SPESFEED NEWS

Summer Edition February 2009

General News

This newsletter marks the 20th anniversary of SPESFEED as an entity. I can assure you that no one is more surprised by this event than Walter and I. Much has changed during the 20 years that we have been active as independent nutritionists, not only in terms of agribusiness, but also in terms of the way in which we conduct our own business.

From an animal production point of view, the genotypes that we are required to feed have continuously improved. In broad terms, or animals now require more protein in their diets relative to energy to meet the requirements for improved growth and egg production. The other significant change has been the consolidation of production into fewer, ever-larger companies. In terms of broiler production, seven companies now produce 78% of South Africa's broilers, with other smaller producers being responsible for the remaining 22%. This has created opportunities for skilled operators in niche markets.

Lastly, and perhaps most significantly, the liberalisation (if this is the correct term) of world markets (free trade) has meant that the comfortable situation of the Maize Board setting the selling price on an annual basis are over. Supplying our businesses with reasonably priced grain (reducing the risk) has become a specialised and full time job for many people.

The changes that have occurred in the way in which SPESFEED works may seem trite by comparison. Computing is probably the area that has changed the most. My very first notebook was a Bondwell 80286 with a 20 Meg Hard drive. It cost R 12 000 (1989 Rands). It took nearly 20 minutes to solve a simple Multi-Mix problem. Solving the same sort of problem now takes hundredths of second – all in full colour – on a machine that costs far less than R 12000 (2009 Rands). Other things that have changed are the looming demise of the fax machine, the coming of cell phones and of course the internet with its instant broadband connectivity, wherever you happen to be. This means that our business has become largely email driven (which may or may not be a good thing), but it has also given us access to libraries of information not previously available.

In short, the claim that technology is making us 3 to 5% more efficient each year is probably not far off the mark.

We would like to thank our all our clients in particular, but also the numerous people in our industry as a whole who have supported SPESFEED and its endeavours for the past 20 years.

I have waited 20 years to visit the famous World Poultry Exposition that takes place in Atlanta each January. This year my chance has finally come, and I will report on the trip that Peter Fisher (from DSM) and I made to Atlanta in some detail in this newsletter.

Inside This Issue

US Costs and Performance.

Each edition of the Poultry Informed Professional, published by the University of Georgia and edit by South African Steve Collett, carries a summary of US broiler performance. I have "translated" these results into the metric system and SAR. The results are from August 2008, and I used an exchange rate of ZAR 7.5/US$, which is what it was at that time.

Feed Cost R/ton	2742
FCR	1.85
Weight at 42 days (kg)	2.08
Slaughter Weight (kg)	2.71
Chick cost (Rand)	1.74
Vac-Med cost (Rand)	0.35
Mortality (%)	3.92
Stocking Density (birds/m^2)	13
Yield (kg/m^2)	34.20
Downtime (days)	14

Training of Nutritionists

The article on Nutritionists in the last edition of the SPESFEED News elicited more response than any other we have ever carried. None of the responses was negative; mostly the people who spoke to me are as concerned as I am about the lack of skills in our profession. I would remind you that I simply changed an article by Terry McKenzie-Hoy, published in Martin Creamer's Engineering News, to reflect our industry.

This brings me to the next point. The September issue of the Poultry Bulletin contains a series of articles about the skills shortage in animal agriculture, the drop in training standards and the poor quality of students graduating from higher education institutions. I have a number of thoughts in this regard which are probably worth sharing.

I do not believe that the standard of training which our University students are receiving has declined. It may be true that graduates "cannot write an essay", but this is hardly any University's fault – rather that of the school system. I believe that in Animal Science, standards are higher and that the course contents have mostly been expanded and updated (with the exception of Biometry, where students' lack of skills is cause for concern).

Some people are concerned that the training is not entirely appropriate for our industry. Whilst this comment may be partially true, it must be seen in context. For example, training someone to fulfil the role of a formulator is not something that Universities can realistically be expected to do. We all know that it takes months - even years before a formulator has adequate experience to be left on his/her own. Perhaps ensuring that our graduates are well grounded in the sciences of biochemistry, physiology, nutrition, genetics and statistics is what is required. In addition, they should be exposed to concepts such as feed formulation and they should have some basic business management training. It is unrealistic to expect students to have industry specific skills – after all, each and every job description differs.

We need to guard against the old attitude of- "in our day we used to walk 10 miles to school". I think that it is human nature to remember the good and not the bad, which is why we all remember how brilliant our class was, compared to the youngsters of today. Just ask yourself how many of your University classmates are still in animal agriculture, and try to remember where the rest have landed up. It will bring you down to earth with a bump.

I was recently an external examiner of final year students at TUKS. I was delighted to see just how good some of the students were and how much effort they had put in to their studies. True, there were students that disappointed as well. In short, I believe that there have always been both good and mediocre Animal Science graduates, and this is not something that the University system is ever likely to overcome.

Oscar Blanco from the University of KZN makes a couple of interesting points. The first is that as students have become less privileged, so students that are less academically inclined have entered the system. This is not anything new. For years, universities have been full of students who believed that a 51% pass was wasted effort, as the

additional 1% was more than required. It is true however that "students from previously disadvantaged backgrounds may have lacked the stimulation required to fully develop their academic inclination", and this is something that Universities will have to address.

The point remains, there are many less academically inclined students at universities, and I would suspect they may turn out to be "disappointing" graduates. I agree whole-heartedly with Oscar when he says that there is a difference between what the university expects and what the students are able to do. He suggests that teaching methods need to be adapted to bridge this divide. Mature teachers, are required, who are trained to teach students in a way which transcends the traditional lecture and note taking model still widely prevalent at universities.

Is it not a little ironical that to teach at a high school, teachers are required to have a formal teaching qualification, yet university lecturers are not?

In conclusion, I believe that as an industry we should guard against expecting every university graduate to slot into a position and function efficiently from day one. This will never happen. However, by adapting (improving) teaching methods, universities may well be able to produce a higher proportion of students that will perform adequately.

Rick Kleyn

Fibre in Layer Diets

Crude Fibre has no direct nutritive benefit in poultry nutrition and has largely been regarded as `useless roughage´. Experience in countries that use high fibre ingredients would suggest that fibre is by no means harmful to poultry. Rather, there is a growing body of evidence showing the opposite. There are indications from research and practical experience suggesting a positive effect on faecal consistency (gut health), litter quality, improved animal welfare and even improved performance.

In the October 2008 edition of Lohmann Information, Robert Pottgüter of Lohmann Tierzucht GmbH, wrote a thought provoking article on the feeding of fibre to laying hens. I have tried to encapsulate his ideas here.

The term fibre or 'crude fibre' describes different structural plant materials that are insoluble in diluted acids and lye's and form a diverse group of poorly digestible or indigestible feed constituents. This may be the reason why fibre has a poor reputation in poultry nutrition.

By-products of cereal processing such as wheat bran are particularly high in fibre. Some cereal varieties such as wheat, rye and maize contain little fibre, whereas husky cereals like oats and barley have higher fibre contents. Sunflower products are also high in fibre.

Crude fibre forms a part of all poultry diets that contain plant derived ingredients. Crude fibre should form part of the information for all poultry formulations. The question which needs to be asked is whether there is a need or desire for targeted intervention by manipulating the crude fibre content of the diet?

Despite negative reputation that fibre has, it is simply not true that fibre forms a negative element (of the diet), neither has it any adverse effect on layer productivity. Rather, increasing the crude fibre content of the diet while maintaining a constant energy level (through using fats and oils) improves the acceptability of a meal-type feed for hens and binds dust. The higher energy contribution from fat and oil provides numerous nutritional benefits for high-producing laying hens.

Very often it is found that rations with higher fibre content, i.e. more than 3.5 – 4.0% (up to 7%), stabilise the gut, resulting in drier litter, especially in non-cage systems. Even in battery systems a more stable gut situation will reduce the proportion of dirty eggs (Ed: this is not always the case with the fibre contained in sunflower).

Reports suggest that layer rations with higher fibre content can reduce the ammonia concentration in the air. This has a positive effect on the health of the birds and improves working

conditions in poultry houses. Excessive ammonia levels are a frequent problem especially in floor systems. Practical experience would indicate that diets with higher fibre content have a favourable effect on laying hens in non-cage production systems. This observation has been confirmed by recent scientific studies.

Dietary fibre is of key importance during the pullet rearing (approx. weeks 9 – 16). Provided the development of the chicks during the starter phase (up to week 8) was successful, a nutrient-reduced ration can and should be fed during the pullet phase in order to enable the pullets to grow slowly into physically and sexually mature laying hens. Nutrient reduction refers to the protein and amino acid content rather than the energy content. If available, ingredients with a lower nutrient density and higher fibre content could be introduced into the ration.

A higher fibre content in pullet feed (e.g. above 5.5%) also helps the young birds to get used to eating a larger volume of feed. The inclusion of high fibre components (e.g. cereal by-products) slightly reduces the specific weight of the feed, forcing the pullets to spend more time eating. Training pullets for a high feed intake capacity during rearing is the key to adequate feed intake at the start of the laying period. Undernourishment of hens during this phase may also cause poor performance and health problems, such as fatty liver syndrome.

Scientific trials have shown that an increased dietary fibre has a favourable impact on behavioural characteristics of hens by reducing the tendency to aggressive pecking and cannibalism. There is also a direct correlation between dietary fibre and maintenance of an intact plumage.

A question that is still not entirely unresolved is the impact of fibre, if any, on the gut flora. We know from other species that the gut flora can be influenced by stabilising it through nutrition and diet, but very little research has been done in this area with poultry. A healthy, species-specific gut flora is essential for stable digestion and efficient nutrient absorption. It also forms the basis of the body's ability to fight infections.

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Nutritional Issues Facing the Swine Industry

At the 2008 Midwest Swine Nutrition Conference, Barton Borg of Murphy Brown addressed this issue. I have briefly encapsulated his paper.

Feed ingredient prices have increased dramatically during the last two years and we have likely reached a new plateau for major ingredient prices. We are now in a new environment relative to past feeding practices, priorities and paradigms. As past sources of feed energy become diverted to other uses it becomes increasingly important that our methods focus on extracting every bit of value out of feed ingredients. An improved understanding of the feed and ingredient processing opportunities allows for optimization of nutritional strategies.

Grain micron size: Determining the optimum particle size for grain used in swine diets has many decision points. For example, depending on genetics, health of the herd, feeder type, grain processing equipment (i.e. roller mills or hammer mills) and in some cases opinion relating to potential ulceration problems with reduced micron size, the micron size target may differ. Many of the factors listed above are not well defined relative to the financial impact over a changing micron size of grain. However, the feeding value of corn at various micron sizes has been defined and presents itself as an opportunity for evaluation and cost improvement.

Wondra et al., 1992 evaluated the effect of micron size on pig performance and nutrient digestibility in finishing pigs from 56 to 115 kg of body weight. Digestibility of dry matter, nitrogen and gross energy improved linearly ($P<.05$) as micron size was reduced. This impact, when related to potential improvement in feed conversion due to improved dry matter digestibility, results in reduced feeding cost. There is also a cost of processing corn to a smaller micron size. For example milling to 1000 microns (1 mm) requires 2.42 kWh per ton whereas milling to 400 microns requires 7.52 kWh/ton.

As would be expected, as costs of the ingredients increase, the value of improved utilization of the ingredient becomes more important. Despite this, milling maize to 400 microns as opposed to 600 microns, the increased value of the maize is about $ 2.80 per finishing pig. The extra milling cost was only $ .08.

A gap in the current methods used to describe the energy value of corn is the fact that very few, if any, references provide a benchmark to the micron size of the corn used as the energy value was derived. This may be looked at as insignificant as a 200 micron change in corn would only move metabolisable energy estimates by approximately 3%. However, with the black and white decision making properties of least cost formulation, an energy value change of this magnitude is substantial.

Pellet Quality: The debate about pellet quality continues. The cost of pelleting has increased due to rising energy costs and it is important that we consider the value of pellet quality in the context of optimizing rather than maximizing the production system.

Stark *et. al*, 1993 described the value of reducing feed fines presented to the pig through increased pellet durability/quality. There was a linear decrease in FCR (P<.1) as the percentage of fines in the diet increased. At a level of approximately 20 to 25% fines the value of pelleting is significantly reduced. In a study at Murphy Brown, it was found that feed conversion deteriorated with increasing fines in the diet up to a plateau at approximately 50% fines.

Understanding the value and costs associated with pelleting and optimizing the system is key to making the correct decision.

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IPE – Atlanta 2009

In January, I attended the International Poultry Exposition in Atlanta for the first time. This show now incorporates both poultry and feed components. It is preceded by the International Poultry Scientific Forum (IPSF), which I also attended. I was not aware of too many South African delegates, but did see some old friends, including Dave Burnham, on some of the stands.

IPSF

As with many modern conferences, the IPSF ran with a number of sessions being held concurrently. This makes it difficult for anyone to cover the entire event. I attended three of the four nutrition sessions (two of which overlapped), and studied the abstracts and posters of many of the other papers that were presented. The format of the conference is a series of 15-minute papers, which works very well if the presenter really knows the subject. Many of the presenters however were young post-graduate students on their first "outing", so the standard of the papers was a bit variable.

Much of the conference appeared to involve discussion on the various aspects of enzyme nutrition. Although some of the work was repetitive, I certainly learnt a fair amount.

Dr E Moran of Auburn University presented the paper that I found to be the most interesting. The published abstract did not fully cover the talk, and I have had to rely on my hand written notes (Dr Moran does not have a full written paper available).

It was pointed out that the amount of egg (size) determines energy, protein, and Ca-P remaining for reserves during post-hatch development. Thus chicks hatched from older flocks are likely to be at an advantage. In their natural state chicks derive a digestive advantage from diverse enzymes (not to mention bacteria) assumed with coprophagy of hen ceacal excreta while in the nest and thereafter.

An experiment was conducted which compared males hatched from eggs of Ross 708 breeders at 25 vs. 65 wks of age. The birds were vaccinated for coccidiosis (CocciVac D®) and placed on used litter (25 chicks/pens-64 total). Pelleted control diets were based on corn, soybean meal, poultry fat, limestone and Dicalcium Phosphate to supply generally accepted nutrient requirements during 0-3, 3-6, and 6-8 wks periods. Trial diets containing reduced energy, available phosphorus and calcium (0.4 MJ/kg of ME, 1 g/kg of AvlP and 1 g/kg of Ca) were also formulated. An enzyme composite containing Amylase (400u), phytase (5000u), protease (4000u), and xylanase (300u) was prepared to simulate microbial contributions by coprophagy.

The chicks from 25 wk breeders weighed 33g while those at 65 were 46g. Differences in live weight and carcass composition could be attributed to breeder age, but femurs had similar breaking strength regardless of hen age.

Reducing dietary specifications had a small adverse effect on live performance, regardless of breeder age, with the exception of mortality. Losses were extensive during the last period (6 to 8 weeks) in the case of birds from young breeders. When processed, the birds fed on the low nutrient diet had reductions in carcass weight, abdominal fat, skinless boneless meats. *Inclusion of the enzyme composite increased live weights and relieved all mortality*. Enzyme addition also led to yield increases in carcass, abdominal fat and fillets while femurs were strengthened. These changes were the most dramatic in the case of the birds from young parent flocks and that the variance attributable to breeder age and nutrient level can be relieved by including a complementary array of enzymes to the feed.

Dr Moran is of the opinion that it is the phytase enzyme that has the greatest impact and that the complimentary enzymes play an important role in aiding and abetting gut maturation and enteric balance – creating an environment in which phytase can best function. Dr Moran also made an interesting comment that the protease enzyme included in the diet would most likely have the greatest impact on structural protein, which would yield amino acids such as valine and isoleucine, rather than lysine.

A few more interesting points were made regarding phytase. Dr Nelson Ward of DSM made the point that 66% of phytase activity occurs in the crop and proventriculus of the chicken, which is where the pH is the lowest in the gastro intestinal tract of the chicken. When chickens are meal fed (i.e. on intermittent lighting programs) feed tends to remain in the crop for longer, but it was not possible to say that this had an impact on the efficiency of phytase utilisation.

Dr Su of Genencor Enzymes in Denmark presented a highly technical paper on how phytic acid (the form in which most plant phosphate occurs) inhibits pepsin catalysed protein hydrolysis. This would in part explain why the inclusion of phytase in the diet (which breaks down phytic acid) results in improved protein utilisation.

Dr Kurt van de Mierop of Nutrex in Belgium gave an excellent presentation on the aribinoxylans that occur in the diet, the bacterial endoxylanase enzymes that are available, and how to formulate practical diets using these enzymes.

The level and characteristics of the Non Starch Polysaccheride (NSP) in a feed, determine its anti-nutritional effect, making these parameters crucial when estimating the effective energy of added NSP-enzymes.

Arabixylans, the most important NSP structure can be split into two broad classes, water extractable (WE-AX) and water-unextractable (WU-AX) fractions. Each fraction contributes to the overall anti-nutritional effect in a different way. Nutrex, using in house broiler trials with diets with different levels of WE-AX and WU-AX wheat and/or maize based) have shown that the increase in AME is correlated with the level and type of AX. AX-dependant enzyme energy factors were calculated and put in the prediction model:

AMENX (kcal/kg) = AME + (100*WE-AX (%)) +(25*WU-AX (%))

The model was validated using diets containing sorghum (very low in WE-AX) and rye (high in WE-AX) and was found to accurately predict the energy "upgrade" when using their enzyme.

Four papers discussing the use of DSM's protease enzyme were presented. While all of the results were positive, it was not clear to me how best to use the product in practice.

IPE

The IPE started on the Wednesday. The event takes place in two of the biggest indoor venues I have ever seen. One hall was taken up by poultry (broiler) processing equipment, while the other hall focused on chicken farming (both broiler and eggs) and feed milling equipment. Many of the companies represented at the show we are all familiar with. For example, Big Dutchman and Cumberland on the equipment side, Aviagen, Hubbard, Hy-Line and Cobb representing the breeding companies and so on. I thought that I would only mention those items that I felt were innovative or interesting.

On the meat processing front, Marel Food Systems have developed an in line X-ray detector for identifying bone fragments in poultry cuts (breasts). This leads to better product, less rework and less cutting loss (the exact location of bones are shown).

The packaging equipment on show was interesting; with a whole range of form fill machines being shown. Form fill machines make the "bags" in line and can be filled with inert gas to increase shelf life. Innovative packaging and products were everywhere to be seen.

Two different companies had robotic packing machines on show. These machines are able to select a cut (breast, thigh, or drum) from a moving conveyer and then pop them into a bag in the correct ratios. They were the sort of thing that you could just stand and watch all day.

The automatic hand washer on display was interesting. Factory workers simply walk up to the machine and put their hands into the twin holes, and 10 seconds later they have been sprayed with an anti-bacterial soap and rinsed off again. The beauty of the system is that nothing needs to be touched and the manufacturers claim a 99.9% kill of all harmful pathogens.

On the poultry production front, it was interesting to note that Big Dutchman now make a female broiler breeder feeding pan which can be set to different widths (38 to about 45mm I think). I looked at all the other pans on show and did not see a similar innovation.

I was impressed by a simple hanging scale that weighs birds in-house, produced by Farm Weigh Systems. The scale includes a data logger, so all weights can be downloaded to a PC for evaluation. These scales were not very expensive and I think they would a useful asset to farm managers and feed millers who want to monitor the performance of a particular flock.

A company called Enreco market a stabilised flax seed product called Super Egg. It is an innovative way of boosting the Omega-3 levels of eggs, without having to use fish oil, with the probably fishy taint implications that this entails.

The reworking of used litter is a big issue in the US. On show was a litter cat. A small bulldozer that drives through the house and windrows (for want of a better word), the litter so that it can compost between flocks. I also saw a machine produced by Flame Engineering, which looks a bit like a tractor drawn brush cutter, but instead it contains powerful gas burners that literally scorch the litter, thus sterilising it. Unfortunately, the pamphlet that I collected on this machine is the Spanish edition!

I have saved the best innovation to last. A company called Aova Technologies has just brought a new feed additive called; wait for it – "Big Bird". The single trial that was conducted on broilers shows that the product had not impact on growth or feed conversion ratio to 41 days of age, but that carcase yield increased from 70.8% to 73%. Similar amazing results were achieved with a single flock of laying birds. No explanation as to what "agent" was involved was given (even on their website). I can't help but wonder how gullible these guys think we are.

Alternative Feed Ingredients

During the conference WATT Poultry (the publishing house) ran a workshop entitled "Impact of Alternative Ingredients on Poultry Feed Cost and Quality". Dr Nick Dale, an old friend, gave a brief talk about what alternative ingredients we would be likely to use in the poultry industry. In broad terms, he does not believe that we are likely to find too much that is new. The problem with using new material, especially if produced locally in small quantities, is knowing what it is we are using in terms of its nutrient profile, and how much we can use without causing production drops even if we do already know the nutrient profile.

Dr Dale believes that certain niches may exist for certain materials, and he mention the use of cotton seed meal in breeder rearing diets as a way to keep the protein and energy level of the diets. He also mentioned that you can lose a new ingredient as well. The University of Georgia has spent a lot of time and effort developing Pearl Millet as an alternative grain to maize for the poultry industry, only to have it stolen by the quail producers, who are prepared to pay far more for it than it is worth as a poultry grain.

The use of DDGS was mentioned briefly, but Dr Dale left it up to the other speakers to deal with the material in more detail.

Dan Rollins the feed milling director of Aviagen went on to discuss DDGS in some detail. His primary concern is that it is a difficult material to pellet properly, especially if it has not been milled fine enough. Handling issues also abound, although Mr Rollins did not believe that it was all that different to handling wheat bran. Mr Rollins recommended a handbook on the use of DDGS in feed that can be found at www.grains.org.

Dr Tom Frost of Wayne Farms was the final speaker of the session. He began his talk by saying that although prices had fallen off their highs of last year; he did not believe that they would ever return to their previous low levels. There was even a chance that they would increase again.

Dr Frost then discussed a number of innovations that could be used to reduce the cost of feed, including such things as phytase, corn soy enzymes and by using DDGS. It would appear that he is not a great fan of DDGS, stating that handling the product is a real problem. Making decent pellets with DDGS is problematic in itself, but when one considers that extra fat has to be added to the diet in order to maintain dietary energy, it becomes even more difficult. He showed that at best, the saving that could be brought about using all of the methods discussed above, could bring about a saving of about US$ 10 to 12/ton. It would be more realistic to expect an average saving of $ 5/ton. When one considers that the feed cost is currently about $ 300.00/ton, this represents a saving of less than 2%.

Dr Frost then went on to show how we could get a lot more than $ 5 out of a ton of feed if we were only to pellet our diets properly. He showed a lot of data suggesting that the best broiler results are achieved when the feed in the feed pan comprises 70 to 75% pellets and 25 to 30% fines.

Rick Kleyn