking (26%), aggression (13%), and accidental triggering (3%). Growing-finishing pigs spent an average of 1.1 to 1.4% of their time drinking during the day or 0.7% of their time over a 24 hour period. This can be translated to a total of 10 minutes over a 24 hour period. On average growing - finishing pigs drank twice per hour during the day and a total of 26 to 33 times during a 24 hour period. Average drinking time was 18 to 24 seconds.

Experiment 2 results indicated that neither nipple height nor flow rate affected average daily water intake or feed intake in either grower or finisher pigs. Water-to-feed intake ratios were in the range of 1.8 (Exp. 2) to 2.4 (Exp. 1). However, the higher flow rate (0.6 ounces/sec.) resulted in a 25% increase in water disappearance for the grower pigs and the unadjusted nipple height increased water disappearance by 40% for the finisher pigs.

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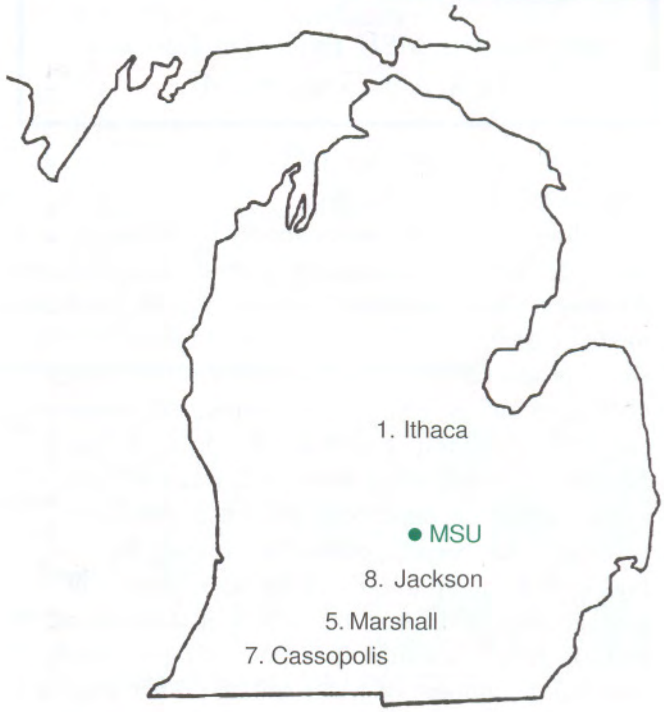

In Experiment 3, pigs on the four drinker treatments performed similarly: final body weight 229 ± 4.4 lbs. and an Average Daily Gain (ADG) of 1.89 ± 0.04. The stepped and bowl drinkers resulted in the least amount of water disappearance, with the unadjusted drinkers having the greatest amount of water disappearance. The recommended nipple drinker height was among the highest levels of water disappearance during the first sub-period (smallest pigs), and among the lowest levels of disappearance during the last period (largest pigs). The unadjusted nipple drinker was among the highest disappearance levels for all sub-periods.

Implications

In conclusion, Li et al. (2005) reported that approximately 26% of the water disappearance was water waste from growing-finishing pigs at nipple drinkers. However, water wastage did range from 15 to 42% in this study. The amount of water waste depended on factors such as pig size, nipple height, and flow rate. Providing a step beneath a nipple drinker was an effective means of providing access to water by smaller animals, while achieving low levels of wastage without adjusting nipple height. Overall, good management practices can decrease water wastage from nipple drinkers by approximately 15% when compared to unadjusted nipple drinking devices.

Source: Li, Y.Z., L. Chenard, S.P. Lemay, and H. W. Gonyou. 2005. Water intake and wastage at nipple drinkers by growing-finishing pigs. J. Anim. Sci. 83:1413-1422.

Happy Holidays!