SPESFEED NEWS

Winter Edition June 2009

General News

As I write this, I cannot help but feel that the worst has passed for animal agriculture. Ingredient prices have softened and demand for our products has strengthened. Generally, producers are in a better position than they were at this time last year.

Sadly, this sentiment is not true for the economy as a whole. That South Africa cannot escape the negative impact of a weak global economy is illustrated by the motor trade. Car sales have dropped some 43% year on year. Car sales in the United Kingdom have dropped by more than 60% during the same period. Either the global meltdown has been slow in reaching our shores, or our economy is in relatively good shape. It is hard to know which.

The staffing/office situation at SPESFEED has changed yet again. We have restructured the sales function of Avi Products, which has resulted in us closing our Johannesburg (Isando) sales office. I will be relocating my office back to Rivonia (a decision partly motivated by the traffic situation) and will again be sharing an office with Afrisoft. The good news is that Bianca will be rejoining us, if only on a part time basis.

Inside This Issue

Our contact numbers will remain:

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Nutrition Courses

For the first time in many years SPESFEED plan to hold a Dairy Nutrition Course on the 7th and 8th of September. This will be followed on the 9th by a one-day workshop on how to use the SPESFEED Express program to formulate dairy diets. Numbers for the workshop will be limited.

In addition, we will be holding our annual Poultry Nutrition course from 21st to the 23rd of September.

Both events will take place at a venue at the Country Club, Woodmead.

Should you require more information about the courses, or if you would like to attend, please send an email to rick@spesfeed.co.za

Schothorst Feed Research

In March, I visited Schothorst Feed Research in which is located just outside Lelystad in the Netherlands.

The Schothorst is an independent research institute that prides itself on converting "scientific research into concrete applications", with the sole aim of improving the competitive position of their clients. They provide knowledge regarding feed ingredients, additives, nutrient requirements and the relationship between nutrition and health.

The institute was founded in 1934 to support the Dutch cooperative feed compounding industry. In 2004, it became an independent, autonomous organisation. Their focus is to bridge the gap between experimental results and practical feed formulation. This is achieved by converting qualitative nutritional concepts into quantitative ingredient-related data.

The specific know how of the institute would include the following:

- The development of feed evaluation systems for cattle, pigs and poultry.
- The evaluation of feed ingredients as regards their nutritional value and scope of application.
- The nutrient requirements of high yielding farm animals.
- The effect of processing technology on the nutritional value of feed ingredients.
- Quality management in the total animal production supply chain.

The reason for giving you this background is that SPESFEED and the Schothorst will be working together in the future. SPESFEED will provide on the ground support and backup for the Schothorst feed tables in Southern Africa. The Schothorst will obviously provide the data used in the tables themselves, together with an on line (but fully integrated) service for the recalculation of matrix values, depending on nutrient analysis.

Obviously, there are costs involved in such a partnership, but we do not believe that they are particularly onerous. SPESFEED sees this as a way of bringing the latest international data to our client base.

Additional information is available at www.schothorst.nl

The Premix Industry

The premix industry is an integral part of the animal feed industry. Although there are a number of players in the industry, it is coincidental that two of the largest players, namely DSM and Advit, have both had official opening ceremonies for their new factories in the past few weeks.

Not only will both companies easily be able to cope with increased volumes, but quality control and traceability have been raised to new levels. This can only be good for the feed industry as a whole.

Saponins in Broiler Production

Saponins have been used in animal agriculture for many years. A paper presented at the 2009 Australian Poultry Science Symposium by Cheeke of the University of Oregon (Aust. Poult. Sci. Symp. 20:50-55), not only gives an excellent review of saponin use in poultry feed, but also points to their inclusion in as a useful alternative to anti-biotic growth promoters.

Saponins are natural detergents or surfactants found in a wide variety of plants. The major commercial saponin-containing products are those derived from *Yucca schidigera* and *Quillaja saponaria*. Yucca is harvested in the wild in northern Mexico, while quillaja is a tree native to the Andes region of South America. It is harvested in the wild in Chile.

Saponins have detergent properties because they contain both water-soluble and lipid-soluble moieties. They consist of a lipophilic nucleus with one or more side chains of carbohydrate, which confer water solubility. In yucca saponins, the nucleus (sapogenin) is a steroidal structure while in quillaja saponins the sapogenin is a triterpenoid.

Yucca and quillaja products are available to the feed industry as extracts and whole plant powders. The extracts contain water-soluble components, while the whole plant powders contain all phytochemicals present in the plants. These include oligosaccharides and polyphenolics, which may contribute to the beneficial properties of these products as feed additives.

Some of the positive effects of yucca and quillaja as feed additives are the following:

- Reduction of environmental ammonia and odour
- Anti-inflammatory activity
- Anti-protozoal activity
- Nematocidal activity
- Growth promotion and improved FCR.
- Hypocholesterolemic activity (binds cholesterol) resulting in a reduction of egg cholesterol contents.

Cheeke reported on three trials using a commercial product containing whole plant powders of yucca and quillaja, enriched with quillaja polyphenols (Nutrafito Plus, a proprietary feed additive of Desert King International). Two of these experiments are reported on here.

In the first trial, carried out using Ross 308 birds at altitude in Mexico, diets containing Saponins (Nutrafito Plus) were compared to a negative control (NC) diet was based on sorghum, supplemented with soybean meal, and containing no growth promotants. A positive control (PC) diet contained 100 ppm flavomycin was used. Treatments were NC plus 100 ppm and 150 ppm of Saponin. Treatments using flavomycin and Saponin were included, but as no positive effects were recorded we have not reported on them here.

Growth rate, feed intake and feed conversion data are shown in Table 1. Weight gain and feed conversion were improved ($P < 0.05$) in the positive control versus the negative control. All treatments with Saponins had higher gain ($P < 0.05$) and improved feed conversion ($P < 0.05$) compared with the positive control. There were no differences in feed intakes nor carcass characteristics.

Table 1: Performance parameters of broiler fed Saponins at 49 days post hatch (Mexico).

Treatment	Weight (kg)	ADG (g/day)	FCR (g/g)
Negative Control	2.411[a]	48.3[a]	2.118[a]
PC + Flavomycin	2.462[b]	49.3[b]	2.077[b]
NC + Saponin (100 ppm)	2.520[c]	50.5[c]	2.029[c]
NC + Saponin (150 ppm)	2.513[c]	50.4[c]	2.029[c]

A different than b ($P < 0.05$)

In the second trial, diets containing saponins were compared to a diet containing Zinc Bacitracin. Typical Corn Soya diets, all of which contained monensin, were used. Treatments were a negative control (NC), a positive control (PC) containing zinc bacitracin, NC + 100 ppm Saponin, and NC + 150 ppm Saponin.

There were no significant differences in growth or feed conversion compared to the negative control or to the positive control containing Bacitracin (Table 2). However, the reduction in mortality where diets contained saponins was statistically significant. There was slight evidence of anti-inflammatory activity and there were no effects on carcass parameters.

Table 2: Performance parameters of broiler fed Saponins at 42 days post hatch (Mississippi State).

Treatment	Weight (kg)	Mortality (%)	FCR (g/g)
Negative Control	2.579	10.2[a]	1.79
PC + Zinc Bacitracin	2.625	2.6[b]	1.74
NC + Saponin (100 ppm)	2.615	1.3[b]	1.74
NC + Saponin (150 ppm)	2.606	1.3[b]	1.75

A different than b ($P < 0.05$)

It was concluded that saponins produced improvements in growth, feed conversion and other performance data that were similar to those seen with antibiotic growth promoters. No mention of the cost of the product is made, but these trials may well be worth repeating.

Enzymes in Poultry Diets

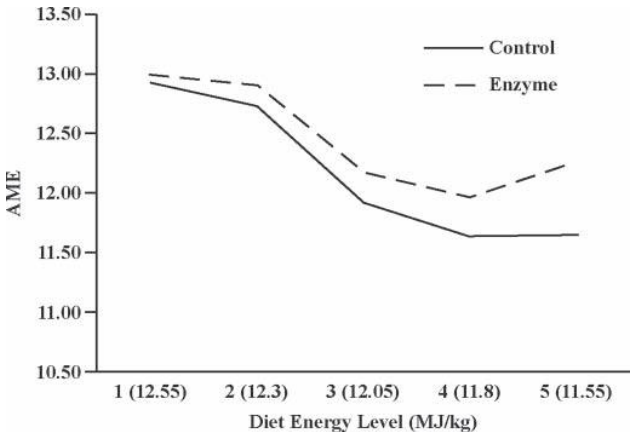
In the January edition of Poultry Science, Zhou and co-workers published a paper entitled *Improved energy-utilizing efficiency by enzyme preparation supplementing broiler diets with different Metabolisable energy levels* (Poultry Science 88 :316–322).

The aim of their work was to study the efficiency of energy improvement in broiler diets with different ME levels (in maize soybean diets) by supplementation of enzyme preparation.

They fed broilers diets with 5 different ME contents, (12.55, 12.30, 12.05, 11.80, and 11.55 MJ/kg), either with or without exogenous enzymes.

Although the energy levels used in the experiment were lower than traditionally used in broiler diets they were able to clearly demonstrate how that when the energy level in a diet is reduced, so the effectiveness of enzyme addition improved. It is for this reason that the distributors of enzymes prefer that nutritionists do not add enzyme "on top" of the specification, but rather that they formulate them into the feed, by reducing the energy level of the diet.

Figure: Effects of enzyme supplementation on the AME (5 levels, MJ/kg) in broiler starter diets.



Rick Kleyn

The Impact of Feed Restriction on Broilers

In broiler production, any factor that causes feed intake to drop will have a negative impact on both growth rate and FCR. Research has that the AME and Nitrogen digestibility of the diets do not change at lower feed intakes, the birds use the energy that they consume in a different manner. This effectively means that the true energy (Net Energy) derived from any diet may be influenced by feed intake.

The impact of feed intake and hence energy intake in broilers has a dramatic intake on broiler performance and energy utilisation in broiler chickens. Two recently published papers not only demonstrate the impact of restricting feed intake, but also go some of the way to explaining what happens in the birds in terms of energy metabolism.

Firstly, a paper entitled *Effects of Feed Restriction on Modern Broiler Performance* was presented at the 2009 Australian Poultry Science Symposium by Huang *et al.*, of Aviagen (Aust. Poult. Sci. Symp. 20:71).

The study investigated the effects of feed restriction on male broiler performance in two modern broiler strain crosses. Broilers were housed in individual cages and fed one of four feed regimes: ad lib, 90%, 80%, or 70% of ad lib intake from 24 to 31 days of age. All birds received a low nutrient density broiler grower maize based diet (12.66 MJ/kg, 9.2 g/kg digestible lysine).

The effects of feed restriction on body weight gain were similar for both strain crosses. Birds fed *ad lib* gained significantly more weight (Figure 1) and had a significantly better FCR (Figure 2) than those fed on a restricted basis. Weight gain and FCR was similar for both strains.

Figure 1: Weight gain between 24 and 31 days of age.

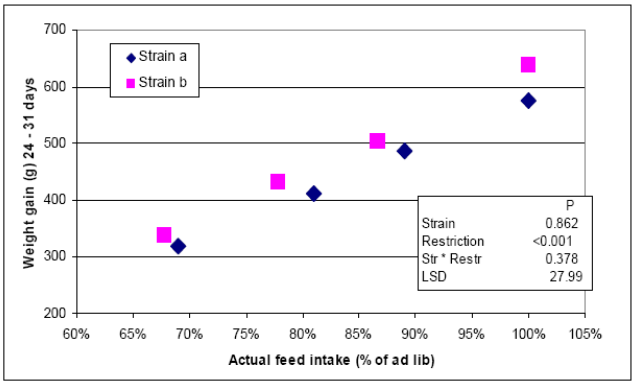
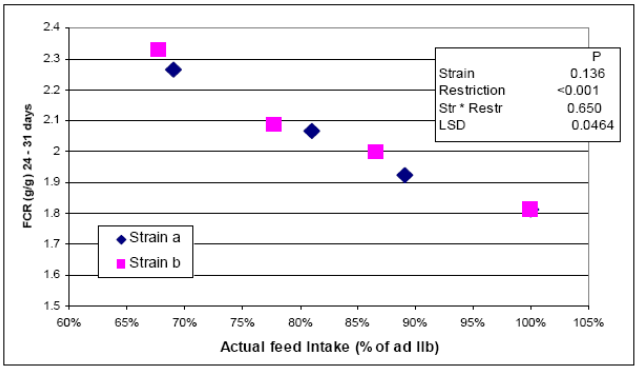


Figure 2: FCR between 24 and 31 days of age.



AME and Nitrogen retention was measured and was found to **not** be significantly affected by feeding regime or strain of bird.

This study clearly shows that feed restriction has a significant effect on modern broiler performance during the age period studied. Field conditions limiting feed intake may compromise performance of commercial broiler strain crosses. It does not explain why nutrient utilisation changes with changes in feed intake.

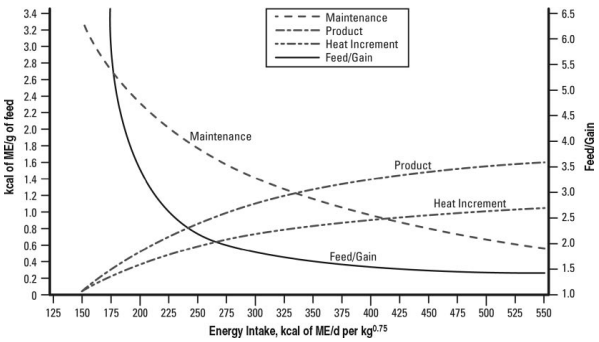
In a second paper, (Latshaw and Moritz, Poultry Science 88:98) broiler chickens were fed amounts of feed ranging between 75% of *ad libitum* and *ad libitum*. Birds were in the weight range of 1.1 to 2.2 kg. Two strains and broilers and both sexes were used.

These workers were able to demonstrate that the daily amount of feed offered did not affect the AME of the feed, but that broilers fed limited amounts of feed, gained less body weight and had a larger (poorer) FCR.

A number of interesting observations were made during the experimental period. The first of these is that Cobb birds took fewer days than did the Hubbard (16.2 vs. 18.7) to reach 2.2 kg. Also, male carcasses contained a greater percentage of water (more protein) and a lower fat content than did females. This meant that males had decreased carcass energy content per gram than females and retained less energy per day than females

The objective of this study however, was to test the hypothesis that the amount of energy consumed each day has an impact on the partitioning of energy for use either for maintenance or production. A model was developed that showed these effects and the FCR over a wide range of daily energy (feed) intake (figure 3).

Figure 3: Partitioning of ME and the resulting feed: gain ratio as affected by daily energy intake. Numbers are plotted from the simulated model.



The authors of this paper do not make their point about Net Energy as well as they have illustrated it in figure 3. When energy intake is restricted in any way, a greater proportion of the energy is used for maintenance than is used for production, with a concomitant drop in heat production (heat increment). Thus, the Net Energy of a diet is determined not only by its chemical makeup, but also by the feed intake achieved by the individual animal. This reinforces the theory that the energy content of a feed (diet) is a function of the animal that is consuming it, rather than a function of the diet itself.

Rick Kleyn

Stocking Density and Pig Performance

We have always believed that when things get tough in animal agriculture, the only way to stay in business is to be technically efficient. In the simple simulation that we carried out we have been able to demonstrate that the correct strategy for maximizing profit should not be prescribed. Rather it should be determined for each financial circumstance. The feed price ratio plays a pivotal role in any decisions that are to be made. In hard times however, it is only technical efficiency that will keep producers in business.

Following on the theme of feed intake in broiler diets, it is probably a good idea to pay another visit to the impact that stocking density, and hence feed intake, performance and profitability has on growing pigs.

Stocking density has traditionally been expressed as area per pig housed. Under conventional management systems, pigs remain in the same pen for several weeks and space allowance is based on the maximum space required during a given period of growth. For pigs that are removed from a pen as a group, the maximum space requirement occurs on the day the animals are moved.

Research results have shown that as growing pigs are provided with less space, feed intake declines with a resultant decrease in daily gain, and a decline in feed conversion ratio.

The stocking density that is chosen by a producer impacts on the overall profitability of the piggery. Using figures published by Brumm as a basis, Brian Buhr - an agricultural economist at the University of Minnesota - looked into the question of what stocking density was appropriate when growing pig numbers on a farm become too high (i.e. not enough grower pens).

He found that reducing stocking density (i.e. building more finisher houses) resulted in a *reduced* return on equity, but that financial losses are small when compared to reducing the size of the sow herd (fewer pigs entering the system).

Our experience in the poultry industry, where we strive to maximize the return per m^2 of house per year, has shown that the feed price ratio (the value of 1 kg of pig meat the cost of 1 kg of feed) may have an impact on what strategy we should use. We set about building a model, based on Brumm's data (Table 1) to look into this.

Table 1: Effect of space per pig on performance (After Brumm)

Space/Pig (m^2)	Daily Gain (kg)	Daily Feed (kg)	FCR
0.49	0.64	2.23	3.48
0.57	0.66	2.28	3.44
0.66	0.68	2.31	3.39
0.73	0.70	2.32	3.30
0.81	0.73	2.39	3.27

Daily gain/m^2 can be calculated using the stocking density and the actual gain recorded. The income per m^2 can then be determined at any selling price (via a simple model). The cost of the feed consumed can be calculated using the FCR and the gain per m^2. In addition, a fixed cost of R 1.15/m^2/day was assumed.

In the first example (Table 2), a feed price of R 3000/ton was used and a selling price of live pig of R 15.00/kg, giving a feed price ratio of 5. As can be seen returns were clearly higher in the case where the stocking density was the highest.

Table 2: The return per m^2 of house space per day when a feed price ratio of 5 is achieved.

Space/Pig (m^2)	Gain (kg/m^2/d)	Feed (kg/m^2/d)	Income (R/m^2)	Feed Cost (R/m^2)	Return (R/m^2/d)
0.49	1.31	4.56	19.59	13.68	4.77
0.57	1.20	4.11	17.45	11.93	4.36
0.66	1.09	3.69	15.48	10.46	3.86
0.73	1.05	3.54	14.47	9.72	3.59
0.81	1.02	3.38	13.54	8.96	3.43

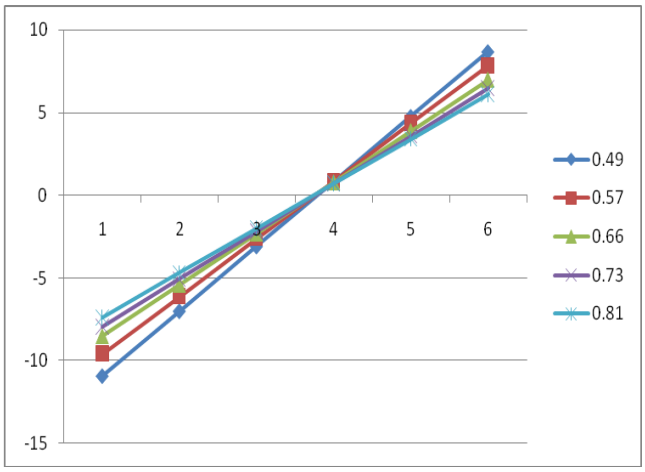
In a second exercise, only one parameter was changed, and that is the value of live pig was dropped to R 9.00/kg, giving a feed price ratio of 3. This ratio is perhaps more realistic for the current South African situation. Note how the highest return (lowest loss) is achieved at the lowest stocking density.

Table 3: The return per m^2 of house space per day when a feed price ratio of 3 is achieved.

Space/Pig (m^2)	Gain (kg/m^2/d)	Feed (kg/m^2/d)	Income (R/m^2)	Feed Cost (R/m^2)	Return (R/m^2/d)
0.49	1.31	4.56	11.76	13.68	-3.07
0.57	1.20	4.11	10.47	12.33	-2.62
0.66	1.09	3.69	9.29	11.08	-2.33
0.73	1.05	3.54	8.68	10.62	-2.19
0.81	1.02	3.38	8.12	10.14	-1.99

In the figure below, the return per m^2 of house space at different feed price ratios is shown. Note how they cross over at around 4.

Figure 1: The return (in R/m2/day) at different feed price ratios and different pig stocking densities.



We do not believe that the actual numbers generated in this exercise are of significance here. Rather the trends that have been illustrated are of importance. Firstly, Buhr's findings that reducing sow numbers is not the correct thing to do in hard times, unless that is they are really bad performers, is probably correct. Secondly, when times are good it will always pay to stock as many pigs into a pen as is humane. When times are bad (poor feed ratio), it may well pay to reduce pressure on the system by building additional housing and letting the animals achieve their true genetic potential.

Walter Scharlach and Rick Kleyn