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USA Trip Report

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This article summarises the findings of Roger Campbell's recent trip to the USA.

Introduction

I attended the American Society of Animal Science (ASAS) meetings in Des Moines, Iowa between March 16 and 19 2008 and visited with the production and research managers of two integrated pork businesses in the days preceding the ASAS meetings.

Summarised below is what is currently happening in the USA from a business perspective and some of the more interesting presentations/abstracts from the ASAS meetings. If you want copies of any abstracts from these meetings please give me a call.

The USA Industry

The USA pork industry is struggling due to high feed costs and relatively low pig prices at the moment. Feed costs are some 100% higher than the long term average for the US industry resulting in the COP averaging around 80 cents/LB (\$ 1.89 AUS /kg) carcass weight. The current pig price is around 55 cents/LB carcass weight (\$1.30 AUS/kg) so there is considerable money being lost. Based on the futures markets, pig price is expected to reach 74-76 cents/LB in summer; so a little relief in sight.

The cost of old and new seasons of corn and soy bean meal will depend largely on seasonal conditions and the acreage of each planted in 2008. During my short stay in the US soy bean prices fell in response to South American yield reports but remained near record levels. Grain prices however, remain extremely volatile and could move in either direction when the first estimates of crop plantings are released on Monday March 31. Phosphorus (P) costs have also reached record levels in the USA resulting in the increased use of phytase and readjustment/re-evaluation of P levels in grower/finisher diets.

Despite the losses being experienced by US producers, as of March 2008, there had been no increase in the weekly sow slaughter though packers are gearing up for increased kills in the future.

It is evident from recent benchmarking reports that the profitability/competitiveness of the US industry is most constrained by their "poor" feed efficiency. On a whole herd basis the average feed efficiency of the US industry is between 15% and 20% worse than that for countries such as Denmark, The Netherlands and Canada. The latter however, is not helping the Canadian industry which is in dire straits because of changes (contraction) to their processing industry, reduction in the price offered for pigs and the strength of the Can \$. This is resulting in proportionally more Canadian pigs being finished and slaughtered in the USA.

In response to the cost price squeeze US producers are:

1. Reducing slaughter weights.
2. Using higher levels of Dried Distillers Grains with Solubles (DDGS) the by-product of ethanol production and other by-products in grower/finisher diets.
3. Reducing the energy levels of sow diets.
4. Using higher levels of phytase (up to 1200 units) in grower/finisher diets and adjusting the nutrient availability levels of ingredients accordingly.
5. Trying to renegotiate abattoir (Packer) supply contact prices.
6. Strategically using Ractopamine in the last 21-28 days of growth.

Two vs. three AI doses on reproduction

In a “study” involving hundreds of thousands of sows and conducted over 12 months Sea Board Farms in the USA compared the reproductive performance of their sows mated with two or three doses of semen. They normally use three doses per mating using an AM, PM and AM schedule but investigated an AM/AM strategy due largely to continual staff shortages.

Overall the two dose AM/AM strategy reduced farrowing rate by 2.4% and total and born alive (BA) by 0.11 and 0.10 pigs respectively. Effects seem small but over 200,000 sows a reduction in BA of 0.1 represents a reduction in pigs born alive on annual basis of some 46,000.

Seaboard decided to use the AM/AM (two doses) strategy whenever labour is especially short but to use three doses otherwise. Their goal is to develop a system which permits a single mating per sow.

ASAS Meetings

The ASAS meeting abstracts and presentations covered the “normal” issues including the use of Dried Distillers Grains and Solubles (DDGS) from the ethanol industry in pig diets and of course the amino acid requirements for nursery and grower/finisher pigs.

i) Reproduction and Longevity

A number of presentations dealt with reproduction and longevity or lifetime productivity.

Gilt Development and Life Time Performance

The results of two studies designed to investigate the effects of nutrition between 123 and 226 days of age on gilt performance and subsequent reproduction were reported by researcher from the University of Nebraska. The development treatments (123-226 days of age) involved ad libitum feeding (AL) and a 25% feed/energy restriction (R). The treatments were imposed on two genetic lines.

Restricted gilts were lighter at 226 days of age (131 vs. 123.5 kg), had 33% lower back fat (BF) and a lower loin muscle area (LMA). There was a trend for restricted gilts to wean more pigs and litter weaning weight was significantly increased (AL = 50.7 kg R = 53.6 kg).

At 236 days there were a total of 462 gilts. Of these some 414 attained puberty, 379 were designated as breeders and 296, 176 and 133 had P1, P2 and P3 litters such that only 44.9% of those that had a first litter had a third litter (133/296 breeders).

For one genotype AL feeding increased the number of gilts attaining puberty (91.4% vs. 78%). The feeding treatment did not affect the number of piglets produced over three litters based on breeding

gilts but of females with a P1 litter those fed AL between 123 and 226 days of age produced 2.91 more piglets than those fed R.

Weight and BF at P1 and P2 did not affect the likelihood of another litter. There were interactions between genotype and the effects of LW and BF at 226 days on the likelihood of gilts producing a first litter.

Overall, the results tended to demonstrate the problem of gilt wastage but provided few answers to the problem. It could be concluded however, that there is little to be gained from restricting the feed intake of gilts between selection and breeding.

Factors affecting the likelihood of gilts having a first litter

The results of another experiment 'designed' to identify gilt development traits associated with whether a gilt would have a litter (based on retrospective information) concluded that the factors associated with gilts having a first litter were - wider vulvas, increased vulva swelling, slower growth to 114 kg and "better" front leg side views. A rather useless exercise especially since only 142 gilts were involved in the study and 83% farrowed a first litter.

Changes in the antioxidant status of sows

An interesting presentation was given by Don Mahan (Ohio State University) on changes in the antioxidant status of sows over a 12 month period. The antioxidants measured in serum were the three forms of ascorbic acid (total, ascorbate (active) and dehydroascorbic acid (inactive)), glutathione peroxidase (GSH-Px) and serum Se and Vitamin E.

The effects of dietary mineral source (inorganic and organic) and level (National Research Council - NRC) recommendations and levels above NRC recommendations, parity (1-6), seasonal effects and day of pregnancy/lactation were assessed for each antioxidant.

Serum antioxidant levels remained relatively constant to day 80 of gestation and fell thereafter through early lactation. The declines were in the order of 50% indicating sows are under oxidative stress in later gestation and in early lactation.

Parity 1 sows had higher antioxidant levels than older sows and all sows showed lower antioxidant status during the warmer months. Neither the source nor mineral level had any effects on serum antioxidant status.

The results suggest that sows are more vulnerable to oxidative stress in late gestation and early lactation due to lower antioxidant status and this may be associated with sow mortality. The results also 'support' the concept of strategic diet and other interventions to enhance the antioxidant status of sows.

DDGS and lactation diets (University of Missouri, Columbia)

A total of 155 multiparous PIC Canborough sows were used to assess the effects of including 0, 10, 20 and 30% DDGS in the lactation diet on lactation performance and on subsequent reproduction. The diets were formulated to contain the same energy and amino acid levels and were offered ad libitum through lactation.

All sows received gestation diets containing 10% DDGS and the experimental diets were offered starting day 112 of gestation through to day 19 of lactation. Average feed intake in lactation was 6.7 kg /d and was unaffected by the dietary treatments.

Interestingly (and commercially unusual) sows on all treatments gained weight during lactation and this was linearly and positively related to the level of DDGS included in the diet. The weaning to

remating interval and the number of sows mated within 10 days also improved linearly with increasing dietary DDGS level. Neither weaning weight nor subsequent litter size were affected by the diet offered during lactation. Total born for the subsequent litter averaged 13.5.

The experiment was conducted in the “new” (now over 12 months old) lactation facility used by Missouri researchers. The facility is located in Illinois and is temperature controlled and obviously “well” managed since it is unusual to have sows gain weight during lactation. The latter is of concern to the researchers using the facility and they are now limit feeding lactating sows to simulate “commercial” conditions. Nevertheless, the results showed that the weaning to remating interval declined from 7.4 to 5.5 days in response to increasing weight gain in lactation. Similarly the percentage sows mated within 10 days of weaning increased from 85% to 95% in response to increasing weight gain in lactation further demonstrating that weight and body composition changes in lactation are keys to subsequent and overall reproduction in sows. The results are summarised in the table below.

<i>DDGS Level in lactation diet (%)</i>	0	10	20	30	<i>Significance (P)</i>
Lactation feed intake (kg/d)	6.9	6.7	6.3	6.5	NS (P> 0.10)
Sow weight gain (kg)	6.5	3.7	8.7	17.7	P< 0.06
Wean -remating (days)	7.4	6.3	6.0	5.5	P<0.06
Sows mated within 10 days (%)	85	91	93	95	P<0.06
Total born in subsequent litter	13.9	13.6	12.2	14.1	P> 0.09

The results also suggest the energy level of DDGS for sows is likely higher than assumed and probably should be established.

Creep Feed and post weaning performance

The results of two experiments were presented by researchers from Kansas State University.

In the first experiment lactating sows were offered feed ad libitum and at 75% of ad libitum intake and the litters were offered creep or no creep feed from day 3 to day 21 of lactation (weaning).

Sows fed restrictively lost more weight during lactation and produced litters of lighter weight than those offered feed ad libitum. The number of sows exhibiting oestrus within 14 days of weaning was also higher for ad libitum compared to the restrictively fed sows (90% vs. 71%).

Sow weight and fat loss was not affected by creep feeding though the researchers reported that creep feeding extended the weaning to remating interval (5.4 vs. 4.9 days).

Creep feeding tended to increase litter weaning weight by reducing mortality after cross fostering (3.9 vs. 7.3% P = 0.06). Piglet weaning weights were however, similar between the two treatments.

Creep feeding per se had no effect on post weaning performance though pigs identified as eaters before weaning did exhibit marginally faster (P=0.06) growth rates between 0 and 28 days post weaning than non eaters or control piglets (0.39, 0.37 and 0.37 kg/d).

In a second experiment the researchers investigated the effects of creep feeding starting at 7, 13 and 18 days of a 20 day lactation on creep feed intake and the proportion of pigs identified as eaters (based on the appearance of chromic oxide or green colour in the faeces) before at weaning. The duration of creep feeding had no effect on piglet weaning weight and the authors did not report results for pre-

weaning mortality so it would be safe to assume there was no positive effect of creep feeding. Litters offered creep feed for 13 and 6 days consumed more creep feed than those offered creep feed for two days only. However, the percentage of eaters was only increased by 10% (from 70 to 80%) when the duration of creep feeding was extended from two to 13 days.

The results have to be interpreted carefully since litter size was standardised to 12.5 piglets which might be expected to stimulate creep feed consumption.

The researchers reported that piglets of heavier birth weight were more likely to be eaters than those of lighter birth weight and some 77% of the creep feed consumed by litters was done so in the last 7 days of lactation.

Interesting results but the commercial implications remain questionable.

Effects of administering bovine colostrum extract (BCE) on the performance and liveability of disadvantaged pigs in commercial facilities

Researchers at the University of Minnesota selected the two smallest piglets with weights above 680 grams (average initial weight of 1.1 kg) from each of 165 litters. One piglet from each pair was administered an oral dose of 2.0 ml of a bovine colostrum extract (BCE-first Pulse D) within 24 hours of birth. The other piglet was allocated to the control group. The piglets were weighed at day zero and day 18 (weaning). Blood samples were also taken on days 0, 7 and 18 and the serum analysed for the acute phase proteins haptoglobin (Hp) and alpha -1 acid glycoprotein (AGP).

Pigs treated with BCE were significantly heavier at weaning (5.32 vs. 5.08 kg) and had significantly higher serum Hp levels at weaning than their control counterparts (647 vs. 180 ug/ml). Mortality was similar for the two treatments.

The results suggest the use of bovine colostrum extracts may have the potential to enhance the pre weaning performance of at risk piglets and may also have application for gilt progeny.

ii) Effects of birth and weaning weight on life time performance

There were five abstracts on the effects of birth and weaning weight on life time performance and carcass traits.

Mashoff Farms

In a retrospective analysis of a genotype study conducted by Mashoff Farms in Illinois 5,390 piglets with individual birth weights were divided into four quartiles based on birth weight and their subsequent performance and carcass traits analysed.

Pigs were weighed individually at weaning and at eight and 20 weeks post weaning. All carcasses were also assessed for weight, P2, Loin depth and lean percentage.

The quartiles and average weights at birth weaning and 20 weeks post weaning are shown in the table below.

BW quartiles and average pig weights	0.63-1.36	1.36-1.59	1.59-1.86	1.86-3.15
Birth (kg)	1.1	1.5	1.7	2.1
Weaning (kg)	5.7	6.3	6.7	7.2
20 weeks post weaning (kg)	107.3	113.5	116.3	119.5

In general the relationship between birth weight and subsequent performance parameters was positive but low. The relationship between birth weight quartile and subsequent weight and growth rate during each period was cubic.

Birth weight quartile had no effect on P2 fat thickness or carcass lean however, pigs in the lightest quartile had the greatest percentage ham ($P < 0.05$) and the lowest percentage belly.

Prairie Swine Centre

Researchers from the Prairie Swine Centre assessed the effects of litter size (three groups with litter size ranging from 3-8, 11-13 and 14-19 pigs born alive) and birth weight (four quartiles- 0.8-1.2, 1.25-1.45, 1.50-1.70 and 1.75-2.5 kg) on performance to 120 kg and on carcass quality. A total of 98 litters and 1114 pigs were used in the study. Piglets with birth weights below 800 gram were not included in the analysis.

The authors reported that litter size per se had no effect on pig performance or carcass quality and that there was no relationship between birth weight and birth order.

Otherwise the effects of birth weight on postnatal performance were similar to those reported from the Illinois study. The effects of birth weight quartile on post natal performance are summarized in the table. Whilst birth weight affected weaning weight and weight compared at the same age through the study the effects of birth weight on performance compared over the same periods of growth (e.g. from 5 to 7 weeks of age) were small and similar for the three heavier quartiles.

BW quartiles and post natal performance weights	0.8-1.2	1.25-1.45	1.50- 1.70	1.75-2.50
Weaning (kg)	5.48	6.30	7.04	7.68
7 weeks post weaning (kg)	29.6	31.8	33.8	34.7
Days to market (120 kg)	159.3	154.9	152.3	149.6
Growth rate 5-7 weeks post weaning (g)	680 b	710 a	730 a	730 a

Neither birth weight nor litter size significantly affected carcass lean or fat content or back fat thickness. There were small but significant differences in intra muscular fat with pigs in the lightest quartile having the highest level of intra muscular fat.

North Carolina State University

In a separate study conducted in North Carolina State University 1472 piglets were used to assess the effects of birth weight on life time performance and survival.

The results showed that a 1.0 kg increase in birth weight increased weaning weight by 0.53 kg ($P < 0.01$) and weight at sale by 6.25 kg ($P < 0.01$). The probability of survival to sale and the likelihood of a pig being a full value animal at sale were also positively related to birth weight. Neither back fat or loin depth were affected by birth weight

Purdue University

A study at Purdue investigated the effects of weight at 21 days of age (weaning) and the diets offered after weaning (conventional and low crude protein - low P diets to minimise nutrient excretion).

The relationships between weaning weight and late finishing body weights and days to 125 kg differed between dietary treatments. For pigs offered the low nutrient excretion diets the relationships were non linear. For control pigs the relationships were linear. For control pigs a 1.0 kg change in weaning weight and at 7, 14 and 28 days post weaning was predicted to reduce days to 125 kg by 3.71, 3.99, 3.30 and 2.26 days respectively. Increasing the weaning weight of the lightest pigs fed the low nutrient excretion diets had a greater impact on subsequent live weights than increasing the weight of the average or heavier pigs at weaning.

The results of the three papers suggest birth weight has a greater effect on subsequent and life time performance than weaning weight though the latter is more likely to be manipulated using technologies such as artificial colostrum than the former -though we should continue to concentrate on birth weight.

iii) Dried Distillers Grains and Solubles (DDGS)

A session on DDGS comprised 15 presentations but not a lot of new information. The nutrient availability from DDGS is now well established and can be obtained through the University of Illinois (web site <http://www.uiuc.edu>) and the University of Minnesota web sites (<http://www1.umn.edu/twincities/index.php>)

Researchers from Purdue University reported the proximate analyses, DE, ME, NE and standardised and apparent ileal digestibility of all essential amino acids for corn DDGS. On a DM basis the GE, DE, ME and NE values were 17.1, 11.4, 10.46 and 7.5 MJ/kg respectively. These values seem low compared to those published by others and probably due to the fact that the DDGS (corn distillers meal actually) contained only 4% ether extract. Amino acid SID and AID values are published in the abstract.

Between and to a lesser extent within processor variation remains a 'problem' with diet formulations using DDGS but there are now few plants that haven't been evaluated and the better sources of DDGS identified.

In a summary of all experiments reported to date on the effects of sorghum, wheat and corn based DDGS, Hans Stein (University of Illinois) concluded that DDGS can be included at 20-30% in the diets for all classes of pigs with no or minimal adverse effects on animal performance.

Using pelleted feeds, Stender and Honeyman (Iowa State University) reported that including 20 or 40% DDGS in diets offered pigs with an initial weight of 74 kg for 42 days had no effect on final weight or carcass lean content. In contrast pigs offered the pelleted diets with 40% DDGS exhibited significantly better feed efficiency than pigs on the other two treatments during the experimental

period. Pellet durability declined as the level of dietary DDGS increased whilst the iodine value of back fat increased; an indicator of oxidative rancidity. The results suggest that pelleting may enable the level of DDGS to be increased in diets for finisher pigs though the effects on pellet durability would need to be considered at the commercial level.

Feoli et al (Kansa State University) reported that expanding corn soy diets and corn soy diets containing 40 % sorghum or corn DDGS improved the growth rate and FE of weaner and grower pigs and the FE and dressing percentage of finisher pigs. In general pigs offered the diets without DDGS exhibited faster and more efficient growth than those offered diets containing DDGS though the differences were reduced when the DDGS based diets were expanded. The scientists also reported that for finisher pigs the greatest improvement in performance associated with expansion were for the diets containing sorghum DDGS.

A number of presentations concentrated on the use of saturated fat in diets containing 20-30% DDGS. Overall, adding fat to the diets improved FE but did not overcome the adverse effects of DDGS at high levels on dressing percentage or iodine value.

The current grain price situation in the US is forcing/encouraging greater use of DDGS and the economics are changing given the tendency for most businesses to reduce slaughter weights. On the other hand DDGS price is of course tied to that of corn so the savings offered by the use of DDGS is somewhat limited.

iv) Nutrition

a) Valine and nursery pigs

Dr Arron Gaines from Mashoff Farms reported that the essential amino acid valine was more limiting in the diets for pigs between 8 and 12kg and 12 and 20kg than tryptophan or isoleucine. In diets containing 0.625% synthetic lysine (L Lysine HCL), Gaines determined the True Ileal digestible (TID) the full form of acronym? valine requirement for pigs 8 to12 and 12to 20kg to be 0.92 and 0.78% respectively .The latter levels corresponded to a TID valine :TID lysine ratio of 0.65.

The implication from the results is that as the price of synthetic valine declines synthetic amino acids can be used to replace fish meal and blood proteins in the diets for nursery pigs. In an economic analysis it was shown that depending on the levels of fish meal and blood proteins used in phase two and three nursery diets the use of synthetic valine (and other essential amino acids) reduced feed costs between \$20 and \$50/tonne.

b) Glycerol

The results of two experiments designed to investigate the effects of glycerol on the performance of nursery pigs and on pellet mill production parameters were presented at the meetings.

1. Effects on performance and the pelleting process

In an experiment conducted at KSU the effects of 3 and 6% glycerol on the performance of pigs over 26 days starting at 10.9 kg was compared with a corn-soy control diet and diets containing 3 and 6% soy oil or 6 and 12% of a glycerol -soy oil blend.

Growth rate increased linearly with glycerol addition while adding soy oil or the combination of oil and glycerol improved feed efficiency. The addition of glycerol to the diets before pelleting also improved pellet quality and decreased the energy cost of processing.

2. Effects as a replacement for lactose

In a separate experiment conducted at Missouri, researchers compared the performance of nursery pigs offered a four phase diet program with lactose levels of 20,15,10 and 0 % in phases 1,2,3 (to day 21 post weaning) and 4 respectively against a negative control diets (zero % lactose) and diets containing 6% glycerol. In a second experiment performance was compared for pigs offered control diets or those containing 6% glycerol.

In the first experiment pigs offered the negative control diet and those containing glycerol ate less feed and grew slower to 21 days than those offered the positive control diets.

In the second experiment glycerol had no adverse effects on growth performance.

The researchers concluded that glycerol is probably not a replacement for lactose in the diets for pigs during the first 21 days after weaning but can be used as an energy source for nursery pigs at levels to 6% without adverse effects on growth performance.

v) Effects of fibre and grower/finisher performance

The results of two experiments to investigate the effects of including 30% soy hulls or 30% wheat middlings in corn-soy diets on the performance and carcass composition of grower and finisher pigs offered feed ad libitum for 28 days and starting at 25.4 and for 35 days starting at 84.8 kg respectively were reported by researchers from the University of Illinois and The Prairie Swine Centre (Canada).

During the grower phase including soy hulls or wheat middlings in the diet significantly reduced growth rate and feed efficiency. Including the two fibrous materials in the diets also reduced dressing percentage, carcass weight and total and percentage fat in the carcass.

For finisher pigs including the two fibrous materials in the diet had no effect on growth rate or feed efficiency or carcass weight. Interestingly the concentrations of fat and protein in the carcasses of finisher pigs was unaffected by the dietary treatments but the total concentration of fat was significantly higher in pigs offered the control diet (41.45 kg) than pigs offered the soy hull (35.0 kg) or wheat middling (36.7 kg) diets.

The results suggest higher levels of fibre (lower DE) can potentially be used for finisher pigs to reduce feed costs though the difference in carcass and total body fat reported here needs to be investigated further and maybe even confirmed. I will also follow up with the authors to obtain the DE and NDF levels of the experimental diets.

vi) Boar taint - Swiss study

A study reported by Swiss researchers indicated that the meat from boars slaughtered at 105 kg had a surprisingly high acceptance by a trained taste panel compared to castrates.

The study which involved boars, castrates and boars offered diets containing raw potato starch for the seven days prior to slaughter was conducted in view of a recent Swiss home use test which revealed a high acceptance of pork from boars and the fact that surgical castration without anaesthesia will be banned in Sweden in 2009.

In the study the meat from the neck and loin was used in a taste test in which sensory scores for boar odour and flavour were ranked from 1 (no boar taint) to 10 (obvious boar taint/flavour).

Boars grew slower, ate less and were more feed efficient than castrates. Boars also produced carcasses with 4.3% more lean than castrates.

Sensory scores were lower in the loin than the neck ($P < 0.05$) and were higher ($P < 0.05$) in boars than castrates by some two points but all values/averages were below 5. Including raw potato starch in the diets offered boars in the seven days before slaughter significantly reduced the skatole level (0.22 vs. 0.85 $\mu\text{g/g}$) but had no effect on androsternone level or on sensory scores.

The authors were surprised by the relatively low sensory scores for pork from boars and “believe” the production of intact males may be an alternative to castration. The consumer doesn’t seem to be overly concerned (based on results of home use test) but Swiss processors are yet to be convinced and fear a decline in the consumption of pork due to “boar taint”.

Disclaimer

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