centred on SWINE
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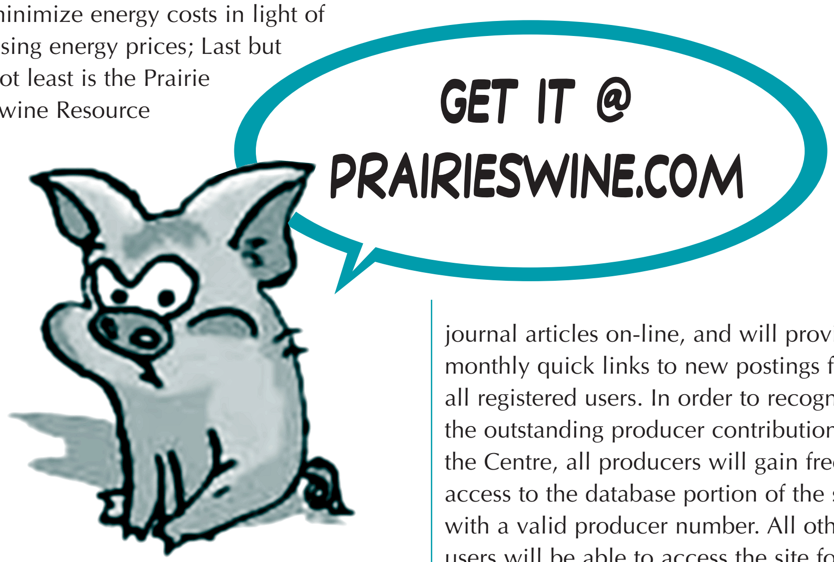
Ken Engele, BSA. P. Ag.,

The kick off to the new Technology Transfer year will bring many new and exciting changes to Prairie Swine Centre, none more than the release of the new website. Along with the new website will be a promotional campaign coined "Get it @ prairieswine.com".

The new website will bring a fresh look to a familiar face, not only incorporating new design features but complimenting it with the inclusion of three new databases. Producers will now have access to 4 databases at their fingertips. The Environmental Issues Resource Centre contains a review of scientific literature dealing with intensive livestock operations and the environment; Welfare Issues Resource Centre contains a cross-species (swine, cattle, horses, sheep, poultry) examination of welfare related issues like housing and handling of animals; The Energy Efficiency database examines topics in the areas of heating, ventilation and lighting and how these can be effectively managed in order to minimize energy costs in light of rising energy prices; Last but not least is the Prairie Swine Resource Centre. Producers will now have access to a growing list published material available from Prairie Swine Centre, including past Annual Research Reports and Centred on Swine articles, fact sheets, and special publications.



The user-friendly databases provide access to over 1,000 articles, research reports, conference proceedings and journal articles on-line, and will provide monthly quick links to new postings for all registered users. In order to recognize the outstanding producer contribution to the Centre, all producers will gain free access to the database portion of the site with a valid producer number. All other users will be able to access the site for a subscription fee of $349.99 annually. PSCI is very proud to be to be kicking off this new campaign on November 1, we look forward to seeing you on-line.

In This Edition

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Driving Profitability

Ken Engele, BSA. P. Ag.,

Memories of the price disaster experienced in 1998 still remain engrained in the minds of many producers, but what a difference a couple of years can make. Low grain prices combined with a strong cash hog market, including hog prices 20% higher than a year ago, have rejuvenated an optimism and profit in the hog industry comparable to that of 1997.

With profitability on the producer's side, now is the time to fine tune your operation. Not only within the production unit, but also through developing a more effective marketing strategy that will maximize returns for your operation.

Marketing Strategy

Typical Production Scenario

600 sow farrow-to-finish operation
Avg Live Weight: 114 kgs
Avg Index: 108
Dressing Percentage: 79%
Pigs Weaned/sow/year: 24.7
Post-Weaning Mortality: 3.5%
Total kgs Sold: 1,287,975

Given This Production Scenario

How do I increase profitability?

(a) seek to increase productivity by 1 pig/sow/year

or (b) seek to achieve a higher market price

How can producers effectively equate a increase in productivity to a increase in market price?

First, we need to calculate the additional kgs marketed, realized from a productivity gain. Using the above example an additional 1 pig/sow/yr results in an additional 52,144 kgs ((1 pig/sow/yr x 600 sows x (1-3.5%) x (1-79%)) being marketed throughout the year.

Second, we need to link the additional sales (in kgs) to market price. In 1999 and 2000 the increased productivity would generate an additional $61,374 (52,144kgs x $1.1770ckg) and $81,762 (52,144kgs x $1.5680ckg) in revenue respectively.

The last step involves dividing the increased revenue stream by total kgs shipped ($61,374/1,287,975kgs). Thus giving us a figure of $4.77ckg and $6.35ckg (for 1999 and 2000) that is comparable to achieving a productivity increase of 1 pig/sow/yr.

Would it be easier to achieve these improvements from changes in a marketing strategy or attempting to move from 24.7 to 25.7 pigs/sow/year?

What Drives Profitability

Profitability has been previously defined through the following equation:

Profit = Market Price – [(herd feed conversion x feed price) + overhead] x volume

Assuming production is maintained at a reasonable level, price has the single largest impact on the profitability of any operation. Or does it? Price is just one component in the value of the hog, therefore producers need to carefully analyze value rather than focusing on price alone. Other components include: index, bonuses, and freight.

Price per kilogram

This is the largest single factor influencing the value of the hog. Most prices in western Canada are based on the United States Interior Iowa-Southern Minnesota market. Other components of the pool price also include basis adjustments (determined by supply of hogs), exchange rate, average Canadian yield, average Canadian index and metric conversion.

Packer Settlement Grids

Packer grids differ according to their weight range, lean range, index and premium/discounts offered. In selecting the most favourable grid producers need to analyze their genetic line, tightness of weight distribution at market and type of hog (barrow/gilt) when determining the highest yielding grid for their particular operation.

"Profit = Market Price – [(herd feed conversion x feed price) + overhead] x volume"

Transportation

An important but often overlooked component, freight costs are important in the decision making process determining overall value. Most producers in Saskatchewan can access all the major packers within western Canada and northern U.S. states for $7-9.00/hog (800 km radius). Some specific packer programs will pay freight, or subsidize transportation to specific plants.

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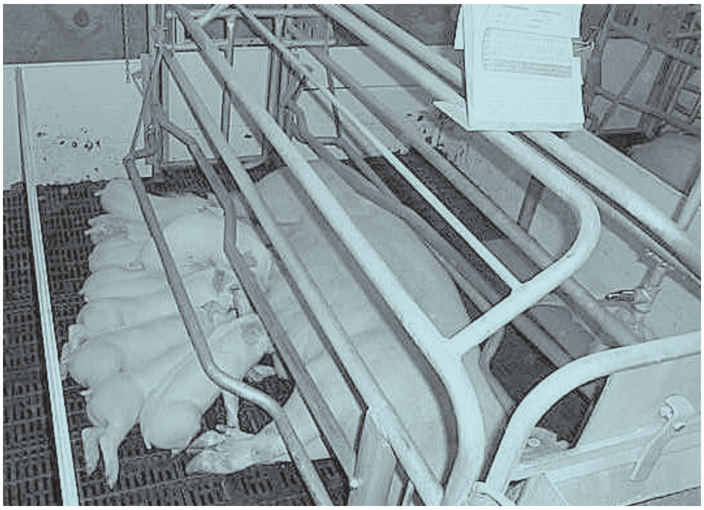
Packer	Price/ckg	Rank	Index	Rank	Bonus	Rank	Freight	Rank
A	$140.70	4	108.6	2	$2.39	3	$6.87	4
B	$138.02	6	105.2	7	$0.13	7	$0.00	3
C	$137.72	7	109.2	4	$3.39	5	$10.05	6
D	$142.50	2	104.1	6	$0.08	6	$1.91	5
E	$141.55	3	105.2	5	$0.13	4	$9.55	7
F	$140.70	4	109.2	1	$3.39	1	$7.04	2
G	$166.04	1	100	3	$6.29	2	$7.04	1
Range	$28.32		9.2		$6.21		$10.05	
Range/Hog	$11.45		$7.46		$11.19		$10.38	

Table 1: Producer returns for seven Canadian packing plants

Savaging of Piglets: A Puzzle of Maternal Behaviour

Moira Harris[1,2], Renée Bergeron[3], Yuzhi Li[1] and Harold Gonyou[1]
[1]Prairie Swine Centre Inc., [2]Department of Animal and Poultry Science, University of Saskatchewan, [3]Université Laval

"Mother Kills Newborn Within Minutes of Giving Birth". A headline such as this would be sure to raise concerns if printed in any newspaper in North America. Yet infanticide, the killing of one's young, has been reported in many species, with various explanations given for its purpose in the cycle of life. The occurrence among pigs is great enough that it has been given its own term, 'savaging'. It remains a puzzle for pig producers who are concerned when they discover one or more otherwise normal looking piglets lying dead near the head of the sow or gilt.



Various explanations have been given for savaging: the sow is frightened by piglets approaching her head; the sow is in pain due to a difficult farrowing; or, the sow is disturbed by the presence of the herdsperson. Various solutions have been suggested: remove all of the pigs immediately; give the sow a sedative; or, mix some beer into the sow's mash. These suggestions may be effective, but unfortunately savaging occurs rarely enough that it is very difficult to study. A farmer with 100 sows, might encounter only 40 cases of savaging over a 10-year period. Similarly, few research farms experience sufficient occurrences of savaging to conduct relevant studies.

A universally held opinion is that savaging is more common among gilts than second or later parity sows. This raises concerns about the costs of savaging to start-up farms, which are populated entirely by gilts. Such farms pass through a period of 5-6 months during which only gilts are farrowing. Part of our series of studies on savaging involved following seven new operations, totalling approximately 10,000 females, through the first two farrowing cycles. During this study we also imposed some environmental treatments on each farm, and compared the various genetic lines used within a farm.

The farrowing technicians on each farm assessed and reported the incidence of savaging for each litter. Farms varied considerably in the incidence of savaging reported. The proportion of gilts killing piglets on farms varied from less than 1% to greater than 5%. The overall average was about 3% of gilts. We have extrapolated our results to a 'typical' 1,000 sow operation as presented in Table 1. Our assumptions here, based on the practices on the farms we observed, were that 30% of the breeding females were replaced after the first farrowing, but that savaging was not used as a culling criterion. During the first farrowing cycle (all gilts), the farm would lose approximately 63 piglets due to savaging. This averages out to about 1 pig per 20 farrowings, or 2.5 pigs per week. It has been suggested that 'all-gilt' farms are a particular problem in that a savaging 'frenzy' may develop within a room of gilts. We have concluded that such is not the case. The gilts in the second farrowing cycle, when farrowing rooms are shared with second parity sows, savaged at approximately the same rate as those in the 'all-gilt' cycle. But true to form, the older animals in the second farrowing cycle savaged at half the rate of gilts; killing approximately 1 piglet per 40 farrowings.

We tested four hypotheses concerning savaging during this study. The first was that gilts that savage during their first farrowing are more likely to savage during their second. This proved to be true. Approximately 15% of savaging gilts killed piglets during their second parturition, whereas less than 1% of non-savaging gilts savaged as second parity sows. The second hypothesis we considered was that genetic lines would differ in their incidence of savaging. The farms in this study often had three or four lines present within their herds, but no differences were evident in the level of savaging among those lines. The third hypothesis was that getting gilts accustomed to the sounds of newborn piglets would reduce the level of savaging, perhaps by reducing their fear of newborns. The playback of newborn piglet sounds in farrowing rooms prior to the birth of the piglets did not affect

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	Gilts	Sows		Combined
Item		savaged as gilt	did not savage as gilt	
First farrowing cycle				
# of females	1,000			1,000
# savaging	29			29
# live born	10,400			10,400
# killed by savaging	63			63
Second savaging cycle				
# of females	300	20	680	1,000
# savaging	8	3	6	17
# live born	3,020	215	7,285	10,520
# killed by savaging	15	6	12	33

Table 1: Expected levels of savaging on a typical 1,000 sow unit during the first two farrowing cycles.

savaging levels. Our final hypothesis was that by leaving the lights on throughout the night, we would allow sows to be better aware of the movements of their piglets and they would be less likely to be startled and attack the young. Leaving the lights on throughout the night reduced savaging losses by about 40% during the first (all-gilt) farrowing cycle.

We also had the opportunity to study the incidence of offspring-directed aggression among farmed wild boar through collaboration with Université Laval. We videotaped 24 wild boar 'gilts' as they gave birth in well strawed farrowing pens. It has been suggested that savaging is an aberration in maternal behaviour due to the genetic selection occurring in domestic pigs. If such is the case, we would not expect to see savaging in wild boar. We did. Two of the gilts killed piglets, and another six showed some degree of aggression toward their young. On the surface it would seem that the potential for savaging existed in the wild progenitors of domestic pigs. However, in contrast to our study on large commercial units, there was a difference among the three genetic lines of wild boar that we studied with only one showing severe aggression toward their young. The number of animals per genetic line in this study precludes drawing any firm conclusions about genetic factors and savaging, but the results were striking.

During a final study we examined savaging in detail in a limited number of gilts and sows. We videotaped 101 farrowings in conventional farrowing crates and analysed the behaviour of the sows for 12 hours before the birth of the first piglet until the end of farrowing. Aggression toward piglets was observed in nine of the farrowings, although only five females actually killed a piglet. This suggests that some aggression occurs approximately twice as often as a piglet is actually killed. Savaging behaviour always started during parturition (birthing) and was characterized by attempted or actual bites, and shaking or throwing of the piglets. Piglets were attacked when they approached the sow's head or attempted to suckle from the front teats. Females that eventually attacked their piglets were likely to be less settled (more standing and lying activity) before parturition began, and took longer to deliver their piglets. There was only slight evidence that increased human activity in the farrowing room disturbed the sows and increased savaging. We found no difference in genetic lines, or any relationship between savaging and the condition of the sow, litter size or piglet characteristics. Dominant females (they were group housed during pregnancy) were somewhat more likely to attack piglets than were the lower ranking mothers.

The Bottom Line

So what have we learned? A 1000 sow operation can expect to lose about 100 piglets to savaging during its first six months of operation. Gilts savage more than sows, and we now have good evidence that farmers can reduce future savaging deaths by culling gilts who savage. Genetic selection during the process of domestication has apparently had little effect on the incidence of savaging in pigs and, perhaps surprisingly, differences among genetic lines are not common. Some environmental factors seem to affect the incidence of savaging, with continuous lighting reducing the number of piglets killed, and there is some support for the hypothesis that disturbance by humans can increase aggressive behaviour. Savaging is not solely due to events during the actual delivery of the piglets, as females that eventually attack their young are more active during the hours immediately before giving birth. The reasons that sows savage remain somewhat elusive, but this series of studies has clarified some aspects of this intriguing, and sometimes costly, behaviour.

This series of studies represents the research portion of the Ph.D. program of Moira Harris in the Department of Animal and Poultry Science at the University of Saskatchewan. Funding for the research was provided by the Agricultural Development Fund of Saskatchewan. Program funding for the Prairie Swine Centre is provided by Sask Pork, Alberta Pork, Manitoba Pork Council, and the Agricultural Development Fund (Sask.). The collaboration of Heartland Livestock, Quadra Management and Université Laval was much appreciated.

Fibre and Enzymes

Ruurd T. Zijlstra, Ph.D. and John F. Patience, Ph.D

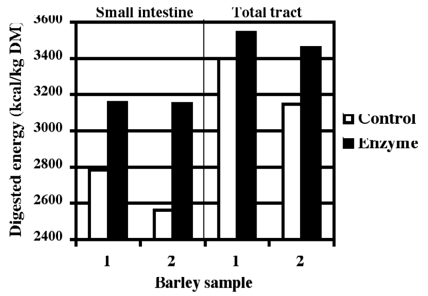
The fibre content of cereal grains is quite variable; for example in barley, ADF (Acid Detergent Fibre) ranges from 4.0 to 8.4%. The ranges in fibre content in barley and wheat have been related to changes in DE (Digestible Energy) content (see for example Centred on Swine, issue Winter 1998). The relationship between fibre and DE also means that DE content may be predicted using fibre analyses. For example, barley DE can be predicted using the equation DE (DM) = 3,918 – 92.8 x ADF (DM), indicating that an increase of 1% ADF reduces DE content by almost 100 kcal/kg. Wheat DE can be predicted using the equation DE (DM) = 3,584 + 38.3 x CP (DM) – 16.0 x NDF (DM). As the equations suggest (– in front of ADF or NDF(Neutral Detergent Fibre)), fibre reduces digestibility of energy and amino acids.

The pig, especially the young pig, has a limited capacity to digest fibre. The pig does not produce enzymes to digest fibre and is entirely dependent on intestinal bacteria to digest fibre. Absorption of the most important nutrients, glucose as an energy source and amino acids for protein deposition, occurs in the small intestine. In contrast, most of the fibre digestion occurs in the large intestine by intestinal bacteria in a process called fermentation. Fermentation of fibre produces volatile fatty acids, which can be used by the pig as an energy source as well, but overall energy utilization via this process is less efficient compared to glucose absorption in the small intestine. Dietary strategies to improve fibre digestibility may result in a shift of fibre digestion from the large to the small intestine, which will improve overall energy utilization.

Specific supplemental enzymes are able to digest part of the fibre complex; for example, xylanase digests xylans in wheat and ß-glucanase digests ß-glucans in barley. Supplemental enzymes may improve digestibility of energy and amino acids for diets high in wheat or barley. However, improvements in animal performance or nutrient digestibility are not consistent among studies. A lack of a response to enzyme may be due to a lower than average dietary fibre content. If xylans or ß-glucans are not a limiting factor for digestion, the enzyme will show a small response.

In a study with grower pigs, two samples of barley (barley 1, 5% ADF, 19% NDF; barley 2, 6% ADF, 22% NDF) were fed with and without supplemental enzyme (ß-glucanase + xylanase). The measured DE content was 3,400 kcal/kg DM for barley 1 and 3,150 for barley 2, and was improved (with enzyme supplementation) 4% to 3,540 for barley 1 and improved 10% to 3,460 for barley 2. Supplemental enzymes thus improved the lower quality barley more than the high quality barley. Supplemental enzymes improved the amount of energy digested by the end of the small intestine for both samples, indicating that overall energy utilization was improved for either barley.

Impact of supplemental enzyme on DE for 2 barley samples



The Bottom Line:

An increase in fibre content in ingredients is related to a decrease in DE content. Supplemental enzymes can be used to reduce the negative effects of fibre on nutrient digestibility; however, their effect will depend on the specific ingredient sample. Ingredient evaluation should thus be integrated with enzyme supplementation to maximize the benefits of enzyme supplementation. Fibre analysis should be an essential component of any grain sample evaluation.

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Assessing Value

How can producers effectively access value? Using a spreadsheet developed at PSCI, producer returns were compared across different packer programs. Table 1 displays individual returns for seven different packers throughout Canada (for a production unit based in central Saskatchewan). It also illustrates the importance of examining all of the components of hog value, rather than any one specific component. Packer rankings change depending on the number of variables assessed. Take Packer B for instance, it has a poor showing when comparing pool price, index and even bonuses. However when transportation is factored into the equation its final rank changes quite dramatically in the final determination.

Furthermore, Table 1 demonstrates the strong differences between packer receipts for the same distribution of hogs. In this example the value of the load varied by $10.38/hog depending on the packer of choice.

The Bottom Line:

All factors need to be considered in order for producers to maximize their returns over time. When managing a highly productive herd it becomes increasingly difficult to improve revenues through further production gains. It is at this point that the marketing strategy pays large dividends.

Graduate Student Profiles

Crystal Levesque

Crystal Levesque

Raised on a chicken broiler farm near Langham, Saskatchewan, Crystal, after starting her family, returned to school as a mature student and earned a B.Sc. (Agr) degree from the University of Saskatchewan, majoring in Animal Science. She is doing a Master's in Animal Nutrition under the guidance of Dr. John Patience. Crystal is studying the effects of site of weaning and dietary energy content on the performance of weaning pigs.

It is generally accepted that the young pig is not growing at its genetic potential primarily due to a limitation in gut size that limits nutrient intake. Due to this limitation in capacity, protein is formulated as a ratio to energy.

Crystal examined the effect of weaning site and dietary energy by comparing three levels of dietary energy (3.35, 3.50 and 3.65 Mcal DE/kg) at on-site and off-site nurseries. Diets were formulated for a Phase III and IV nursery-feeding schedule with 3.50 and 3.10g dlys/Mcal DE, respectively. A total of 262 pigs were used, with experimental diets being fed from 25 to 56 days of age. Performance data was collected weekly. A digestibility study was also conducted on the experimental diets.

The Bottom Line

Results suggest that pigs weaned to an off-site nursery are heavier at 56 days of age than pigs weaned to an on-site nursery; however, site of weaning did not affect the response to dietary energy. Pigs on the low energy diet compensated by increasing daily feed intake such that there was no effect of dietary energy on 56d body weight. The digestibility study showed a higher energy and nitrogen digestibility for the high-energy diets.

Crystal is conducting another study that includes a greater range of dietary energy in weaned pig diets to see if pig-housing density has an impact on the results. She hopes to defend her thesis in the winter of 2002.

Miladel Casano

Miladel Casano

Born in Quezon City, Philippines, and attended the University of the Philippines Los Baños, where she earned her B. Sc. degree in Agriculture. She worked several years for the feed industry before deciding to pursue a Master's degree in Animal Science under the guidance of Dr. Ruurd Zijlstra.

For her M. Sc. research, Miladel's focus is to study the effect of diet composition and feeding level on DE (digestible energy) measurements of barley as fed to swine.

The objectives of Miladel's experiment are (1) to study the effect of diet composition and feeding level on measurements of DE content of barley, (2) to determine if voluntary feed intake differences exist among barley samples fed to grower-finisher pigs and (3) to relate differences in DE measurements to differences in physical and chemical characteristics of barley samples. Four methods of DE measurement and three barley samples were tested with 72 grower pigs. The barley samples were selected based on ADF and NDF content and evaluated using four methods, as follows: restricted access to a standard diet or complete diet and free access to a standard diet, or complete diets.

The Bottom Line

Miladel found that the measured DE content was affected by the method used. Determination of the true nutritional value of barley is important, particularly when differences in voluntary feed intake cannot be explained by DE content alone. A measure of feeding value that takes in to account both DE content and feed intake may be key to predicting performance.

Miladel is currently finishing the statistical analysis and interpretation of her data and hopes to defend her thesis in winter of 2002.

Coming Events

Environmental Management Seminar

October 30, 2001
Prairie Swine Centre Boardroom
1:00 – 4:00
Contact: Ken Engele, 667-7446

Saskatchewan Pork Industry Symposium

November 13 – 15, 2001
Saskatoon Inn   Contact: Wendy Hayes
306-933-5078 (phone) 306-933-7352 (fax)
whayes@agr.gov.sk.ca (e-mail)

Hog Days '01

December 5 & 6, 2001
Brandon, MB   Contact: Brian Cotton
204-726-6357

Banff Pork Seminar

January 22 – 25, 2002
Banff, AB   Contact: 780-492-3236

Swine Behaviour Seminar

December 11, 2001
Prairie Swine Centre Boardroom
1:00 – 4:00
Contact: Ken Engele, 667-7446

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Please send your cheque or money order to:

Lee Whittington, Managing Editor
Prairie Swine Centre Inc. P.O. Box 21057,
2105 - 8th St. E. Saskatoon, SK S7H 5N9 Canada

Tel: (306) 667-PIGS (7447) Fax: (306) 955-2510
www.prairieswine.com