Factors associated with the use of veterinarians in preventive health management in Ontario swine herds

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Summary: *This study was performed to examine in detail the use of prescheduled visits of veterinarians on Ontario swine farms. We did this assuming that prescheduled visits would reflect a farm's involvement in preventive health management (PHM). A mail survey, a personal survey, and a prospective study were used to provide descriptors of users and non-users of PHM. Possible relationships between farmer and farm characteristics and use of PHM were examined by producing a predictive model using stepwise logistic regression. Based on this model, we found record-keeping for enterprise analysis, debt level, number of pigs marketed annually, use of washing, and slatted floors in the nursery all to be positively related to the use of PHM.*

Preventive health management (PHM) services have evolved away from emphasizing the care of individual animals to focusing on herd-level disease control and production analysis.[1] Herd-level PHM focuses on proactive responses and regularly involves veterinarians on individual farms to analyze, plan, and discuss methods to alter production levels and benefit the farm economically.[2] In England, swine farmers who enroll in PHM programs tend to be knowledgeable farmers who are financially successful. They also tend to be averse to risk and not financially overextended.[3]

Few swine farmers in North America, however, have adopted herd-level PHM services on their swine farms, for a number of possible reasons:[4]

- most farmers do not appreciate the effects of subclinical disease;
- farmers' primary aims may not be to optimize health and economic performance;
- veterinarians' traditional reliance on sales of drugs and vaccines may hinder their ability to provide the expertise farmers need in PHM;[3] and
- most farmers fail to keep records on which to base discussion and consultation.[5]

This study was performed to compare the management, housing, and farmer characteristics, such as age and level of education, between users and nonusers of PHM. Identifying the characteristics of farmers who choose to use PHM could help veterinarians increase their marketing of PHM and change the delivery mechanisms to meet the different needs of their potential clientele.

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Methods

Sampling procedure

We used data generated by three surveys for this study:

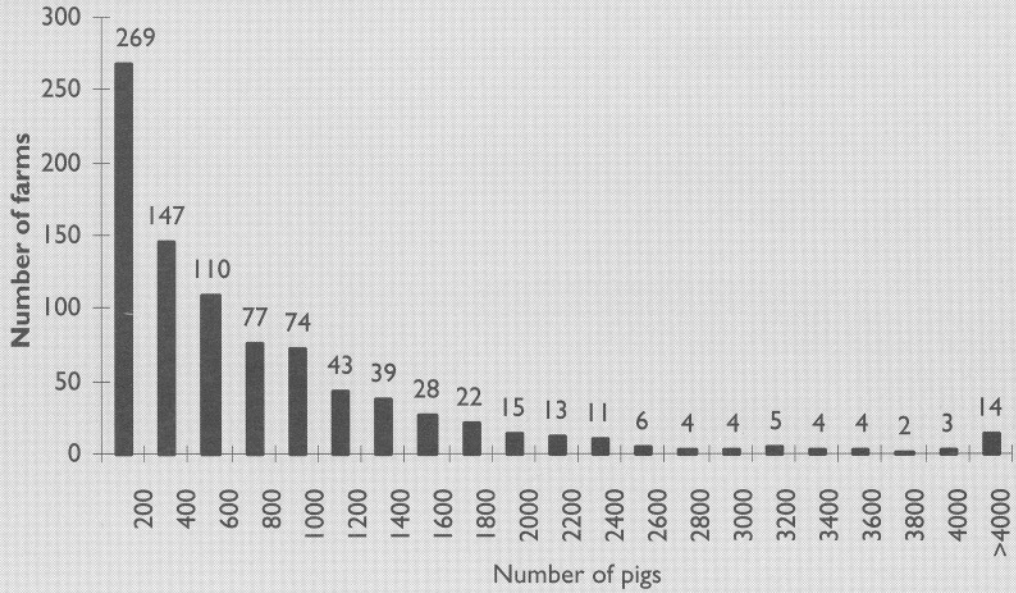
- The first sampling frame was generated from a list of approximately 12,000 farmers who marketed hogs, sows, or boars through the Ontario Pork Producers Marketing Board in 1988. Within this sampling frame, the Marketing Board mailed a survey to 1920 randomly selected producers in September 1989 asking about the production technologies they were currently using to produce pigs (copies of survey available upon request from first author).[6] Of the 1920 surveys mailed, 1145 (60%) were returned. Of the returned surveys, 120 were discarded either because the farmer was out of business or because s/he had refused to participate.

  The nature of farming activities and characteristics of the swine enterprises that were investigated in the mail survey, including the technologies used on the farm, were summarized by Rosenburg and Turvey.[6] The technologies included:

  — computerized records;
  — early weaning (average of < 4 weeks);
  — all-in–all-out (AIAO) animal flow in nurseries and finishers;
  — partial-slat flooring in the farrowing room or nursery;
  — washing nursery or farrowing pens between turnovers;
  — handmating the majority of sows;
  — mixing at least part of the farm rations on farm; and
  — keeping records for production analysis.

- We also used the results of a detailed prospective study conducted by the Ontario Ministry of Agriculture and Food

Figure 1



Histogram of number of pigs marketed annually on Ontario swine farms

(OMAF) from September 1986 through December 1990. This study, which tracked production data of Ontario swine herds, was designed to determine baselines of productivity for Ontario swine herds.

- To gather more detailed information about producers' attitudes toward various technologies and producer demographics, an Ontario-based information research group (InfoResults Limited, Suite 204, 60 Queen Street East, Brampton, Ontario L6V1A9) performed an interview survey of 300 farms. Half (148) of the farms were chosen because they were part of the prospective OMAF study, while the other half were randomly chosen from the sampling frame used for the Ontario Pork Producers' Marketing Board mail survey. The personal interview survey asked participants to explain why they were not using prescheduled veterinary visits, among other technologies.

Of the 148 herds surveyed by OMAF and in the interview survey, 97 (65%) were found to have participated for at least four quarters in the prospective study and thus had valid estimates of production.

In the OMAF and the interview surveys, besides the data concerning their participation in PHM programs, data on various producer demographic factors, including

- age;
- level of education; and
- work experience

were collected.

The majority of information presented in this paper used the mail survey. Information from the personal survey and the production survey were used to compare levels of productivity between users and non-users of PHM. Reasons for non-use of PHM were collected from the personal survey.

Statistical analysis

For the purposes of this study, we defined PHM users as all farmers who reported that they had participated in one or more prescheduled veterinary visits per year. The length and number of prescheduled visits were not measured.

We initially recorded age, level of education of the owner, and weaning age as ordinal variables. We transformed these to binary variables based on the greatest difference between PHM levels, using the technique devised by Walter, et al.[7]

For the current study, farms were classified into one of four distinct enterprise types:

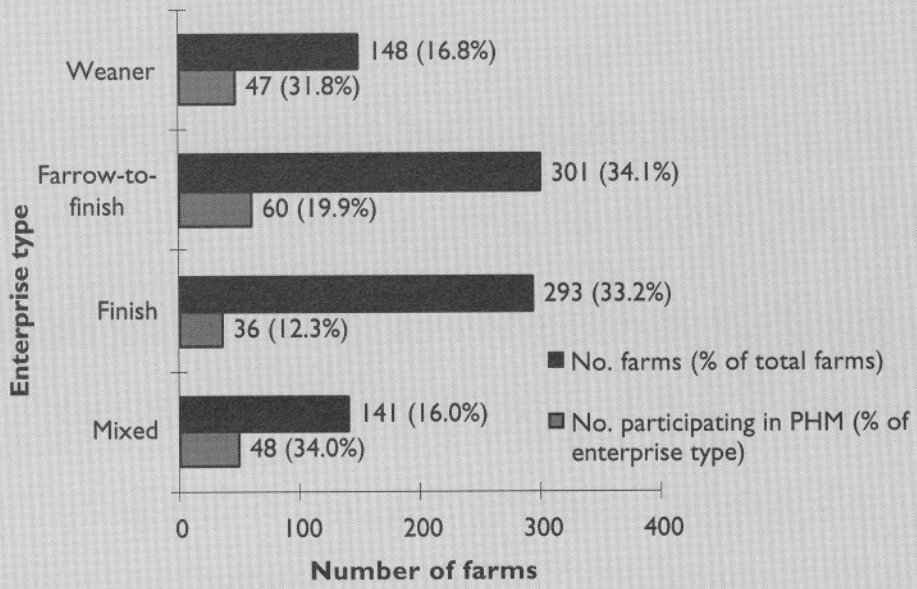
- weaner (selling pigs at 20–25 kg)'
- finisher (selling pigs at approximately 100 kg);
- farrow-to-finish; or
- mixed (all those farms with a breeding herd that sold between 10% and 90% of their pigs as weaners).

We initially examined the type of enterprise as a predictor of the use of PHM using the Chi-square test. We examined the size of the herd as a predictor of PHM using a test for equal medians,[8] because the distribution of farm sizes was skewed (Figure 1), as confirmed by the runs test.[9] Individual production levels were compared between users and non-users with a T-test. The levels of use of individual technologies were compared between users and non-users using a Chi-square test. No adjustment was made to compensate for multiple comparisons.

Logistic regression was performed to identify which farm technology and producer attributes variables were most highly associated with the use of PHM. We entered the following farm technology and producer attributes variables into the logistic model:

- number pigs marketed;
- number acres cultivated;

Figure 2



Use of prescheduled veterinary visits among enterprise types

- percent debt;
- weaning at > 4 weeks;
- AIAO farrowing rooms;
- had slatted farrowing pens;
- washed the farrowing pens;
- AIAO weaner rooms;
- had slatted weaner floors;
- washed the weaner pens;
- hand mating;
- on-farm feed mixing;
- record keeping;
- had no interest in using computers;
- education > grade 11 and
- age > 40 years.

The logistic model was as follows:

$$\Pr\left(Y \middle| X_1, X_2, \ldots X_k\right) = \frac{e^{\alpha_0+\beta_1X_1+\beta_2X_2+\ldots+\beta_kX_k}}{1+e^{\alpha_0+\beta_1X_1+\beta_2X_2+\ldots+\beta_kX_k}}$$

where $\Pr(Y|X_1,X_2,..,X_k)$ is the probability that a farm used PHM given the conditions $X_1,X_2,..,X_k$, which refer to the above farm technology and producer attributes variables.

Reasons producers gave for not participating in PHM were tabulated for comparison.

Results

We found enterprise type to be significantly associated to use of PHM (Chi-square equal to 37.4 ($P<0.01$)) (Figure 2). Approximately 22% of farms had one or more prescheduled visits per year. The participation rates were highest in the mixed and weaner operations. The finisher farms had a lower proportion of PHM users than the other enterprise types.

Herd size varied widely in the study (Figure 1). Although there were few large farms, they provided a large proportion of marketed pigs. The farm size distribution was skewed (the mean exceeded the median) and not normal ($P<0.00005$). The median level of annual sales across all farms was 480 pigs. The farms that used PHM were larger than those of nonusers. Of PHM users:

- 70% (134) of farms marketed more than 480 pigs; and
- 45% (311) of nonusers marketed more than 480 pigs (Chi-square = 37.1, $P<0.05$).

Other significant differences between users and nonusers included the number of acres cultivated and debt level (debt:equity) (Figure 3).

Participants in PHM programs tended to use more capital- and management-intensive practices, including:

- weaning earlier;
- washing the facilities;
- hand mating; and
- running facilities on an AIAO basis (Figure 4).

The one exception was that PHM users tended to be less likely to use AIAO in the farrowing rooms. Users of PHM also tended to be younger and more educated than nonusers. They were more likely to keep records than nonusers of PHM (Figure 4). They also tended to be more interested in using computers in their operation.

Growth was difficult to measure because entry and exit weights as well as feed conversion data were unavailable. Only reproductive indices could be reported reliably (Table 1). In general, the indices of PHM users equaled or exceeded those of the nonusers; however, only the number of pigs marketed per sow per year was found to be significantly different ($P\leq0.05$).

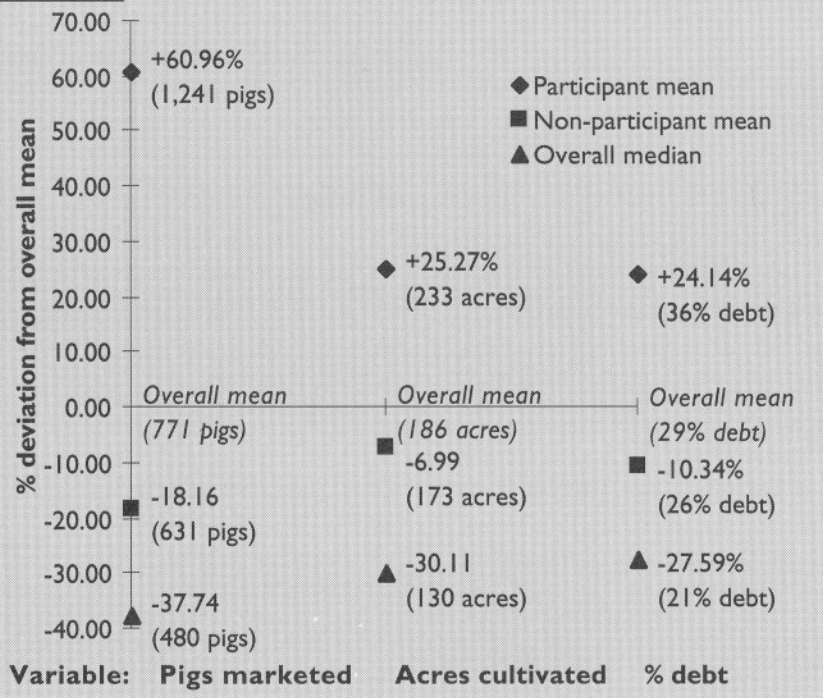
The final logistic regression model (Figure 5) shows that the following factors were positively associated with the use of PHM:

- using records for enterprise analysis;
- debt level;
- number of pigs marketed annually;
- using slatted floors in the nursery; and
- washing the floors in the nursery.

Herds with annual sales of ≥ 1000 pigs were 1.58 times more likely to use PHM. Farms with a debt level of at least 50% were 1.87 times more likely to use PHM.

Herds that kept records were 3.5 times more likely to use PHM. The major reasons producers gave for not using PHM were that it was too expensive or that there were no problems for veterinarians to address (Figure 6).

Figure 3



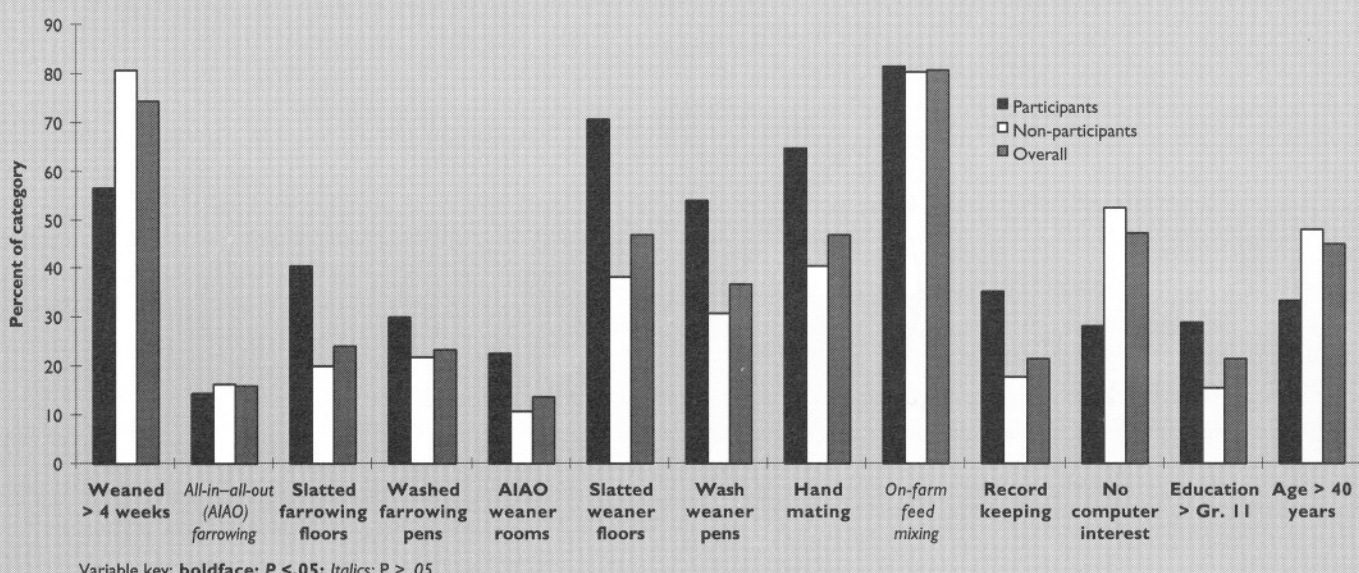
Mail survey: Levels of continuous variables according to participation in prescheduled veterinary visits in Ontario swine herds

Discussion

We consider the definition of PHM used in this study — whether the farm prescheduled veterinary visits — to be the best available surrogate measure of PHM. Though PHM can be practiced during unscheduled or emergency visits, it is unlikely that analysis for the purpose of PHM can or does occur at that time. A scheduled veterinary visit allows adequate time to examine and analyze the farm enterprise data. It should be recognized, however, that this is only a surrogate measure of an activity that has been defined in many different ways. More complex and direct definitions of PHM involving the actual activities performed in a visit may be more accurate, but would be more difficult to measure.

The comparison of participation rates between farm types shows that finisher farms are relatively less likely to participate in PHM. This may be because most finisher farms do not keep useful records. To broaden the use of PHM, it may be beneficial to place more emphasis on monitoring the growing pig.

Figure 4



Variable key: **boldface; *P* <.05;** *Italics;* P ≥ .05

Level of uptake (%) of technologies on Ontario swine farms by use of PHM

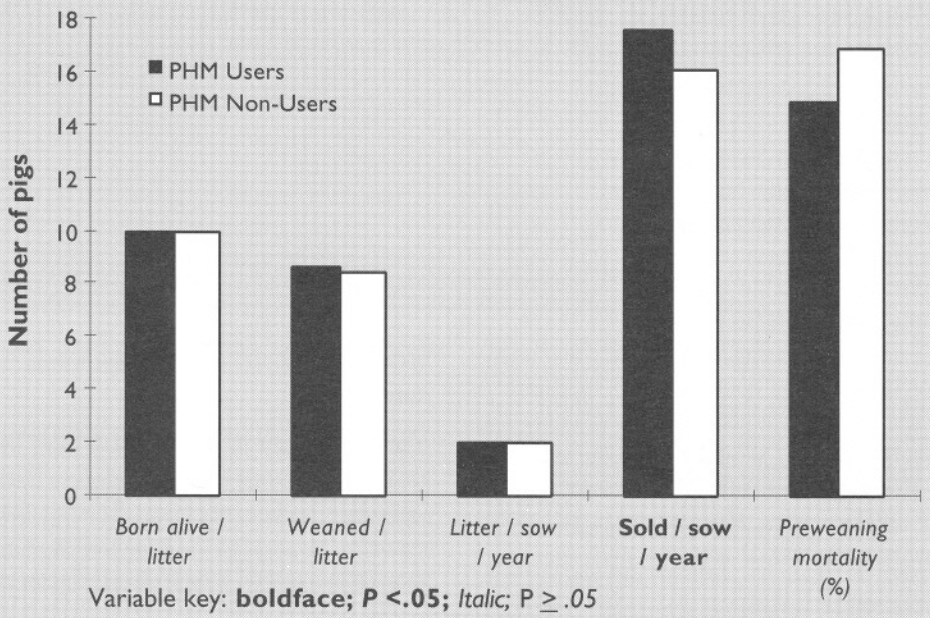
Table 1

Mail survey: Results of logistic regression of the use of prescheduled veterinary visits upon enterprise characteristics of Ontario swine herds

Predictor	b	OR	SE	*P* value
Constant	-4.92	0.007	1.24	.0001
No. pigs marketed per year	0.00046	1.0046	0.00014	.0012
% d ebt	0.0125	1.013	0.0039	.0015
Record keeping	1.25	3.49	0.63	.0466
Slatted nursery floors	0.65	1.92	0.26	.0127
Wash nursery	0.62	1.86	0.23	.0082

where b = regression coefficient; OR = odds ratio; SE = standard error

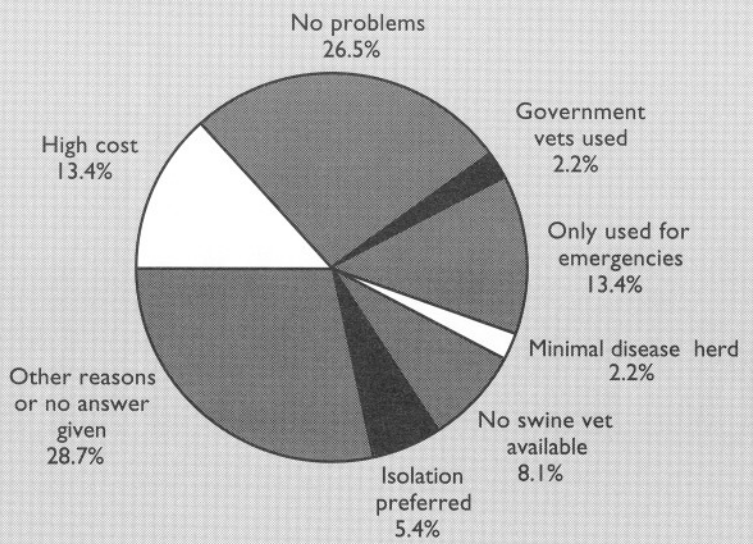
Figure 5



Variable key: **boldface; *P* <.05;** *Italic;* P ≥ *.05*

Comparison of production levels between users and non-users of prescheduled veterinary visits in Ontario swine herds

Figure 6



Stated reasons of 227 respondents for not using PHM services

The results of the logistic model showed that farms that were larger, more leveraged, and used record-keeping and nursery technologies tended to be using veterinarians for PHM. Though this cross-sectional study does not allow us to define causation, it does allow us to describe a PHM veterinarian-producer relationship. Although record-keeping was significantly associated with the likelihood of a producer to use PHM, the level of record keeping sufficient for enterprise analysis was quite low at 21.6%. Even within the group of PHM users, only 35.5% kept records. This finding begs the question whether the prescheduled visits were based on production analysis or other features of performance.

The fact that 47.1% of farm owners would not consider buying a computer suggests that alternative methods of record-keeping, such as a bureau system, may be needed to encourage a productive PHM relationship between the farm manager and his or her veterinarian. Veterinarians should increase their efforts to help producers prepare enterprise production and financial records. Bureau services, technical help, and guidance should be made available as part of PHM to increase the level of record-keeping.

The response of those producers who do not use PHM because they don't believe a veterinarian could benefit their operation should be examined in more detail. If their evaluation is correct, then PHM will be limited to a small proportion of producers until the practice of PHM changes to offer benefits to all producers. If, however, PHM is beneficial but producers have been reluctant to adopt this new technology (as has been the case with many agricultural technologies of proven benefit), then it may be useful to provide further information to non-users about PHM.

Though it would be beneficial to compare users and non-users of PHM based on financial variables, it was not possible in this study nor in other reported studies of swine farms. The benefit of using PHM has been suggested by various authors but often with little substantiation. It has been observed that benefits easily exceed the costs of 0.17% of gross receipts for swine farms in England.[2] These benefits were not quantified, however. It can be argued that the improvements seen when producers adopt PHM, though beneficial, may be caused by factors other than PHM. Concurrent adoption of other technologies or improved management may also have caused reported improvements. Conversely, it has been argued that most studies of veterinary involvement have had a narrow view of its costs and benefits.[10] Further factors that should be considered include the opportunity costs of using veterinarians and the social benefit of veterinary involvement.[10]

In a survey of American pork producers, 49% reported veterinarians to be a very important source of herd health advice, while 37% considered veterinarians to be somewhat important.[4] Swine practice only produces 18% of the income that a bovine practice generates.[11] Further, when examining the income produced in swine practice, 60% was generated by product sales and 40% for services. Services accounted for 69% of dairy practice income.

There are many reasons for the lack of good studies on the economics of PHM. First, a large sample size is needed because profitability estimates are variable and difficult to standardize. As Howe[10] suggested, many benefits may be difficult to quantify. Lastly, a causal link between performance and PHM is difficult to infer in a cross-sectional study such as this, because it may be subaverage economic performance that causes a farm to involve a veterinarian in a PHM program. This is not only true for PHM but for most management decisions.

Implications

- Our profession must still justify the need for veterinarians and preventive health management in swine production.
- The use of veterinarians in preventive health management on swine farms is associated with modern production technologies.
- As the swine industry changes, the level of veterinarian-led PHM should increase.

Acknowledgements

This work was supported by the Ontario Ministry of Agriculture and Food through the Ontario Pork Industry Improvement Program.

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