Have weaners seen the light?

Dr. Phil Lloyd
PhD in Pig Light at pig nutrition

The UK welfare regulations state that housed pigs must have a minimum of 8 hours of light per day with an intensity of 40 lux alongside a rest period from artificial lighting. Legislation is based on the stock keeper's ability to inspect the animals not the visual ability of the pig. There is a lack of clarity within the regulations for light and dark periods, and different farm assurance schemes also suggest different lighting requirements.

All pigs need enough light to see feeders and drinkers easily, especially at the weaning stage where they can benefit from longer light periods to locate food sources. Delaying feed intake after weaning can lead to degeneration of gut villi and poor nutrient absorption reducing performance and cause-health problems such as diarrhoea.

Wild pigs were originally forest dwellers and their eye sight reflects that with pigs having a poorer colour perception and being better adapted to dimmer light levels. Indoor systems have fully controlled and automated lighting allowing the opportunity to maximise the effect of day length and light in the production system.

Identifying the optimal lighting programme may depend on the animal's age and housing type. It is thought that weaner piglets have no diurnal pattern and can be 'taught' but with pigs naturally falling into a morning and afternoon eating pattern. Increased day length in weaned pigs (23 hours light: 1 hour dark (23hr: 1hr) for two weeks post weaning increased feed intake compared with a normal 8 hour light: 16 hour dark. Not only was feed intake increased, the energy requirements for maintenance were also lower with piglets showing increased daily gain.

This improvement in performance may have been due to less gut villi degeneration allowing piglets to absorb nutrients more effectively with less energy required for the recovery of the gut wall.

The increased day length did not affect the time between weaning and first feed intake suggesting performance improvement is due to more continuous feeding activity and continual supply of nutrients which is beneficial for efficient digestion.

There is little research available, but most studies cover the most critical early weaning period. Data suggests that increased day length would need to be carried out for at least 7 days as increased day length during the first 4 days post weaning showed no improvement in feed intake or performance when measured over a 14 day weaning period compared with 8 hours light: 16 hours dark.

When selecting a lighting programme, care must be taken as continuous lighting is detrimental to pig welfare. Under certain farm assurance schemes, greater than 18 hours of light would be unacceptable. There are benefits to darkness too, when used at weaning to reduce fighting in newly mixed groups.

Weaner pigs appear to prefer resting and sleeping in darker areas and defecating in brightly lit areas but chose to move between light intensities when allowed the choice. Whilst the period of dark is important, there is insufficient evidence to specify the optimum darkness for productivity and welfare. ■

Feeding in a crisis

Dr Lucy-Jane Tallman
Pig Nutritionist

The economic outlook for UK pig producers is depressing with high feed costs and no sign of increases in pig prices. Unfortunately there is no 'magic wand' to reduce feed costs but here are a few tips.

- If you are using a single finisher feed – consider using two. Those on heavier weight contracts using two feeds should consider three. Help Premier Nutrition to take the guesswork out of setting specifications by recording feed intake and growth (particularly useful in the last 2-3 weeks before slaughter). Two lactating feeds make nutritional and economic sense, but this remains practically difficult.

- At a conference earlier this month, the idea of missing out or reducing the premix for the last 2-3 weeks before slaughter re-surfaced. At farm level premix contains amino acids, macro-minerals, micro-minerals and vitamins and enzymes.
  – Reducing amino acids as a pig ages reduces cost – but needs to be done properly (hence the first point above).
  – Calcium and digestible phosphorus requirements also fall with age but calcium is cheap and in many feeds digestible phosphorus is floating high in late finishing, particularly where rape and wheatfeed are used. Cost savings are negligible. Sodium should not be reduced.
  – Reducing micro-minerals/ vitamins is a possibility. The US has tried this but currently it is little used. Even reducing them to zero (and you can't) savings are only 10-15p/pig.
  –The last three weeks are critical to grading and the pig is worth about £100 so 'risk reward' looks high.

- Increases in the inclusion rate of rapeseed meal (up to 15% in a finisher 2) and biscuit meal (inclusion rate maximum depending upon source and QC) offer savings. Currently wheat DDGS is generally too expensive relative to other options available. Fodder beet, sugar beet and vegetables can be fed to dry sows. Some of the maize meals/germs have offered small savings. Wet co-products are currently cost effective, with savings of around £1/t/% included (on a compound equivalent basis). Frozen pipes, inconsistent availability, and analytical variation mean it is certainly not for the faint hearted!

- It is tempting to reduce feed specifications but the value of 0.1 in FCR is now twice what it was, around £1.75/pig, so changes need to be 'considered' ones. Reductions in nutrient density in finishing pigs and dry sows can make sense with relatively cheap barley and wheatfeed and very expensive fat (in other words accept a poorer FCR on the basis that feed cost/kg gain is improved).

- We expect to see a drop in slaughtering in June as the weather impact on outdoor sows filters through. There are more producers considering restocking, although not in significant numbers. With high feed prices, optimum slaughter weight is typically back by 2-5kg DW and if all producers dropped slaughter weight back slightly this could then reduce pig meat production by 4% which might stimulate pig prices.

- Remember, optimum slaughter weight is highly farm specific and Premier Nutrition can assist in determining optimum slaughter weight for a particular farm. ■

Feed intake measurement for profitable pigs

Dr. Phil Boyd
Premier Nutrition

Extremely high cereal costs over the past 12-18 months have once again led to many producers suffering negative returns throughout large parts of the pig producing world. As always, during the tough parts of the pig cycle, producers have looked hard at cost saving measures, with feed, as a major component of the overall production cost, obviously being a major and correct focus for attention.

Use of expensive early starter diets and the continued inclusion of (all) feed additives are often the first components to be re-assessed in times of high feed price.

Whilst these approaches are valid if the expensive early diets are fed for too long or if any of the included additives were wrongly incorporated from the outset (i.e. without a full economic evaluation), cutting back starter feed usage beyond what is nutritionally correct for the animals (and thereby reducing growth performance/feed efficiency) or removing additives that showed an economic benefit at low feed cost, is madness in times of higher feed costs, where efficiency of conversion of feed into live weight becomes paramount.

Significant financial saving can be had on many units, without any loss in performance, by targeting the correct dietary specifications at the animals being fed.

Whilst this statement appears to be so obvious as to be ridiculous; on countless units, large and small, high specification diets are still fed for too long (bin availability/pig flow issues) and lack of accurate measurement, relating to feed intake levels, leads to significant over-supply of nutrients, as nutritional advisors 'build in' more insurance than they would otherwise need to, to ensure acceptable levels of growth performance are achieved.

With normal feed costs, this over-supply is wasteful; at high feed costs this waste can be catastrophic to the health of a business. Undoubtedly on many units, additional capital would be required to alter feeding lines or pig flows, so as to be able to supply more feeds through the production cycle and whilst this investment may be unpalatable, with high feed costs (that may become the norm?), payback times on investment will obviously be significantly shorter.

Conversely, accurate measurement of feed intake and monitoring the pattern of feed consumption across all parts of a unit over time costs very little (other than a computer running excel and the time to process the data) but would provide the farm's nutritionist with essential information to enable them to more accurately specify the feeds to be fed (thereby reducing costs) and the farm's production staff with a tool to quickly identify any problems as these occur.

It is widely accepted that level of feed intake markedly influences performance levels achieved (recent Canadian research indicating that 62% of the variation in daily weight gain between individual growing-finishing pigs can be attributed to differences in voluntary feed intakes between animals) and yet this parameter remains one of the least well quantified performance criteria on farm today.

Knowledge of feed intake levels across various live weight bands is essential for accurate, cost effective formulation and feed supply.

A large number of factors influence feed intake levels achieved, so it is absolutely farm specific – lack of accurate feed intake knowledge, at all times and for all classes of pigs, is therefore indefensible and is purely and simply 'money down the drain'. ■

Optimising slaughter weight

Mick Hazzledine
Pig Products Director

In recent years we have seen increases in slaughter weight in virtually all major pig producing countries. In the UK in 1976, average deadweight was a lowly 62kg moving to over 81kg today.

Together with increased sow productivity, the UK now produces almost as much pig meat as in 1976 but with less than half the number of sows.

Undoubtedly increasing carcase weight has been highly economic, however high feed prices reduce optimum slaughter weight so it is timely to re-examine the factors to determine optimum slaughter.

Physical performance

The higher the physical performance of the farm, the higher the optimum slaughter weight will be.

For example, a very high performing herd of finishing pigs (boar/gilt mix) at 110kg live weight; if live weight is increased by an extra 1kg, marginal growth rate could be as high as 921g/day and FCR 3.04.

However, with a poorer herd, growth rate could be as low as 661g/day and FCR 4.24.

Assuming a killing-out percentage of 76% and feed cost of £210/t, the feed cost for the extra 1kg DW is 87p and 117p respectively for each herd.

The current UK pig price is approximately 138p/kg DW leaving 51p and 21p to cover increased non-feed overhead costs and likely reductions in abattoir returns.

In the case of the high performing herd, this is likely to be economic but with poorer performance, this may well not be the case.

Herd health is the biggest determinant of physical performance. Often herd restocks and increases in slaughter weight go hand-in-hand. In addition, a cost that is sometimes forgotten when considering higher slaughter weight is late mortality; whilst this is generally low, it takes only a small increase in mortality to fundamentally alter optimum slaughter weight.

Genetics

Obviously genetics also has a major influence on physical performance; as weight increases, the performance potential of pigs of differing genetics generally widens.

Some are early maturing and might show their maximum growth rate at, say, 60kg, whilst others are later maturing and show maximum growth rate at 80kg.

The early maturing genotypes are less suitable for heavy weights as growth rate is poorer at higher weights and increases in carcase fatness may be higher.

Sex

Boars are more efficient and leaner than gilts, which in turn are more efficient and leaner than castrates.

Consequently, when considering the costs of producing lean meat, boars have a higher optimum slaughter weight.

However overweight boars are heavily penalised by the abattoir because of the risk of boar taint and carcases above 85kg must be taint tested under EU legislation.

Feed costs

The cheaper the feed, the higher the optimum slaughter weight. Whilst some producers still use a single finishing feed from 35kg, the majority use two; those going to heavy weights should consider a third feed for the final weight gain where further savings can be made.

The farm

It is crucial to plan how higher slaughter weights will be achieved. Just 'keeping the pigs another week' without regard to stocking density, feeder space, water provision and other management factors is unlikely to be successful. Indeed, a number of producers who attempt higher slaughter weights find pigs 'stall' (grow poorly), often caused by a combination of too high stocking density with unsuitable genetics. Vice can also become a bigger problem as can the physical damage to the piggery from larger pigs.

The contract

Most pigs are sold against an abattoir contract that prices individual pigs according to their weight and lean (or fat) content. In the UK, contracts vary widely and the 'devil is in the detail'.

The contract cannot be considered in isolation as the variation in the pigs supplied is crucial.

Penalties for over-weights and pigs that are too fat can be severe, particularly for boars. The more homogeneous the pigs that are supplied, the higher the optimum slaughter weight.

Conclusions

In the UK today, typically, the optimum dead weight for a boar/gilt mix is 78-82kg.

Optimum slaughter weight is a function of a large number of factors and is highly specific to the individual farm.

Slaughter weight changes with prevailing economic circumstances, particularly feed and pig price but these factors should not be considered in isolation but instead as part of the whole management system. ■

Vitamin E status in pig farms in the UK

Mick Hazzledine
Pig Products Director

The importance of an adequate dietary supply of vitamin E has been recognised for many years.

Vitamin E is primarily a cellular antioxidant preventing the formation of toxic products. It is necessary for the optimum function and metabolism of the nervous, muscular, circulatory and immune systems.

A deficiency of vitamin E, not surprisingly, can therefore result in a range of conditions. Of these mulberry heart (haemorrhage of the heart muscle) and sudden death of pigs, typically 15-25kg in bodyweight, are those most commonly reported in the UK.

Plasma vitamin E status

The vitamin E plasma reference range used by the Veterinary Investigation Centres in the UK is 1.5-14.3 µmol/l plasma, with levels below 1.5 µmol/l suggesting that the pig is deficient.

However levels of >3 µmol/l may be necessary to maximise immune competence.

In a case study, the plasma vitamin E status of seven UK farms was determined at a number of ages from weaning onwards. None of these farms had any obvious symptoms of vitamin E deficiency.

At weaning (at four weeks of age) the vitamin E status was very variable but no pigs were found to be below the 1.5 µmol/l threshold.

Despite feeding a creep containing 200 iu/kg of vitamin E and an early grower feed with 150 iu/kg, the average vitamin E status declined from 6.0 µmol/l to 3.6 µmol/l at eight weeks of age. Thereafter vitamin E status recovered (grower feed contained 70 iu E/kg and finisher 35 iu/kg).

These trends were similar in separate trials on other farms. Of the 172 tests conducted eight pigs (4.3%) had a plasma Vitamin E of below 1.5 µmol/l, the majority of which occurred in the four week period post weaning. However, over 40% had a plasma vitamin E of below 3.0 µmol/l.

Pigs are born with vitamin E deficiency because there is little placental transfer, but there is good transfer of vitamin E into colostrum and milk, particularly where natural vitamin E is used (RRR).

At weaning the combination of stress, moving, diarrhoea and immune response all increase vitamin E requirements.

Unfortunately, this is at a time when feed intake is also low and very variable, thus hardly surprising that vitamin E status in the population is both very variable and declines post-weaning.

Strategies to improve vitamin E status post-weaning include increasing vitamin E concentration in lactating sow and creep feeds, as well as including vitamin E in the water post-weaning.

In this survey there was little evidence of vitamin E deficiency (as judged by a plasma vitamin E of <1.5 µmol/l) beyond four weeks post-weaning.

Typically in this survey, grower feeds fed from 13-30kg contained 70-75 iu/kg vitamin E and finishing feeds 35-40 iu/kg.

Immunocompetence

The whole area of immunocompetence is complex and performance benefits from improving plasma vitamin E status beyond 3.0 µmol/l are unclear and are likely to be highly farm specific.

Finally, when investigating vitamin E deficiency it is clearly important that a representative sample of pigs are tested.

If underweight and ill pigs are tested then they are highly likely to show a low vitamin E status simply because they have not been eating. ■

Feeding the indoor sow – phase feeding in lactation?

Phil Boyd PhD
Technical Manager (Pigs)

Are we making significant progress with understanding the nutrition of the modern hyper-prolific sow? As in many areas of pig production, the answer is yes…. and no! We do understand sow nutrition today in some detail, but inevitably there are still gaps in our knowledge.

Furthermore, there are areas where we know what we want to achieve, but still struggle to achieve these targets on commercial units. For example, we know that we must minimise condition loss in lactation but, particularly in gilts, it can be difficult to achieve this objective.

Maximising productivity

There is no doubt that maintaining condition in lactation remains the most important objective, if we are to maximise the productivity of our genetically improved sows.

If insufficient nutrients are consumed during lactation weaning weight falls – which has a significant impact on subsequent piglet growth, re-mating interval is extended, subsequent fertility compromised and sow longevity is reduced. Clearly, these four factors can have a significant negative impact on financial return and can be avoided, if we focus effort at this critical stage.

It is clearly accepted that sows need 'lots of nutrients in lactation', but the obvious questions are which ones and how much?

Until fairly recently, sow nutrition has tended to focus more on energy supply and conservation of back fat levels. Whilst this is important, in the late 1980s increased focus was given to protein (amino acid) intakes, as it was found that weaning to oestrus interval in gilts was more related to protein loss in lactation than energy (fat) loss.

One piece of published research showed that gilts which only lost 0.5kg of protein in lactation had a weaning to oestrus interval of seven days, but this increased linearly, up to an interval of over 25 days with a 4kg protein loss.

It was also shown, by the same researchers, that sows that had consumed 52g lysine/day in lactation compared with animals that had only consumed 32g/day (i.e. treatment groups fed 1.04 and 0.64% lysine respectively; average intakes of 5kg) had 1.2 more piglets in the next litter.

Most of our amino acid requirement data is based on the requirements for maximum milk yield and thus piglet weaning weight.

However, the sow uses some of her own body tissues to help maintain milk yield where feed supply is inadequate.

Whilst small losses are probably acceptable, larger losses are clearly not and therefore nutritionists now recommend that we should feed diets that will allow us to limit body protein loss to 10% or ideally less.

So, practically, what does this all mean?

Feeding management

Management of feeding in the farrowing house remains absolutely critical. Sows must be encouraged to eat as much as possible to prevent loss of both body fat and protein. To achieve this goal, we must ensure that abundant water is available, feed a minimum of three times a day (or ad-lib), remove any spoiled feed and ensure that farrowing house temperature is not too high (below 18°C).

Farrowing house feeding starts in the gestation barn! Over-fit (fat) sows must be avoided, as it is well established that these animals have reduced farrowing house intakes.

Producers must not underestimate the value of that 'last 0.5kg of intake' and need to set up management systems, within the farrowing house, so that the staff responsible for securing the desired high intakes understand the importance of these and achieve set targets. Accurate knowledge of weekly feed intakes in the farrowing house is critical.

Even with very good feeding management, gilts and sows in their first week to 10 days of lactation are likely to be fed insufficient amino acids. As genetic progress increases milk yields, this gap will continue to widen (recent studies have shown yields in excess of 11kg/day which on a weight for weight basis, is as good as the top dairy cows).

Use of three diets?

The majority of the European pig industry now uses two sow feeds, a dry sow diet and a higher density lactating ration. How long will it be before the use of three diets becomes the norm? Feeding a higher density 'Gilt Lactator' to gilts and also to sows in early lactation, would benefit most herds today.

The specification required for a gilt lactation diet depends upon a number of factors (particularly feed intake), but typically would be around 1.20-1.30% total lysine and 13.80 MJ / kg ME.

In contrast to a typical 'whole farm' lactating feed (at approximately 0.85-0.90% lysine and 13.20-13.35 MJ/ kg ME), a 'Gilt Lactator' will carry a premium of some €30-35.00/tonne at today's raw material prices (plus of course, the cost of an additional bin). Whilst this additional cost/tonne may seem very high, failing to achieve maximum nutrient intakes in the farrowing house is one of the costliest failings on farm today. ■

Eating to energy?

Dr Lorraine Salmon B.Sc. (Hons), PhD
Pig Nutritionist

Increases in raw material costs result in many producers asking nutritionists to re-evaluate formulation specifications to try and reduce diet costs. However, what are the implications of this from a pig performance perspective?

Energy is a significant contributor to diet cost and a recent review of published data found feed intake fell with increasing energy density. However, in most cases this was insufficient to prevent an increase in energy intake, particularly at lighter weights. Higher energy intake resulted in increased growth rate, carcase fatness and a higher killing out percentage. Conversely, if the energy density of a commercial diet is reduced, the pig may compensate by increasing feed intake to ensure its energy requirements for growth are met. This will have a negative impact on feed conversion and thus at a certain point (depending on costs at the time) negates the reduction in feed cost per tonne. Equally, if energy compensation is poor then growth rate may decline noticeably. In the literature review pigs fed diets with less than 13MJ/kg DE (9.23MJ/kg NE) struggled to maintain energy intake and performance. This may be due to the less energy dense raw materials having higher fibre levels and bulk restricting intake plus lower amino acid digestibility.

A pig's ability to compensate for differing energy density is affected by many factors. The range in energy density and pig weight are two of the key factors. The young pig has a lower ability to compensate for changes in energy/nutrient density. If diet density is not optimised at this stage, the impact will be greater than compared with an older pig (above 50kg). Whilst pigs above 50kg are able to cope and adjust to a wider range of energy densities, there are limits. Other factors affecting energy compensation include:

- Feed form – meal versus pellets, grist size.
- Feed availability – hopper numbers, design, adjustment, number of feeds, feeding time.
- Feed palatability – for example glucosinolates.
- Water availability, quality and flow rates.
- Stocking density – group size and social effects.
- Environment – temperature, noxious gases, humidity.
- Genetics.
- Disease.
- Amino acid balance.
- Previous nutrition and adaptation.
- Gender – barrows, gilts, boars.

In a practical farm situation the influence of many of the above factors are difficult to quantify. Recording of actual feed intakes on commercial farms is often limited making it difficult to assess the likely impact of changes to energy or nutrient density on growth, feed conversion and therefore feed cost per unit of live weight gain. The performance impact of any changes will also depend on the length of time the feeds are offered. Finally, to what extent growth rate changes in one period will influence that of the next is also a question of debate.

In conclusion, there is some room for adjustment of diet energy density for the older pig (+50kg) however, an assessment of costs of increased feed intake/ increased FCR versus the reduction in feed cost must be carried out. In low appetite animals, the ability to compensate may be limited so an impact on growth rate should also be considered. In the young pig, it is better to maximise performance rather than compromising energy density in order to reduce feed cost. Knowing feed intake and growth performance is essential in order to review nutrient density effectively. Any adjustments therefore should be made with an understanding of the relative importance of growth and grading on the farm and only in the knowledge of feed intake. ■

Feeding for genetic potential?

Mick Hazzledine
Pig Products Director

We are often reminded of the enormous potential of modern genotypes. Recent headlines suggest that 40 pigs/sow/year and 4t of carcase weight/sow/year may soon be on the horizon.

Over 20 years ago, I recall some selection results where the best finishing pigs achieved a growth rate of 1.3kg/day with an FCR of 1.8 or better. Impressive; however commercially we only unlock a fraction of this genetic potential as the performance of the pig is typically compromised by a number of factors. Health is certainly the biggest of these, but environment, management and feeding are also of importance.

tion, is indeed geared to achieving 1kg/day; we have a slight excess of nutrients, such that should other improvements be made at farm level, these (excess nutrients) can be expressed as improved growth. There is no feed conversion (FCR) target as we modify the net energy of the feeds depending upon prevailing raw material costs.

The results shown in Table 1 were achieved on relatively low energy feeds because barley, wheat feed, and rapeseed meal, which are all comparatively low in energy, were more cost effective than wheat, fat and soya. The feeds are pelleted and un-medicated.

The average results shown for Company B are for 46 batches of pigs from differing straw based contract finishing farms (of variable quality). Whilst the growth rate is similar to that of farm A, feed intake (or more correctly apparent feed intake) on average is nearly 10% higher. Simplistically, the amino acid concentration in the feeds for producer B should therefore be approximately 10% lower than those for farm A. At the current time, this equates to a substantial reduction of £10/tonne in feed price.

However, the variation in performance across the 46 results for Company B was very large. Feed intake ranged from 2.22 kg/day to a scarcely believable 2.92 kg/day – certainly interesting and thought provoking for a nutritionist theoretically feeding the same genetics and indeed in this case, the same feeds and feeding programme. Some of this variation is due to the farm environment itself, some undoubtedly due to the quality of weaner pigs put onto the farm and some to random effects, of which disease would be the most important. Evidently though, no one feeding programme optimally captures all of Company B's farms.

Another important aspect of specifying finishing feeds is to understand the growth curve of the genotype. These can vary markedly. Some of the traditional UK genotypes, for example, are relatively early maturing and grow very quickly from 35-65kg bodyweight, but then slow up, often quite quickly, beyond 80kg bodyweight. In contrast, we have some genotypes, that have been selected for heavier slaughter weights, which can grow 200g/day (or more) faster (than the earlier maturing genotypes) from 80kg. So it is not just the average growth rate in the finishing house that is important but also the growth curve.

Farm / company	A	B			
		Average	Low feed intake	High feed intake	High growth rate
Start weight (kg)	44	44	40	42	46
End weight (kg)	113	108	106	111	115
Intake (kg/day)	2.30	2.52	2.22	2.92	2.55
Gain (g/day)	940	920	830	951	1049
FCR	2.45	2.74	2.67	3.07	2.43

Table 1. Recent performance results from UK clients (boar/gilt mix).

And hence the question mark in the title of this article. Genetic potential is the wrong target by which to set up our feeds and feeding strategy; doing so would result in regimes that oversupply costly nutrients. What we need are realistic performance targets that take into account both the genetics and the degree of performance compromise that is present at the farm level. For example, Table 1 illustrates recent performance results from UK clients (boar/gilt mix); all of whom use the same (or very similar) genetics.

Farm A (650 sows) has good quality slatted finishing buildings and regularly restocks to maintain a high health status. Production is batched; some batches have achieved almost 1kg gain/day, others an FCR of 2.3 to 1.

Our feeding strategy, in this situa-

In summary; in the case of finishing pigs, the nutritionist and producer should agree a realistic growth target – which then, in combination with feed intake, determines the feeding specification.

Of course, if the producer has no idea what the feed intake is, this process is inevitably less precise!

Measuring feed intakes and growth rates at various stages of finishing (to determine the shape of the growth curve) will always be time well spent ! ■