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Contents

How much feed do your lactating sows need?

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Summary

The number of piglets born alive per litter has increased by 1.5 in the past 10 years, from 10.8 in 2001 to 12.3 in 2011 (Teagasc PIGSYS, 2011). This trend is set to continue. Interpig (2011) showed that in 2011 the number born alive per litter was 14.8, 13.6 and 13.2 for Denmark, The Netherlands and France, respectively. As we approach these levels of productivity the importance of lactation feed intake for sows will increase even more than heretofore. Estimates of the nutritional requirement of lactating sows must consider the body weight of the sow (maintenance component), the yield and composition of milk, loss in body weight (mobilisation of body tissue) during lactation and the litter's intake of creep feed. This paper looks at these the factors that determine the optimum lactation feed intake for sows and in particular it looks at the sows' requirement for energy (digestible energy) and lysine during lactation.

A. Energy Requirement

1. Sow Weight (Maintenance energy requirement)

The empty weight of the sow after farrowing can be used to determine the maintenance energy requirement for the sow. This is calculated as **0.492 MJ DE / kg body weight$^{0.75}$ /day.** Table 1 shows the Maintenance Energy requirement for sows varying in weight from 180 to 250 kg. It can be seen from this that maintenance energy requirement is low relative to the total energy requirement of sows during lactation. Every 10kg increase in sow weight above 180 kg increases daily maintenance energy requirement by 1 MJ.

Table 1. Maintenance energy requirement of lactating sows

Post Farrowing body weight (kg)	Maintenance Energy Requirement (MJ DE / day)
180	24.2
190	25.2
200	26.2
210	27.1
220	28.1
230	29.1
240	30.0
250	30.9

Calculated from (Close and Cole, 2000)

2. Milk production

The energy requirement for milk production can be calculated from litter weight gain by assuming that 1 kg of piglet weight gain during lactation requires a maternal intake of 30.4 MJ DE. It depends on a number of factors such as piglet weaning weight, number of piglets weaned per litter and creep feed intake per litter. For this and all subsequent calculations we assume a lactation length of 28 days.

2.1. Piglet weaning weight

The effect of piglet weight at weaning on the energy requirement for milk production is shown in Table 2. It can be seen that for every 0.5kg increase in the average pig weight at weaning above 7.0kg there is an increase in the energy requirement for milk production of 5.4 MJ DE /day.

Table 2. Effect of piglet weaning weight on the daily energy requirement for milk production

Birth weight (Kg)	Weaning weight (Kg)	No. weaned / litter	Piglet daily gain (g/day)	Energy for Milk Prod. (MJ DE)
1.5	**7.0**	10	196	**59.7**
1.5	**7.5**	10	214	**65.1**
1.5	**8.0**	10	232	**70.6**
1.5	**8.5**	10	250	**76.0**

Calculated from (Close and Cole, 2000)

2.2. Number weaned per litter

The effect of the number of pigs weaned per litter on the energy requirement for milk production is shown in Table 3. It can be seen that for every extra pig weaned per litter above 10 there is an increase in the energy requirement for milk production of 7 MJ DE /day.

Table 3. Effect of the number of pigs weaned per litter on the daily energy requirement for milk production

Birth weight (Kg)	Weaning weight (Kg)	No. weaned / litter	Piglet daily gain (g/day)	Energy for Milk Prod. (MJ DE)
1.5	8	**10**	232	**70.6**
1.5	8	**10.5**	232	**74.1**
1.5	8	**11**	232	**77.6**
1.5	8	**11.5**	232	**81.2**
1.5	8	**12**	232	**84.7**

Calculated from (Close and Cole, 2000)

2.3. Creep feed intake

The effect of the creep feed intake per litter on the Sow's energy requirement for milk production is shown in Table 4. It can be seen that for every 1kg in creep feed consumed per litter there is reduction in the sow feed energy requirement for milk production of 1.1 MJ DE /day.

Table 4. Effect of creep feed intake per litter on the daily energy requirement for milk production

Birth weight (Kg)	Weaning weight (Kg)	No. weaned	Creep feed intake (kg/litter)	Energy for Milk Prod. (MJ DE /day)
1.5	8	11	**0**	**77.6**
1.5	8	11	**1**	**76.5**
1.5	8	11	**2**	**75.5**
1.5	8	11	**3**	**74.4**
1.5	8	11	**4**	**73.3**

3. Sow weight loss

Each 1kg of body weight loss will contribute 12.5 MJ DE to the energy requirements of the sow over an entire lactation. It can be seen from Table 5 that for every 10kg weight loss in a sow during lactation there is reduction in the sow feed energy requirement of ~4.5 MJ DE /day. This is an important source of energy for the lactating sow, however, it is important that weight loss in sows is not excessive during lactation. Thaker and Bilkei (2005) found that weight loss during lactation should not be greater than 5% (~10kg) for first parity sows and 10% (~22kg) for older parities if early return to oestrus, high farrowing rate and a high subsequent litter size are to be achieved. Gilts are most affected by lactation weight loss because of their inherent drive to achieve their target lean body mass and therefore, even after weaning, they continue to mobilise body fat to sustain lean tissue deposition (Foxcroft *et al*., 1997). This leads to an unfavourable endocrine and metabolic state in these young sows which impacts negatively on their fertility.

Table 5. Energy contribution associated with weight loss in sows during lactation

Post farrowing body weight (kg)	Sow weight loss (kg)	Feed equivalent energy from weight loss (MJ DE /day)
220	**0**	**0**
220	**10**	**4.5**
220	**20**	**8.9**
220	**30**	**13.4**

Calculated from (Close and Cole, 2000)

Example

Sows or gilts weaning 11 pigs will need a mean lactation feed intake <u>in excess </u>of 94 MJ DE/day to avoid excessive weight loss during lactation. This is the equivalent of 6.6kg of a diet containing 14.2 MJ DE/kg. Roughly 25% of this is required for the maintenance of the sow while 75% is required for milk production / litter growth.

Table 6. Calculated daily energy requirement of sows weaning 11 piglets each during a 28 day lactation

					Energy (MJ DE per day)				
Sow body weight (kg)	**Wean age (days)**	**Wean weight (Kg)**	**Sow weight loss (kg)**	**Creep intake / litter (kg)**	**Maint.**	**Milk Yield**	**Total Reqd.**	**Weight loss**	**Feed Reqd.**
180	28	8	0	0	24.2	77.6	101.8	0.0	101.8
180	28	8	10	2.5	24.2	74.9	99.1	4.5	94.6
220	28	8	0	0	28.1	77.6	105.7	0.0	105.7
220	28	8	20	2.5	28.1	74.9	103.0	8.9	94.1

B. Lysine Requirement

1. Sow Weight (Maintenance lysine requirement)

The empty weight of the sow after farrowing can be used to determine the maintenance lysine requirement for the sow. This is calculated as **40 mg total lysine / kg body weight$^{0.75}$ /day.** Table 7 shows the Maintenance lysine requirement for sows varying in weight from 180 to 250 kg. It can be seen from this that maintenance lysine requirement is very low relative to the total lysine requirement of sows during lactation. Every 10kg increase in sow weight above 180 kg increases daily maintenance Lysine requirement by ~0.1g.

Table 7. Maintenance Lysine (Total) requirement of lactating sows

Post farrowing body weight (kg)	Maintenance lysine requirement (g / day)
180	2.0
190	2.0
200	2.1
210	2.2
220	2.3
230	2.4
240	2.4
250	2.5

2. Milk production

The Lysine requirement for milk production depends on a number of factors such as piglet weaning weight, number of piglets weaned per litter and creep feed intake per litter. It can be calculated from litter weight gain by assuming that 1 kg of piglet weight gain during lactation requires 4kg of sow's milk. The yield of sow's milk can then be used in the following equation to calculate the daily lysine requirement for milk production:

Lysine requirement for milk yield (g/day) = milk yield (ml/day) x 0.056 x 0.076 ÷ 0.8 ÷ 0.9

or

Lysine requirement for milk yield (g/day) = milk yield (ml/day) x 0.0059

2.1. Piglet weaning weight

The effect of piglet weight at weaning on the lysine requirement for milk production is shown in Table 8. It can be seen that for every 0.5kg increase in the average piglet weight at weaning above 7.0kg there is an increase in the total lysine requirement for milk production of ~4.2 g/day.

Table 8. Effect of piglet weaning weight on the total lysine requirement (g/day) for milk production

Birth weight (Kg)	**Weaning weight (Kg)**	**No. weaned / litter**	**Piglet daily gain (g/day)**	**Lysine for milk prod. (g TLys/day)**
1.5	**7.0**	10	196	**46.4**
1.5	**7.5**	10	214	**50.7**
1.5	**8.0**	10	232	**54.9**
1.5	**8.5**	10	250	**59.1**

Calculated from (Close and Cole, 2000)

2.2. Number weaned per litter

The effect of the number of pigs weaned per litter on the total lysine requirement (g/day) for milk production is shown in Table 9. It can be seen that for every extra pig weaned per litter above 10 there is an increase in the total lysine requirement for milk production of ~5.5 g/day.

Table 9. Effect of the number of pigs weaned per litter on the total lysine requirement (g/day) for milk production

Birth weight (Kg)	**Weaning weight (Kg)**	**No. weaned / litter**	**Piglet daily gain (g/day)**	**Lysine for milk prod. (g TLys/day)**
1.5	8	**10**	232	**54.9**
1.5	8	**10.5**	232	**57.6**
1.5	8	**11**	232	**60.4**
1.5	8	**11.5**	232	**63.1**
1.5	8	**12**	232	**65.9**

Calculated from (Close and Cole, 2000)

2.3. Creep feed intake

The effect of creep feed intake per litter on the sow's total lysine requirement (g/day) for milk production is shown in Table 10. It can be seen that for every 1kg of creep feed consumed per litter there is reduction in the total lysine requirement for milk production of ~0.9 g/day.

Table 10. Effect of creep feed intake per litter on the total lysine requirement (g/day) for milk production

Birth weight (Kg)	Weaning weight (Kg)	No. weaned	Creep feed intake (kg/litter)	Lysine for milk prod. (g TLys/day)
1.5	8	11	**0**	**60.4**
1.5	8	11	**1**	**59.5**
1.5	8	11	**2**	**58.7**
1.5	8	11	**3**	**57.8**
1.5	8	11	**4**	**57.0**

3. Sow weight loss

Total lysine contribution associated with weight loss in sows during lactation as presented in Table 11 is calculated using the following equation

Total lysine contribution from weight loss = Sow weight loss (g/day) x 0.175 x 0.85 x 0.07
or
Total lysine contribution from weight loss = Sow weight loss (g/day) x 0.0104

For every 10kg weight loss in a sow during lactation there is reduction in the sow feed total lysine requirement of ~3.7g/day. This can also be an important source of lysine for the sow during lactation. However, excessive weight loss must be avoided at all costs for the reasons already stated.

Table 11. Total lysine contribution associated with weight loss in sows during lactation

Post farrowing body weight (kg)	Sow weight loss (kg)	Feed equivalent lysine from weight loss (g TLys/day)
220	**0**	**0**
220	**10**	**3.7**
220	**20**	**7.4**
220	**30**	**11.2**

Calculated from (Close and Cole, 2000)

Example

Gilts and sows weaning 11 pigs will need a minimum mean lactation intake in excess of 56.5 and 53.1 g total lysine per day, respectively. This is the equivalent of 6.2kg for gilts and 5.8kg of feed/day for sows when fed a diet containing 9.1g total lysine/kg. Roughly 3.5-4.5% of this is required for maintenance while the remainder is required for milk production / litter growth.

Table 12. Calculated daily total lysine requirement of sows weaning 11 piglets during a 28 day lactation

					Lysine (g Tlys per day)				
Sow body weight (kg)	**Wean age (days)**	**Wean weight (Kg)**	**Sow weight loss (kg)**	**Creep intake / litter (kg)**	**Maint.**	**Milk Yield**	**Total Reqd.**	**Weight loss**	**Feed Reqd.**
180	28	8	0	0	2.0	60.4	62.3	0.0	**62.3**
180	28	8	10	2.5	2.0	58.3	60.2	3.7	**56.5**
220	28	8	0	0	2.3	60.4	62.7	0.0	**62.7**
220	28	8	20	2.5	2.3	58.3	60.6	7.4	**53.1**

Calculated from (Close and Cole, 2000)

C. Time now to get serious about feeding lactating sows

An average yielding dairy cow (5000 litres per year) with a 260 day lactation has an average milk yield of 19.2 litres of milk per day or 2.4 kg solids (12.5% solids content). The litter of a sow weaning 11 pigs at 8kg has a mean growth rate over 28 days of 2.55kg/day which is the equivalent of 10.2 l/day of sow's milk. Sow's milk has a solids content of 21%, so this sow is producing 2.14 kg solids which is not that far off that of the dairy cow. What is even more important is that the energy value of the milk produced by the sow is even higher than that of a dairy cow due to its significantly higher fat content. The daily production of fat would be 740g/day for the dairy cow while it is 1020 g/day for the lactating sow. These high producing sows must be fed appropriately to support this level of production.

D. Pointers to increasing lactation feed intake

- Do not inadvertently restrict feed intake by feeding less than sows can eat
- Over feeding sows in gestation will reduce lactation feed intake
- Maintain farrowing rooms at 18-20^{0}C. High farrowing house temperatures depress feed intake
- The intake of wet fed sows (2x per day) is higher (12%) than that of *ad-libitum* dry fed sows

- *Ad-libitum* wet dry feeding is a good alternative to wet feeding to promote increased feed intake
- Dry feed is eaten more readily in pelleted than meal form
- The higher the energy density of the sows diet the greater the energy intake of the sow will be
- Feed lactating sows at least twice but preferably 3 times daily to encourage increased feed intake.
- Ensure that the feed in front of the sow is fresh
- Ensure that supplementary water is provided to match the sow's needs. Wet fed sows may not be getting sufficient water from the feed mix in the days after farrowing but depending on water to meal ratio excess water in the mix may limit intake late in lactation.
- Increasing gestation feed intake (+1kg) in the last few weeks before farrowing can help encourage higher feed intakes in the days following farrowing
- High feed intake in the first 2 weeks of lactation is very important if high average lactation feed intakes are to be realised
- Suggested target mean daily intakes are 4.1kg (58 MJ DE) in week 1, 6.4 kg (91 MJ DE) in Week 2, 7.8kg (111 MJ DE) in Week 3 and 8.4kg (119 MJ DE) in week 4.
- Ensure that there is sufficient capacity in troughs. This is particularly important when wet feeding sows at high feed allocation levels to prevent wastage while feeding.

Summary

Modern sows can produce quantities of milk solids similar to that of dairy cows. To maximise this potential to produce milk, without excessive weight loss during lactation, sow feed intake must be maximised. Pre-weaning growth rate in pigs is directly proportional to the sow's milk yield (4:1 conversion). The requirement for feed will be determined principally by the number of piglets reared by the sow and their weaning weight (i.e. milk production of the sow). On average sows and gilts weaning 11 pigs at 8kg will have an average daily feed intake requirement of more than 6.6kg of a standard lactation diet (14.2 MJ DE/kg and 9.1g/kg lysine) to satisfy their energy and lysine requirements. Each unit should check the lactation intakes of their sows against their piglet performance. Where necessary feed intake should be increased.

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Converting a setback into an opportunity

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*"When one door closes another opens. But we often look so long and regretfully upon the closed door that we fail to see the open one" -**Alexander Graham Bell***

The Irish pig industry is in the process of converting to loose sow housing which must be completed by January 2013. Unfortunately due to the high price of feed and banking crisis some units are unable to obtain funding from banks to undertake the new dry-sow housing necessary to maintain their herd size. While for some producers this is definitely a setback, for others it may be a beneficial reality check which could turn a setback into an opportunity.

The Problem

The Irish pig herd has seen a substantial increase in sow prolificacy over the last six years. The table below reveals that an average increase of 1.9 pigs produced per sow over this period.

	2006	**2007**	**2008**	**2009**	**2010**	**2011**
Born alive / litter	11.35	11.53	11.88	11.78	12.01	12.33
Pigs Prod Per Sow / Yr	22.2	22.5	23.4	23.3	23.9	24.1
Pig Produced Per Year per 500 sow unit	11,100	11,250	11,700	11,650	11,950	12,050

For a 500 sow unit this has produced an extra 950 pigs annually, which equates to an extra four weeks of sales. While this is a very positive development it has created its own problems on some unit due to a lack of sufficient housing to accommodate these extra pigs. Because of the poor profitability in the pig industry over the last few years, units may not have invested in sufficient additional housing. If this was not undertaken then the only other option is to reduce the sow herd to match the housing available.

Anybody familiar with the pig industry knows cutting the sow herd size is usually the 'very last option on the list'. Instead many units have simply increased the stocking rate per pen which has reduced the growth rates and sale weights on these units.

For a unit to reach its optimum performance it needs to allow pigs to fulfil their growth potential and ideally to reach a sale weight above 100 kgs. If a pig unit is overstocked then it will have deteriorating growth rates and feed conversions with consequential reduction in sale weight. The reduced growth rates further decreases the available space available and the downward spiral continues.

The Opportunity

For these units the unavailability of capital for investment may be an opportunity to reassess their operation and take the 'bitter medicine' of cutting sow numbers. In this case the medicine might well make the patient healthier and wealthier in the long run!

This paper is based on a collage of real pig unit experiences that are distilled down into a single example which examines two scenarios; the current situation where the unit is over stocked with a reduced sale weight and the second scenario where the unit reduces sow numbers to comply with loose sow housing legislation and to ensure that all pigs get their proper space allocation.

Scenario A:

In the current situation the reproductive element of the unit has improved over the last number of years (from 22 -24 pigs/sow/yr) to now reach the national Pigsys average. Unfortunately although the unit is now producing an extra 1,000 pigs per year the amount of weaner and finisher accommodation has not being increased. This has gradually led to pens being stocked at sub-optimal rates throughout the growing period with a consequential deterioration in growth rates, feed conversions and decreased sale weight. The unit is effectively 'running faster' but is not able to stand as it continues to lose ground with a resultant increase in the stress levels on unit staff and most importantly reducing the unit's optimum financial performance.

Sow herd size: 500	Sale weight / pig: 93kg
Pigs Produced / Sow / Yr: 24	Dead weight / pig: 71.1kg
Total Pigs Produced / Yr: 12,000	Pig Price / Kg dwt: €1.84
Weaner ADG: 446 grams	Pigmeat Produced / Sow: 1706kg
Finisher ADG: 782 grams	

Scenario B:

The unit needed to convert some of its dry sows to loose sow housing by January 2013 in order to comply with current welfare legislation. Unfortunately the unit's financial institution rejected the request for additional funding required to build the new dry sow housing and therefore the only option for the unit was to reduce the sow herd size.

By rearranging the internal layout of the existing dry sow and gilt housing the unit has managed to limit the sow herd size reduction to 90 sows, giving a new herd size of 410 sows. This reduction in size and the resultant reduced number of pigs produced however did allow more time in the weaner and finisher stages which increased the transfer and sale weights. It also allowed the pigs to be stocked at an optimum stocking rate which resulted in an increase in growth rate. The increased sale weight required three weeks of non-sales. The financial institute did finance this over a five year repayment schedule, and is included in this calculation.

Sow herd size: 410
Pigs Produced / Sow / Yr: 24
Total Pigs Produced / Yr: 9,840
Weaner ADG: 482 grams
Finisher ADG: 835 grams

Sale weight / pig:109.8 kg
Dead weight / pig: 84.2 kg
Pig Price / Kg dwt: €1.84
Pigmeat Produced/Sow:2021kg

Financial Consequences

		Original Herd		**Reduced Herd**
Pigmeat Sold Kg / week		16,418		15,933
Pigmeat Sold Kg / year		853,740		828,528
Total Feed Cost / year €		1,144,012		1,116,856
Feed Cost / Kg dwt. €		**1.34**		**1.348**
Total Non-feed cost / year €		389,000		371,200
Total Non-feed cost / kg dwt. €		**0.456**		**0.448**
Total Cost / year €		1,533,012		1,488,056
Total Cost / Kg dwt. €		**1.795**		**1.796**
Total Finisher Sales / year €		1,570,882		1,524,492
Total Income / Kg dwt. €		**1.84**		**1.84**
Margin / year €		37,870		36,435

The reduced herd returned a similar financial margin when compared to the original herd, due primarily to a higher output of pigmeat per sow. The increased output of pigmeat from 1706 kgs per sow to 2021 kgs per sow indicates that the unit is now operating close to full productivity efficiency. The financial feasibility of this venture is dependent on the unit obtaining the increased sale weight and the superior growth rates as outlined above.

Another advantage of obtaining a higher sale weight is when the pigs are being supplied to a slaughter plant with bonus weight bands. The percentage of underweight pigs not reaching the bonus bandwidths are lower in the new scenario which increases the level of pigs in the bonus weight range thereby generating an overall higher net price received per kg. This is however dependent on the weight range of heavier pigs been tightly controlled.

Outcome:

- For some units an enforced reduction in their sow herd size may provide an opportunity to generate greater efficiency
- Increased slaughter weights may bridge the financial gap from the reduced herd size
- A higher sale weight may increase the percentage of pigs reaching a bonus weight range thereby increasing the net income.

Feeding a gilt diet will improve sow longevity and productivity

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Introduction

Sow longevity is a key component of an efficient and profitable pig farming enterprise. However, the sow culling rate is steadily increasing at a rate of between 0.7% and 1% p.a. and currently stands at 50%, indicating that the longevity of Irish sows is declining. Efforts to improve sow longevity should be aimed at the replacement animals which are undervalued on many units. They need to be managed, housed and fed appropriately during the developmental phase to ensure that they are at a high level of health and are both physiologically and behaviourally mature on entry to the breeding herd.

This will become even more important once the national herd switches to group housing next year as this will place greater stress on the young replacement animal. In individual housed systems, lameness is one of the main reasons for the loss of young sows from the herd. However, preliminary findings from an on-going Teagasc survey of lameness in pigs indicate that the problem is greater in group systems. Lameness reduces the productivity of a unit by; increasing the involuntary culling rate of sows, the higher cost incurred in replacing sows and reducing the number of pigs produced per sow per year. However there are also indirect costs associated with the negative effects of lameness on sow reproductive performance. This is mediated both by poor lactation feed intake of lame sows but also by the physiological changes associated with infection and inflammation. It can result in energy for growth and litter development being diverted to the energy requirements of the immune response and interference with reproduction hormones. Lame sows produce fewer litters per lifetime and also have higher piglet mortality rate when compared with non-lame sows.

Lameness

Lameness presents as an abnormal gait as a result of physical injury or infection in the limbs or back. The main causes of lameness include: osteochrondrosis, infectious arthritis, arthrosis, trauma and lesions to the limb and claw. In group systems claw lesions are a major cause of lameness. Almost all lame sows on farms and 90% of culled sows have claw lesions. A survey on UK units observed abnormal gait in 45% of pregnant sows housed on partially slatted flooring. Similarly in Ireland early indications are that almost 50% of pregnant sows are either in the early or recovery stages of lameness or are clinically lame.

Claw health

Trace minerals such as zinc, manganese and copper are crucial to hoof health. Zinc is important as it has an essential role in cellular repair and replacement and therefore the rate of wound healing is increased. Copper is essential in the development of antibodies and the replication of lymphocytes, while manganese is vital for the formation and maintenance of cartilage and bone. Copper deficiency is associated with joint stiffness and enlargement, and weak or short bones. The dietary supplement Availa Sow® (www.zinpro.com) contains trace amounts of organic zinc, copper and manganese in a structure that makes the minerals more bioavailable than other forms, thus easier to absorb and utilise. The inclusion of this in the diet of breeding sows reduced heel erosion, heel overgrowth and white line lesions in sows and in one study reduced the removal rate of young sows from the herd (< parity 3) by 20%.

Osteochondrosis

Osteochondrosis is a non-infectious disease of the joint surface; it results in deterioration of cartilage quality and underlying bone. It causes increased pressure on the surface of an affected joint in developing animals. It is most common and severe in the elbow joint of pigs. The main risk factors for osteochondrosis are; genetics, high growth rate and joint stress. It is the primary contributor to leg weakness in pigs, increases lameness and reduces longevity.

Nutrition

Another factor contributing to lameness in young gilts is inappropriate nutrition during the developmental phase. Many producers feed their replacement gilts one of two feeding regimes; a finisher diet to service or a gestation sow diet from 100kg until service. Such regimes may not be optimum for the developing gilt; finisher diets are formulated for fast growth rates and high lean meat deposition and a gestating sow diet is formulated for a sow that has finished growing. In contrast diets specifically formulated for the developing gilt take into account the nutritional requirement for bone development and fat deposition. High growth rates are linked with several pig welfare issues including osteochondrosis, leg weakness, postural defects, cardiovascular issues, increased skeletal injuries, modification of the release of various hormones and behavioural modifications. Replacement gilts require higher levels of calcium (Ca) and phosphorous (P) for bone mineralisation to prevent bone weaknesses and as a backup source of Ca and P for the litter requirement if needed during gestation and lactation.

Increased Ca and P in developing females improves longevity and reproductive performance. It is important to implement a gilt feeding strategy early (at 60-70kg) before bone formation is complete and to facilitate gradual weight gain.

The objectives of this study were to investigate the effects of feeding a finisher diet, a gestating sow diet and a gilt developer diet (including Availa Sow®) on lameness indicators in replacement gilts.

Methods

Thirty six Large White x Landrace gilts were selected from finisher stock at Moorepark at approximately 55kg and transferred to individual pens where they were provided with *ad-libitum* access to a 1st stage finisher diet until c.65kg. Gilts were then switched to one of following dietary treatments; finisher, gestating sow and developer (Table 1). The experiment lasted 12 weeks and the gilts were slaughtered at c. 140kg which was the target weight that corresponded to service.

Table 1. Feeding regime for the three dietary treatments (limit fed=2.25kg/day)

Weight range (kg)	**Dietary treatment**		
	Developer	**Finisher**	**Gestating sow**
65 – 100	Developer (limit fed)	Finisher (*ad-lib*)	Finisher (*ad-lib*)
100 - 130	Developer (limit fed)	Finisher (*ad-lib*)	Gestating (limit fed)
130 - 140	Developer (*ad-lib*)	Finisher (*ad-lib*)	Gestating (*ad-lib*)

Feeding

Gilts on the finisher dietary treatment were a*d-libitum* fed throughout (Table 1). Their diet was formulated as a 2nd stage finisher diet (Table 2). Gilts on the gestating sow and developer dietary treatments were switched from limited to a*d-libitum* feeding of their appropriate experimental diet between 130 and 140kg or for 2 weeks before service to replicate flushing.

Measurements

Feed intake was measured daily. Locomotory ability was scored weekly on a scale of 0 (normal) to 5 (most abnormal/indicative of lameness) according to severity. The gilts were weighed at day 0 (start of the experiment c. 65kg), week 4 (c. 100kg), week 10 (prior to flushing/c. 130kg) and week 12 (prior to slaughter/c.

140kg). Eight types of lesions on the hind claws and soles of feet were scored from 0 to 3 according to severity at day 0, week6 and week12 by raising the pig 0.75m off the ground using a pig chute to allow for inspection of claw and sole lesions.

The front right leg of each pig was removed after slaughter and dual-energy x-ray absorptiometry (DXA) analysis was used to measure bone mineral density (BMD; g/cm2). Surface lesions (SL) on the cartilage of the elbow joints were scored from 1 (normal) to 5 (severe) on the humeral condyle and 1 (present) or 2 (absent) on the anconeal process (Fig.1). Severe corresponded to osteochondrosis dessicans [OCD].

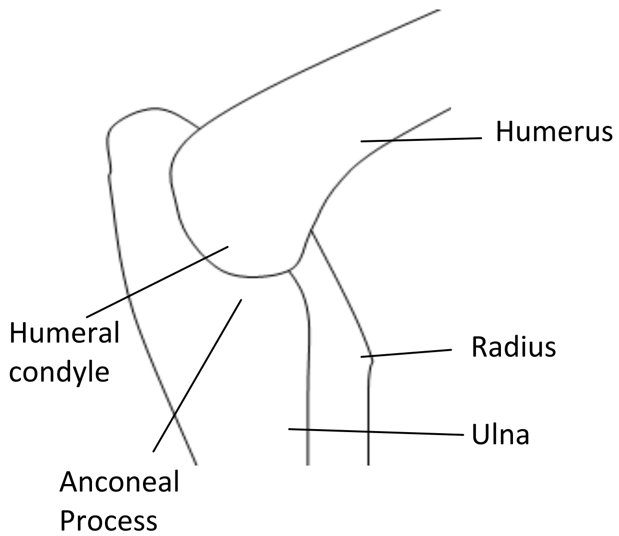


Figure 1. Diagram of the pig elbow joint

Table 2. Composition of experimental diets (kg/t)

Item	Developer	Finisher	Gestating sow
Barley	811.95	500	897.4
Wheat	0	348.7	0
Soybean (48%CP)	103.1	120	70
Soya oil	60	10	10
Lysine HCl	1	4	1
DL-Methionine	0	1	0
L-Threonine	0	1.2	0
Vit-Min Finisher	0	1	0
Vit-Min Sow	1.5	0	1.5
Phytase	0.1	0.1	0.1
Salt feed grade	4	3	4
Di-Calcium phosphate	6.5	0	5
Limestone flour	11	11	11
Availa Sow®	0.85	0	0
Chemical composition			
Digestible energy (MJ of DE/kg)	14.04	13.54	12.96
Lysine (g/kg)	7	9.76	6.35
Calcium (g/kg)	7.58	6.06	6.96
Phosphorous (g/kg)	4.9	3.74	4.62
Digestible phosphorus (g/kg)	3.32	2.41	3.2

Results

Lameness

None of the gilts on the developer treatment were scored as lame (i.e. none received scores >1) at any stage during the experiment (Table 3). From the fifth week of the trial there were significantly more lame gilts on the finisher and gestating sow dietary treatments than on the developer treatment.

Table 3. Gilts (%) affected by lameness (scores of >1) in each of three dietary treatments at 4 stages during the trial

Period	**Developer (%)**	**Finisher (%)**	**Gestating sow (%)**
Day 0	0	0	0
Wk 1-4	0	2.2	2.1
Wk 5-8	0	9.1	20.8
Wk 9-12	0	17.7	14.6

<u>Claw lesions</u>

Claw lesions were present in 100% (n=12) of gilts on the finisher treatment by week 12 (Table 4). The lowest percentage of gilts with claw lesions was in the developer treatment (81.8%). All gilts on the finisher and gestating sow treatments had uneven claws by week 12. In the developer treatment, the proportion of gilts with uneven claws reduced as the trial progressed (Table 4).

Table 4. Gilts [%(number of animals)] with claw lesions and uneven claw size in the three dietary treatments at three inspection points

		Dietary treatment		
	Period	**Developer (%)**	**Finisher (%)**	**Gestating sow (%)**
Claw lesions	wk 0	54.5 (6)	54.5 (6)	50 (6)
	wk 6	45.5 (5)	72.7 (8)	83.3 (10)
	wk 12	81.8 (9)	100 (12)	91.7(11)
Uneven claw size	wk 0	90.9 (10)	100 (11)	91.7 (11)
	wk 6	81.8 (9)	100 (11)	100 (12)
	wk 12	27.3 (3)	100 (11)	100 (12)

<u>Joint lesions</u>

Gilts in the developer treatment had lower surface lesion scores on the elbow joint than gilts in the gestating sow and finisher treatments (Table 5). Gilts on the Finisher treatment had the highest incidence of OCD (score 5).

Table 5. Gilts [%(number of animals)] affected by surface lesions on the cartilage of bones in the elbow joint

		Dietary Treatment		
Joint surface lesions	**Score**	**Developer (%)**	**Finisher (%)**	**Gestating sow (%)**
Humeral condyle	1	36.4 (4)	0 (0)	0 (0)
	2	36.4 (4)	9.1 (1)	8.3 (1)
	3	0 (0)	18.2 (2)	16.7 (2)
	4	0 (0)	36.4 (4)	50 (6)
	5	27.3 (3)	36.4 (4)	25 (3)
Anconeal process		45.5 (5)	72.7 (8)	58.3 (7)

Bone mineral density

Bone mineral density levels did not significantly differ between the 3 treatments. However gilts on the developer treatment had numerically higher bone mineral density (1.04 g/cm^2) than gilts on the finisher (1.01 g/cm^2) and gestating sow treatments (0.99 g/cm^2).

Body weight

At weeks 4, 10 and 12 (trial end/slaughter) gilts on the developer treatment weighed less than gilts on the finisher and gestating sow treatments (Fig. 2).

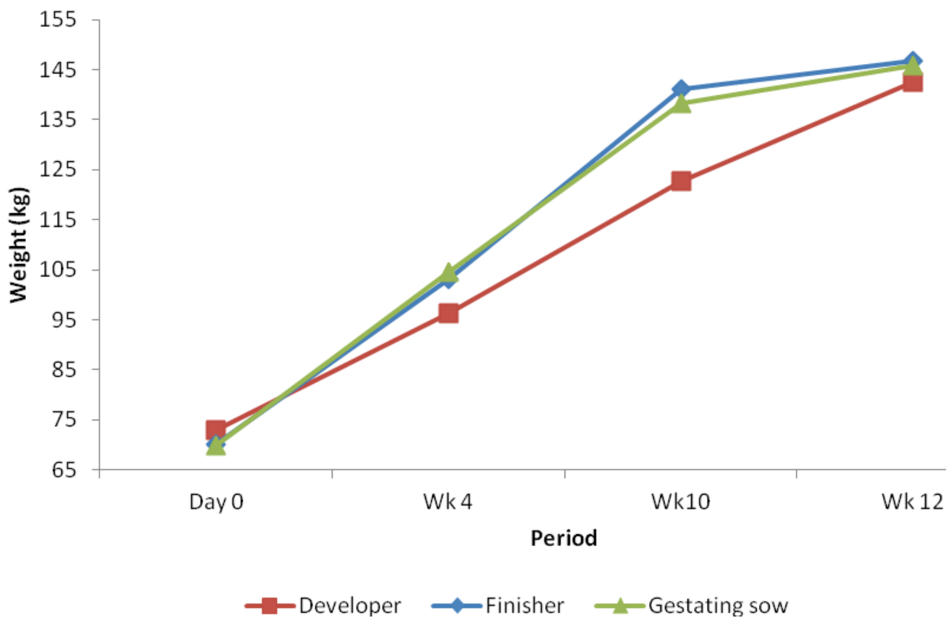


Figure 2. Average body weight of gilts on three treatments at day 0, wk 4, wk 20, wk 12

Conclusions

Limit feeding a diet specifically formulated for developing gilts from 65kg reduced lameness, claw abnormalities and joint surface lesions of the cartilage in the elbow joint compared to the two most commonly practised feeding regimes for replacement gilts on Irish farms. Such improvements would be expected to translate into improved welfare, longevity and productivity of the breeding herd. The results from an experiment carried out in Moorepark on the effect of *ad-lib* feeding a developer, finisher and gestating sow diet on group housed gilts may provide further information on the effects on limb health in a more on farm representative setting.

What's driving the grain markets and what to look out for going forward?

David Norris

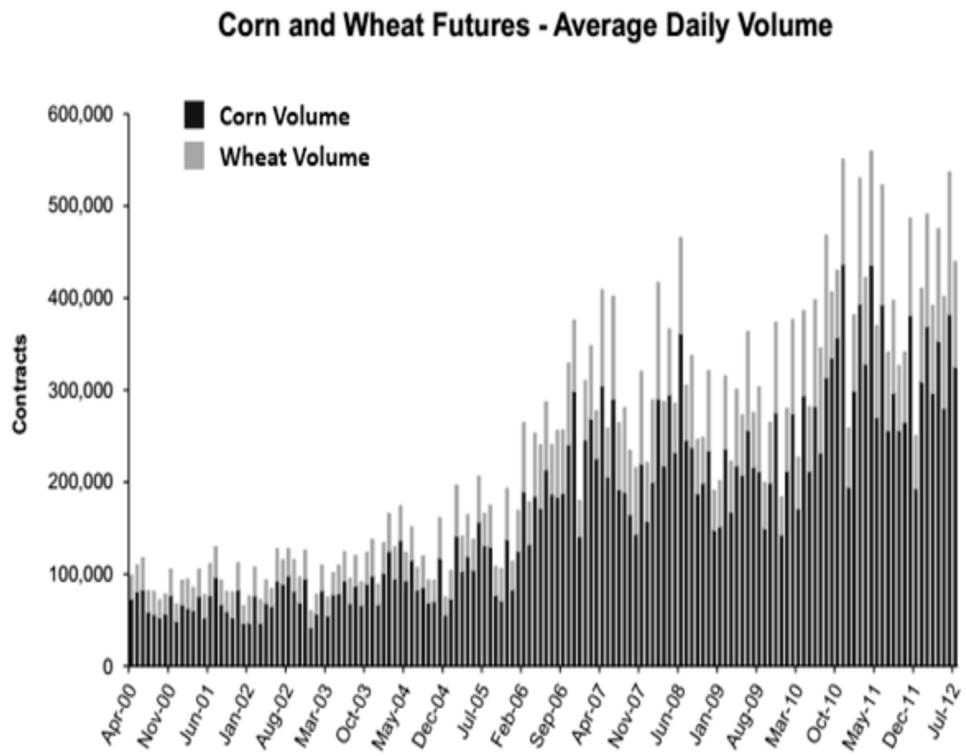
The grain markets have always been volatile, but perhaps never more so than in recent years. There have always been a varied set of factors behind fluctuations in price movements in the markets, old favourites being: **supply & demand, weather, currency fluctuations etc.**

In recent years however we've seen another force begin to have an increasingly dominant role in determining price movements in the grain and other commodity markets:

Money Flows

Make no mistake, this is currently the single biggest mover and shaker in the grain sector at the moment. Regardless of what you might read elsewhere that speculation is not a major influence on price movements in commodities as "for every buyer there must also be a seller" I am here to tell you that this is nonsense. In 1999 the Commodities Futures Trading Commission (CFTC) deregulated the US futures markets, enabling funds to hold as large a position in the grain markets as they liked.

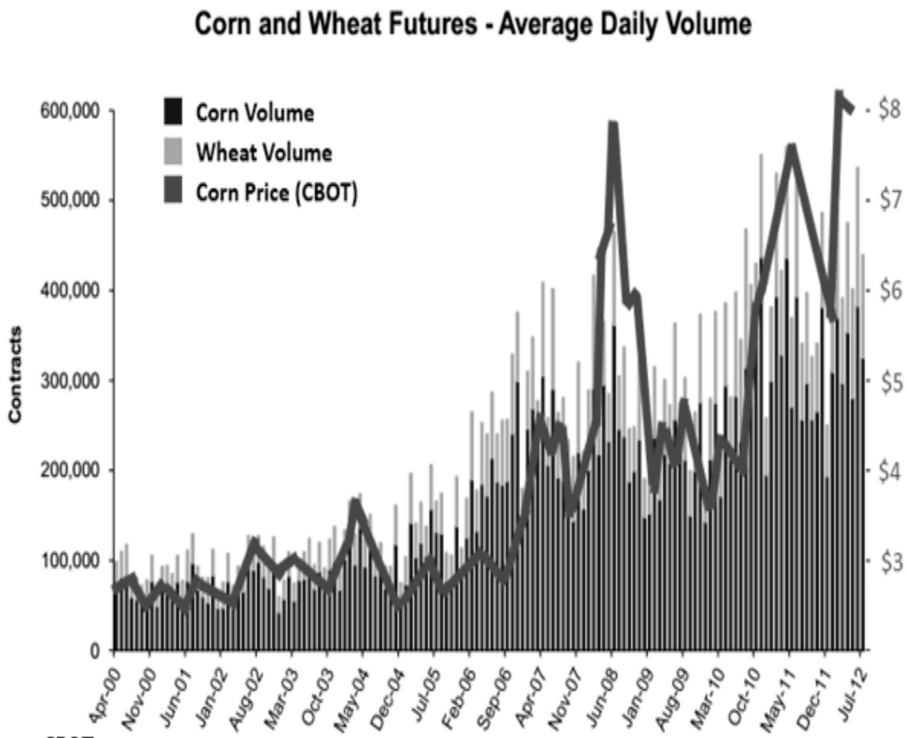
It took a few years for hedge fund managers to realise the significance, and earnings potential, of this apparently innocuous move. In 2003 Index Funds had around $13 billion invested in commodities futures, by 2008 that amount had risen around 2000% to approximately $300 billion. Volumes traded in the grains sector of the Chicago Board of Trade soared by around 500% during this time, and after a lull in 2009/10 have increased further since (see chart below).



Source: CBOT

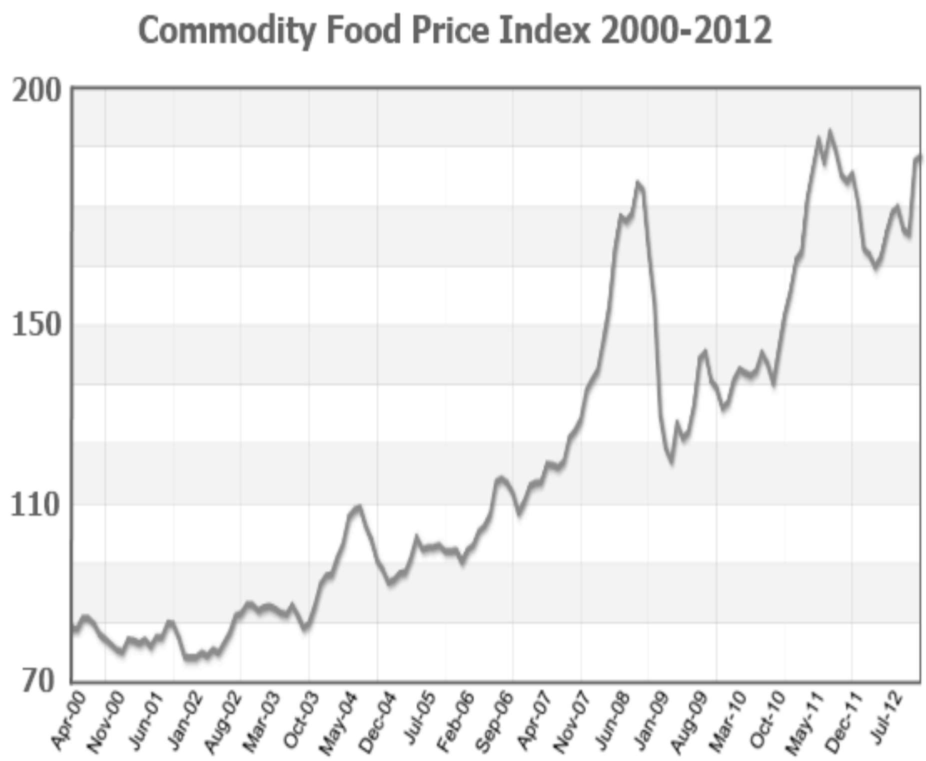
Yet world production of corn only increased by 32% between 2003 and 2008, and wheat output by 8% during the same period. Global consumption was also on the up, but by nowhere near as much: 23% on the case of corn and only 2% for wheat.

So the volumes trading in Chicago grains were suddenly displaying an extraordinary rate of expansion that bore little correlation to world production or consumption levels in those commodities. With that increase in volume came a dramatic increase in prices, this chart overlays the price of front month Chicago corn on top of the previous volume chart:



Source: CBOT

The Commodity Food Price Index shot up 125% between the start of 2003 and June 2008, as world food prices went through the roof and people in underdeveloped nations were dying of starvation.



Source: IndexMundi

Then suddenly, after US wheat and corn prices had raced to then all-time highs, we had the sub-prime induced crash. World commodity prices took a nosedive, including those of wheat and corn, even though the fundamentals of supply and demand for those were essentially the same after the crash as before it.

After a brief period of subdued speculator activity in the commodities markets in 2009/10, volume suddenly increased sharply again in the second half of 2010 following the Russian drought, which gave the funds a renewed appetite for grains. Corn and wheat both posted around an 80% increase in price between June and the end of December 2010, whilst soybean prices were up by nearly 50%.

The correlation between corn prices and world food prices is obvious. Looking at these charts it also seems abundantly clear that the volume traded on Chicago corn and wheat contracts is indeed also clearly linked to prices, even though many so-called experts, and of course the exchanges involved themselves, try to make a convincing case to the contrary.

So, we can see that volume has increased significantly over the last ten years, but what kind of numbers are we talking here?

Exchange data from the US is frequently given in terms of bushels and/or so many contracts or lots, one contract being 5,000 bushels in the case of grains, which often makes the magnitude of the business being transacted difficult for Europeans to quantify.

With that in mind, I've converted data from the official Chicago Board of Trade website into numbers that we can all understand:

Chicago Board of Trade 2011 Futures Traded Volumes:

Commodity	2011 Volume	Tonnes Equivalent	% of World Crop
Corn	79 million	10 billion	1140%
Soybeans	45 million	6 billion	2500%
Wheat	24 million	3.3 billion	475%

So, in round figures, almost the entire volume of all the corn produced in the world last year traded every single month in 2011, for soybeans it was more than twice the global annual output and for wheat we had a more modest, but still extreme, almost half the world crop trading every month last year.

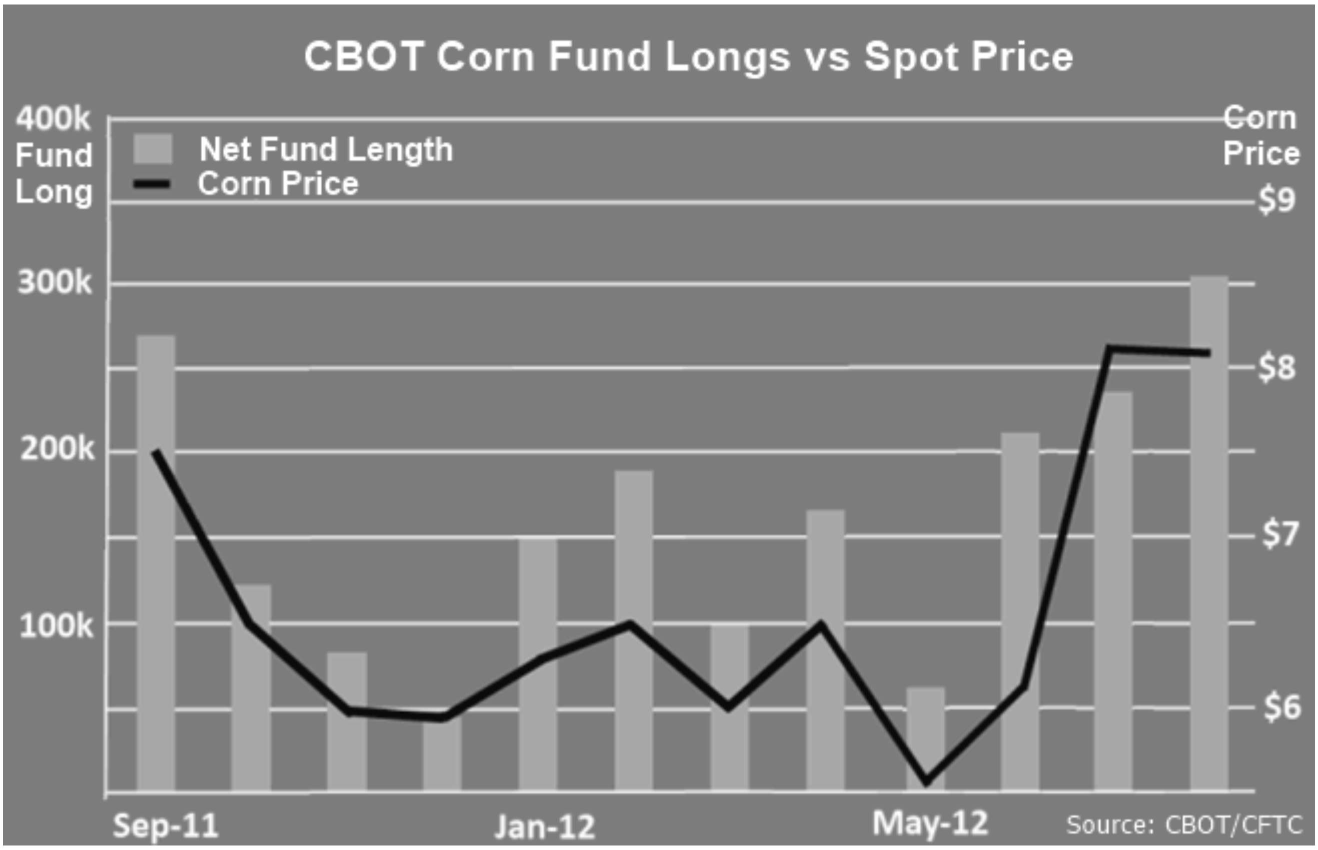
This is clearly far more than bona-fide normal commercial hedging activity. Note also that these are just futures trades, these figures do not include options trades which also saw substantial volumes change hands.

Incidentally the latest figures from CBOT, to the end of August 2012, show that corn futures volumes have declined marginally so far this year, down 2.6% year-on-year in comparison with 2011. Soybean volumes have jumped sharply, up almost 25% year-on-year with wheat volume also significantly higher, up 11.4%.

Soybean prices have subsequently risen to an all-time high of almost $18/bushel in early September this year, with corn prices also setting a record of nearly $8.50/bushel in late August, whilst wheat set a 4-year high close to $9.50/bushel earlier in the summer.

The US has of course been gripped by drought this year, the question is are these record prices justified? How much of these rises to unprecedented levels and the current volatility in the markets are actually due to fund activity?

The following chart plots fund length in Chicago corn over the last twelve months, overlaid by the front month price of corn to the end of August:



It would seem that either the funds are very good at guessing which way the price of corn is going to go, or that the extent of their involvement in the market dictates it.

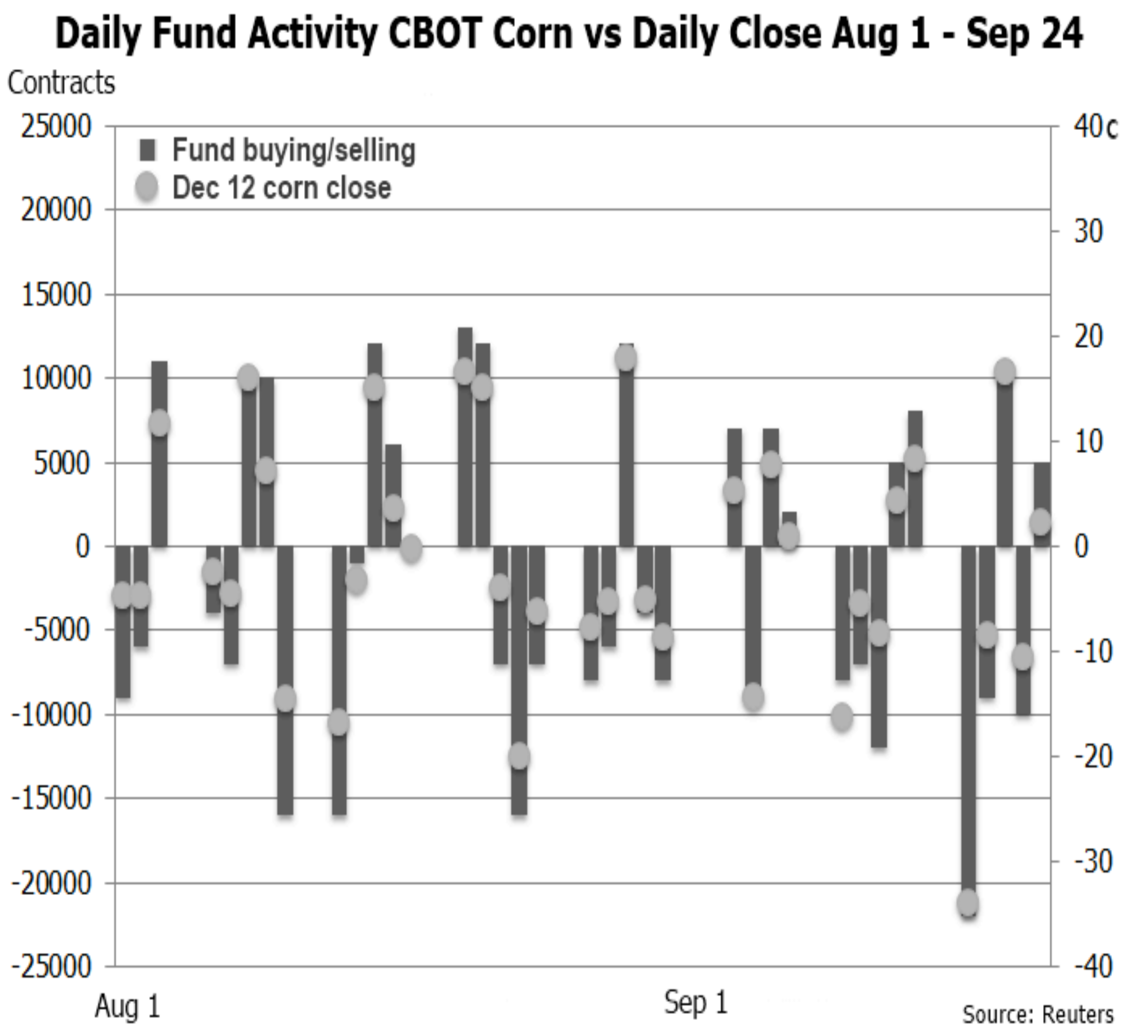
I would contend that the argument that for every buyer there must also be a seller, and vice versa, and therefore fund activity cannot be responsible for overall price movement is one that is inherently flawed.

The following interesting and enlightening article is well worth Googling, and provided me with a lot of inspiration for writing this particular presentation:

"Imaginary wheat dominates the price of real wheat, as speculators (traditionally one-fifth of the market) now outnumber bona-fide hedgers four-to-one." – Frederick Kaufmann, [How Goldman Sachs Created the Food Crisis.]()

It seemed to me that every market report I read these days quotes whether funds were net sellers, or net buyers, of corn or soybeans on a particular day and that almost invariably when they were buyers the market went up (and when they were net sellers prices went down).

It couldn't really be that simple though surely, could it? I decided to do a bit more digging. The following chart plots the daily activity of fund money in CBOT corn, as reported by Reuters, matched against where the most active Dec 12 corn contract finished on that particular day between Aug 1 and Sep 24 of 2012.



Not only did the market finish lower on every single session when funds were net sellers, and higher when they were buyers during this period, the magnitude of the daily price movement seemed to match pretty closely whether they were big buyers/sellers on any given day or if their activity was more muted.

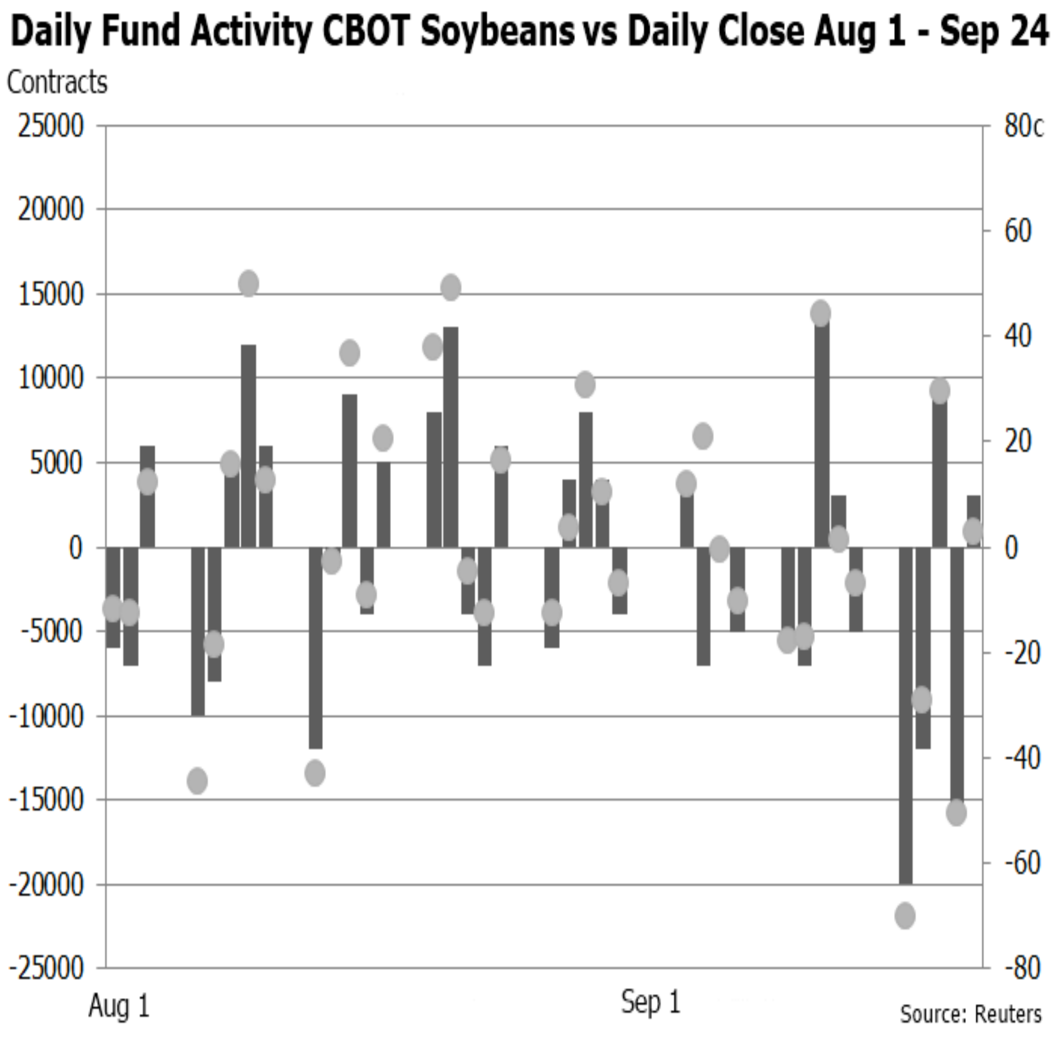
Incidentally there was one session during the period when funds were said to be net even on corn on the day – Aug 17. On that particular day corn prices hardly moved at all, with Dec 12 finishing the day down a quarter of a cent.

Coincidence? I think not, but I thought I'd do the same analysis for soybeans just in case, this time using the most active Nov 12 contract.

By this point it possibly won't surprise you to hear that the soybean chart matches the corn chart very closely. On every single occasion that fund money was increasing their net long, the Nov 12 price closed higher, and every time they were net sellers it closed lower.

There was one occasion here too when fund activity was said to have been even on the day – Sep 6, when Nov 12 beans finished half a cent lower.

Once again, the daily change in price seems greatest during the sessions when funds have been particularly active as either sellers of buyers.



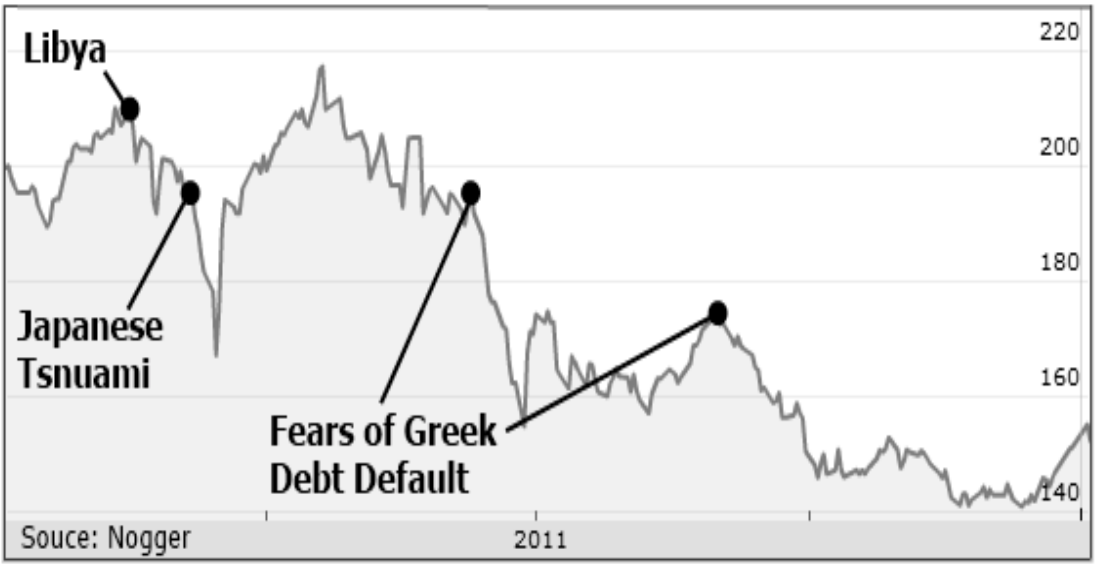
As of Tuesday Sep 18 (the most recent set of data available) "managed money" – a proxy for funds – held a net long position in Chicago soybeans of nearly 210,000 contracts. That's the equivalent of around 28.5 million tonnes of soybeans, or around 40% of this year's entire US production.

That's a very significant proportion of the crop to be held in speculative hands. The short-term fundamentals continue to indicate that prices could move higher between now and when new crop South American soybeans arrive on the market in the spring, with essentially just this year's drought-reduced US crop to keep the world supplied with soybeans this winter.

However, with funds holding such a large long-holding we have to be wary of something coming along that might spook them into wanting to exit the bulk of their position. In the recent past such unpredictable events as the Japanese tsunami and ensuing nuclear crisis, civil unrest in North Africa and the Middle East and the UN intervention in Libya have all triggered a mass exodus of fund money from the markets.

We also of course have the ongoing European debt crisis, with fears that Greece were potentially about to default on their debt having already caused one or two market wobbles. Question marks remain over Spain and Italy too, with an escalation of those also having the potential to unsettle fund nerves.

London Wheat Spot Price 2011



Back in 2011, London wheat fell £38/tonne in a week mid-March on uncertainty of the implications of the Japanese earthquake and subsequent tsunami, before recovering almost all of those losses within a few days.

By mid-June, fears of a Greek debt default saw London wheat drop £40/tonne in a fortnight, and another wave of Greek jitters triggered a further near £30/tonne drop in four weeks in September.

All the evidence points to fund money inflows and outflows being the number one factor in influencing price movements in the grain markets in the current climate. Unfortunately trying to predict these in advance is proving nigh on impossible, certainly sudden outflows in particular can frequently be triggered by external factors that are impossible to foresee like Acts of God and political decision making.

Biofools – Is A U-Turn On The Cards?

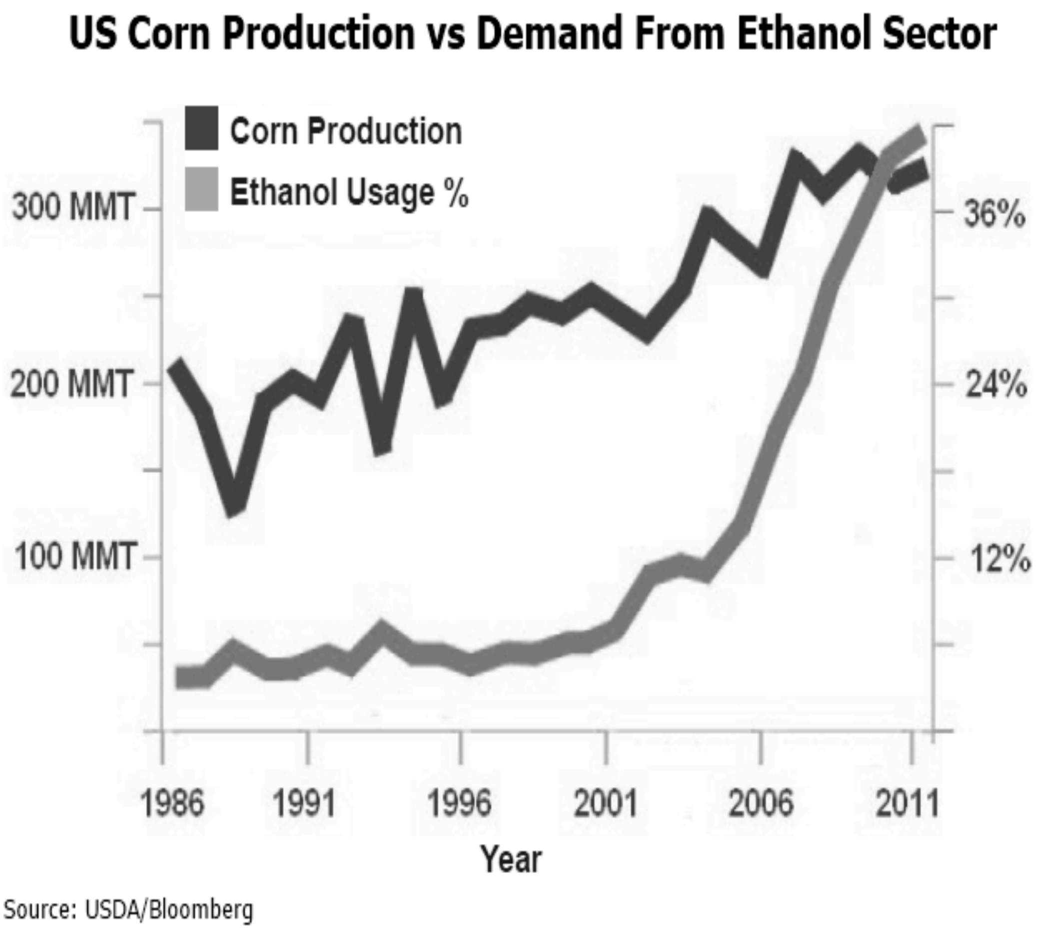
There is currently a growing backlash developing in Europe in particular concerning the real environmental impact on producing biofuels from food crops, and there are signs of a U-turn on earlier targets to meet 10% of the transport sector's needs from renewable biodiesel by 2020.

The European Commission are now said to be proposing to limit the share of energy from food crop-based biofuels, such as wheat and rapeseed, to less than 5% of the total energy consumed in the transport sector in 2020. There are no limits imposed by the commission at the moment. The move potentially marks a radical change in policy.

In the US around 40% of the corn crop currently goes to make ethanol in an industry that has exploded in the past ten years, again due to government mandates.

The steep rise to record levels that we have seen in corn prices this year has prompted many, including the United Nations, to put pressure on the US to at least temporarily suspend the five-year-old Renewable Fuels Standard (RFS), that states that US fuel companies are required by law to ensure that 9% of their gasoline pools are currently made up of ethanol.

A change of heart in an election year may be unlikely, but 2013 could be a different kettle of fish.



The Euro Crisis And A Grexit

A narrow victory for the pro-austerity New Democracy party in the Greek elections in June helped avoid what was looking like a Greek debt default, at least for now. However, civil unrest Greece is ongoing as the government try to push through the austerity measures required to meet IMF/EU/ECB imposed criteria to keep the loan money coming through.

Anything could happen there at any time to spark a new wave of "risk off" flight to safety for fund money, which would almost certainly include a different type of Grexit to the one you have already heard about – a grains exit.

Meanwhile Spanish banks have already had one bailout, and could shortly require another, although the government themselves have managed to avoid such a capitulation up until now. However, pushing their own austerity measures through with unemployment at 25% and rising, and the country gripped by recession will be far from easy. Some would say impossible.

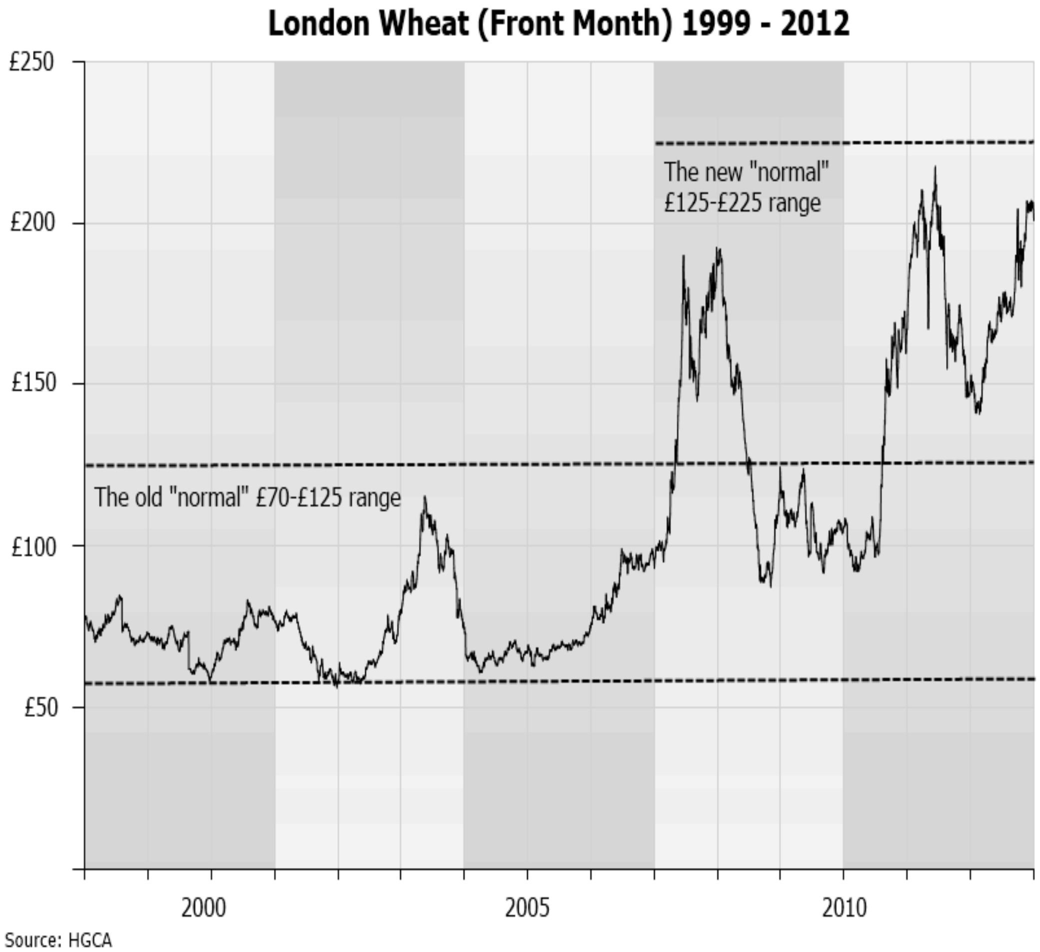
And then of course there's Italy…and Portugal…and Ireland.

The IMF/EU/ECB have managed to contain the individual forest fires that we've seen break out over the last couple of years, what happens if two or three ignite all at the same time? Is there enough water (money)?

And will the German firefighters have the stomach for it? There are some schools of thought that suggest that the best way forward for the Euro might be for Germany themselves to leave it.

My Take On It All

As things stand, volatility is the new normal. A bit like buses, some farmers have waited all their lives for an opportunity to sell feed wheat at £200/tonne and suddenly two come along almost at once.



The old normal has gone out of the window, the new normal seems to be £125-£225 for London wheat, but I wouldn't rule out a test of both the upper and lower end of that scale in the not too distant future.

The all-time high closing price for London wheat was £217.50/tonne set on 20 Apr 2011, I see that being taken out within the next couple of years, quite possibly in the spring of 2013, if the fundamentals are sufficient to back up fund activity we could easily break out of "the new normal" to the upside.

I can also envisage a scenario however where a wave of fund selling and a flight to safety out of commodities in general, if also backed up by bearish fundamentals where prices could conceivably break out to the downside and maybe get close to £100/tonne again – it was after all little more than two years ago that we last visited this territory.

Similar extreme volatility is also easy to foresee in corn and soybeans. The cure for high prices is high prices, they say. Farmers will clearly be looking to maximise their profitability by planting as much of these commodities as they can at these price levels.

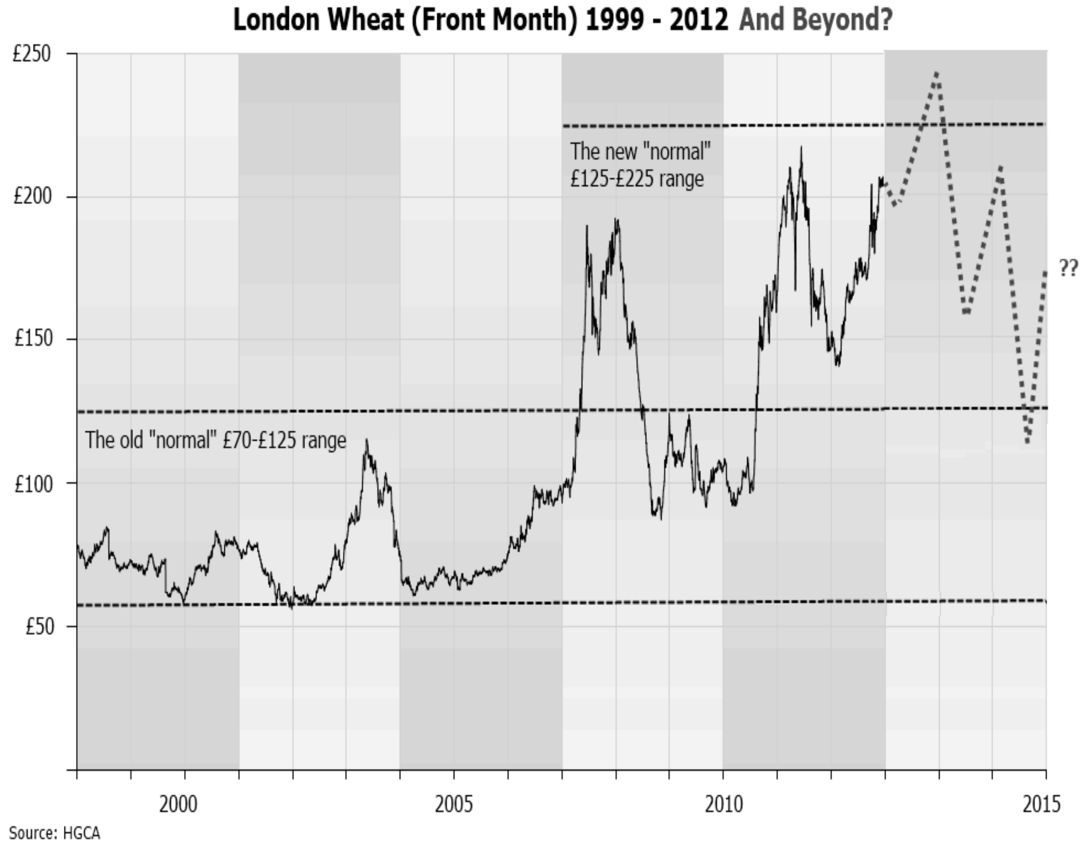
In South America, where plantings are just getting underway for the 2013 harvest, record production levels are expected for soybeans from all the major nations:

Country	**Forecast Production (million tonnes)**	**Increase %**
Brazil	82.00	+23%
Argentina	56.00	+37%
Paraguay	8.60	+115%
Uruguay	3.10	+94%
Bolivia	2.45	+11%

Source: Oil World

The Future Could Look Something Like This

Of course I'm not predicting these specific movements in these specific years, but I can see the large price swings that we've seen in the last 4-5 years persisting, and possibly even getting more extreme.



Charts for corn and/or soybeans would be broadly similar, where corn used to frequent the $3-4/bushel trading range, it could now be $4-8/bushel. Ditto soybeans: $5-7.50/bushel becomes $10-20/bushel, with 100% in values between the top and the bottom of the market the new normal.

"Within a decade no man, woman or child will go to bed hungry"

Henry Kissinger, World Food Conference, 1974

1974: World starving 460 million

2012: World starving 936 million

Global Pig Meat Market Developments

David Owens, Bord Bia

Executive Summary

The market environment for meat is changing considerably at present. Beef production is moving into decline in some developed economies and contributing to firm prices. Global beef supplies that were tight in 2011 have remained so in 2012 with output now declining in the United States and also the EU while only a small recovery is taking place in South America. The global sheepmeat market had an exceptional 2011 with record prices but the market has come back to some extent in 2012. In terms of meat consumption, consumer demand is growing in developing economies but remains under pressure in developed nations.

Globally pigmeat production had been increasing but in many regions a downturn is now expected, in particular in the exporting countries of North and South America and the EU.
The recent sharp rise in feed ingredient prices, both of cereals and soya beans due to a drought hit US harvest, is pushing pig producers throughout the world into a substantial loss making situation. In the EU the situation is being exacerbated by the introduction of sow welfare legislation but the extent to which producers will go out of business because of this is not at all clear and will vary from country to country.

By the middle of next year global pigmeat production can be expected to fall given cutbacks in sow numbers which are now starting to take place. In the EU market prices are very responsive to changes in supply and pig prices can be expected to move up during the course of 2013 and EU exports to the global market will possibly decline. Global trade of pigmeat benefited from strong demand in importing countries in 2011 and this demand has eased back this year.

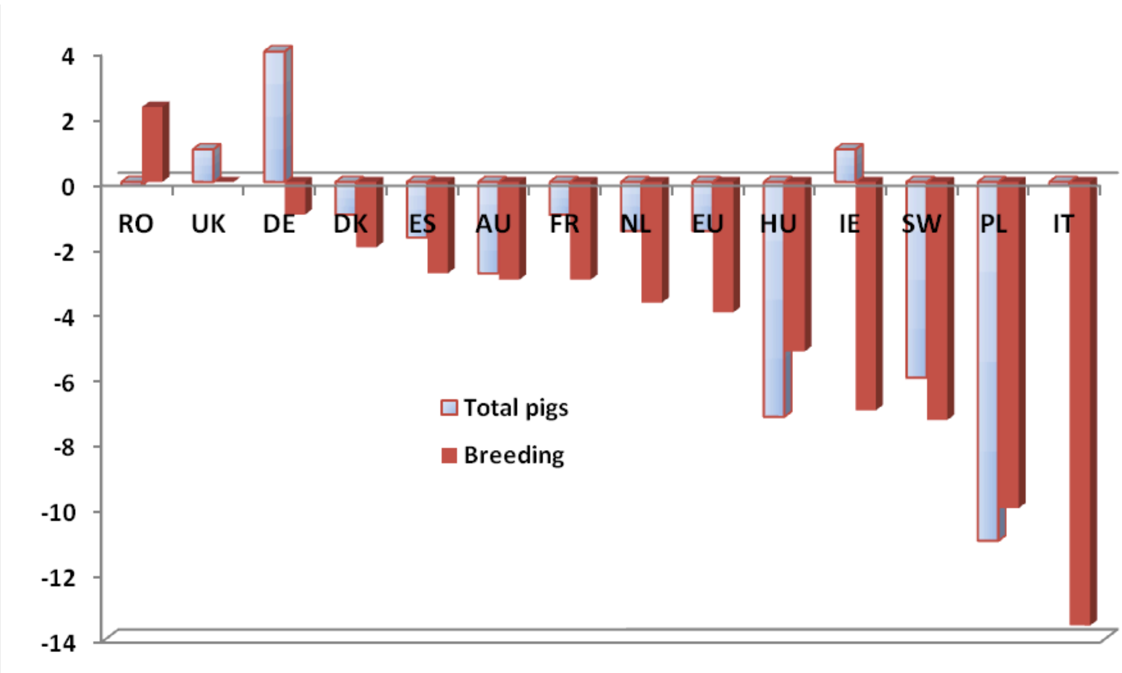
Developments for Global Exporters

EU breeding herd falling

The EU pig sector is going through a turbulent period as a jump in feed costs has co-incided with requirements to meet sow welfare legislation. Both factors will result in some reduction in sow numbers in the EU but the extent of this is by no means clear. As a result some producers across Europe are downsizing, de-stocking or exiting the industry. The EU breeding herd had already been in decline since 2011 due to higher feed costs, with last Decembers pig survey showing a fall of three per cent in sow numbers.

Midyear 2012 herd surveys for a number of countries, representing close to 80 per cent of EU production, have reported a one per cent decline in the total EU pig herd with a further four per cent decline in sow numbers. These surveys were conducted prior to the sharp rise in feed prices, therefore they could be expected to fall further as the year progresses. Higher total pig numbers were evident in the UK, Germany and Ireland, with no change in Romania and Italy. The sharpest decline was in Poland with a 11 per cent fall in overall pig numbers.

EU mid-year 2012 pig herd surveys (% Change vs 2011)



Source: EU Commission

Romania was the only country to report an increase in breeding pig numbers as expansion has been encouraged by the resumption of exports after their classical swine fever outbreak. All other countries have reported declines in their breeding herd, with significant falls reported in Hungary, Ireland, Sweden, Poland and Italy which fell by 13 per cent.

EU finished pig supplies in decline

After rising in 2011, EU pig slaughterings have already started to decline being down one per cent in the first half of 2012. Supplies for Denmark, Germany, France and the Netherlands up to the end of September were three per cent or 2.6 million pigs lower than in 2011. Together these nations account for almost half of EU production and this lower supply has had a major impact on the market in recent months. Some of this decline has been offset by higher numbers in Spain, Italy and the UK, however overall EU production will be back this year The recent *Short Term Outlook*[1] from the EU Commission is forecasting EU pig production to fall by three per cent in 2013. Given the decline in breeding pig numbers a greater fall in production is possible next year and also into 2014. Only once in the past 20 years has EU pig production fallen by this amount. The last time there was a significant downturn in EU pig production was the aftermath of the 1997/98 pig crisis and a look at the data suggests that for a one per cent year on year decline in EU-15 pig slaughterings the EU pig reference price increased by up to eight per cent year on year.

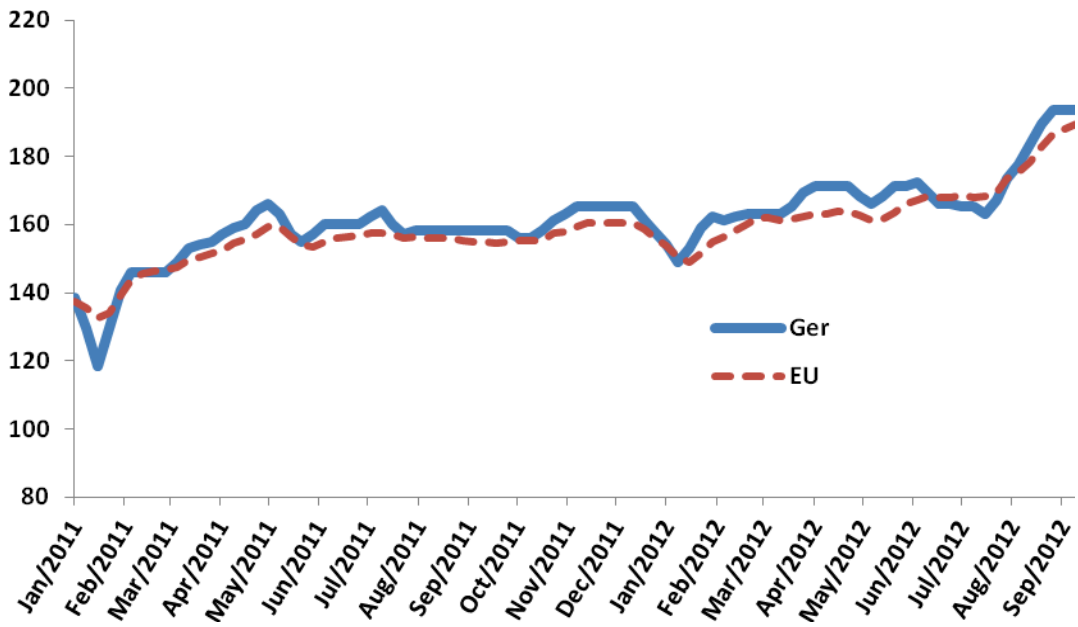
EU pig prices on the rise

Over the two months pig prices have risen rapidly across most of the EU, in response to tightening supplies and strong demand in some markets. Since the start of August the EU average reference price increased by 20 c/kg or 12 per cent to €1.91/kg dw excl. VAT. This is the highest level recorded since the expansion of the EU in 2004 and was only exceeded during the FMD crisis in 2001, when prices briefly topped €2.00 /kg.

The most recent weekly price is some 23 per cent higher than the same week last year while average year to date prices are 10 per cent above 2011. This rise comes at a time of year when prices are normally stable to falling, but yet is required to cover the increased costs of production. Prices have risen in all markets but some of the biggest recent increases have been in Germany, as increasing demand due to better weather coincided with tightening supplies.

It is difficult to predict whether prices will rise further, will remain at their current levels or ease back as the sector is facing unprecedented challenges. However, given the tight global pig supply situation, continuing high feed costs and relatively strong import demand then prices should remain elevated.

EU and German pig prices (c/kg dw excl. VAT)



Source: EU Commission

Good EU export demand

EU pig meat exports in 2011 benefited from strong global demand and competitive prices with shipments (including offal and fats) up significantly by 19 per cent or 535,000 tonnes.

Demand in 2012 on the global market has eased back during the summer after a strong start to the year and so somewhat of stability in EU pork exports seems probable this year as January to July exports this year were slightly ahead of 2011. Lower EU production and higher prices will inevitably put a dampener on exports in 2013 even if the global market moves up.

Exports of pork and processed meats in 2011 were 21 per cent higher and account for over half of total exports. Offal's and fats make up the remainder of export volumes, contribute to adding carcase value and were up 24 per cent in 2011. China and Hong Kong dominate this trade with Russia the other significant buyer. Export growth has slowed down so far in 2012 being only showing a marginal increase.

Given the financial difficulties in many EU markets and the high levels of pigmeat consumption in certain countries, demand has eased across the EU this year. Overall consumption is forecast to be one per cent lower in 2012 with further marginal declines next year.

EU-27 Pigmeat Balance ('000 tns cwe)

	2009	**2010**	**2011**	**2012(p)**	***2013 (f)***
Net Production	21,801	22,663	23,040	22,800	22,050
Imports	34	22	15	18	25
Exports	1,540	1,839	2,174	2,200	1,950
Consumption	20,295	20,846	20,881	20,618	20,325
- Per Capita (kg /head)	40.6	41.6	41.5	40.9	40.6

p - provisional; f - forecast

Some information is provided below on our largest export market, the UK and the largest producer and exporter in Europe, Germany.

United Kingdom production to edge down

Production is expected to increase in 2012 by two per cent this year to the highest level since 2000. In January-July production was up three per cent but the rate of growth is expected to slow down during the remainder of the year. The pig sector has been benefiting from considerable increases in sow productivity, with fewer disease related problems and strong replacement rates, at a time when the sow herd has been somewhat stable. However, a decline in the breeding herd of up to five per cent is possible this year according to the AHDB. This will impact on pig supplies in the second half of 2013 with production returning to 2011 levels.

Falling UK imports

Pork imports increased by three per cent in 2011 but have fallen by 13 per cent in the first half of 2013. Bacon and ham imports in 2011 were down 10 per cent and by a further 11 per cent in January-June 2012. Import prospects for 2013 would suggest an increase but if EU production falls and the EU market tightens with prices rising then a decline seems more probable.

Steady UK consumer demand

Supplies available for consumption increased in 2011 and will remain at a similar level in 2012, but in 2013 if supplies are lower and prices rise at a time when UK consumer spending remains under pressure then consumption may fall.

UK pigmeat balance ('000 tonnes cwe)

	2010	**2011**	***2012 (p)***	***2013 (f)***
Production	758	806	*824*	*809*
Imports	941	960	*940*	*940*
- Pork	402	410	*370*	*350*
- Bacon	366	328	*290*	*290*
- Processed	173	223	*280*	*300*
Exports	186	211	*215*	*210*
Supplies for consumption	1,513	1,555	*1,549*	*1,539*

Source: AHDB; p – provisional, f - forecast

German production edging down

Pork production in 2011 increased by three per cent given increased availability of domestically reared pigs which in turn reduced import demand for slaughter pigs and weaners for finishing in Germany. To date this year production has fallen by three per cent reflecting their lower breeding herd and live import levels. German finishers have reduced their weaner demand and Danish and Dutch exporters have found the Polish market more attractive.

Slaughter plants in Germany are very dependent upon imported pigs which now make up over 20 per cent of the supply. Production developments in 2013 will partly depend upon the ability of finishers to source weaners from outside Germany as some of the smaller breeders in Germany can be expected to cease over the coming months. This will further reduce the German sow herd which in May 2012 was down one per cent on a year earlier.

North America production to decline

In the United States producers are now in a loss making situation with rising feed costs and a weak finished pigs market because of increased slaughterings associated with de-stocking and end of the heat wave. This includes producers de-stocking with sow slaughterings in July and August up on normal levels and inevitable fall in the sow herd in the months to come. Some industry commentators suggest that pig producers are heading for record losses of US$60-75 per pig by the autumn. The USDA is buying pork under the national food programme but its impact will be small. The USDA has been revising down its pork production forecasts for 2013 and in mid-August it had production down one per cent whereas an increase had been previously expected.

In Canada a decline in the breeding herd is also expected with producers affected by the turbulence in the US. Recently the second and fourth largest pork producers in Canada, accounting for almost 70,000 sows have reported serious financial difficulties.

Increasing North American pork exports

The US was the leading global pork exporter in 2011 with 35 per cent of all trade and with strong global demand last year their volumes increased by 25 per cent. Shipments to Japan were up 19 per cent while exports to China quadrupled. Trade with South Korea last year was more than double 2010 volumes. The upward momentum was maintained in the first half of 2012 even though there were signs of some easing of demand.

The USDA is expecting total pigmeat exports to increase by four per cent in 2012, with volumes remaining steady in 2013, however given they are looking at lower domestic production levels next year export volumes may actually decline.

Canadian exports are also rising, up three per cent in 2011 to 870,000 tonnes with a further rise of six per cent in January-June 2012 helped by increasing trade with Russia and China.

Brazil

In Brazil producers were reported to be losing between US$30-50 per pig with the recent escalation in feed costs and a weak finished pig market. Pork production has been increasing in Brazil in spite of the problems that some producers have been facing since last summer. Production was up six per cent in 2011 with a further rise of four per cent in January-July 2012 but some downturn is expected.

Brazilian exports under pressure

Brazilian exporters have been under some pressure due to market access issues as the Russian authorities imposed restrictions in June 2011 on product from plants in southern Brazil. Pork exports fell as a result in 2011 and only recovered slightly this year. Russia accounted for 49 per cent of its exports in 2010 but this was down to 25 per cent in the first seven months of 2012 although it remains their largest market. Shipments to Hong Kong have been increasing but it has only just started shipping to China this year (1,900 tonnes in January-July).

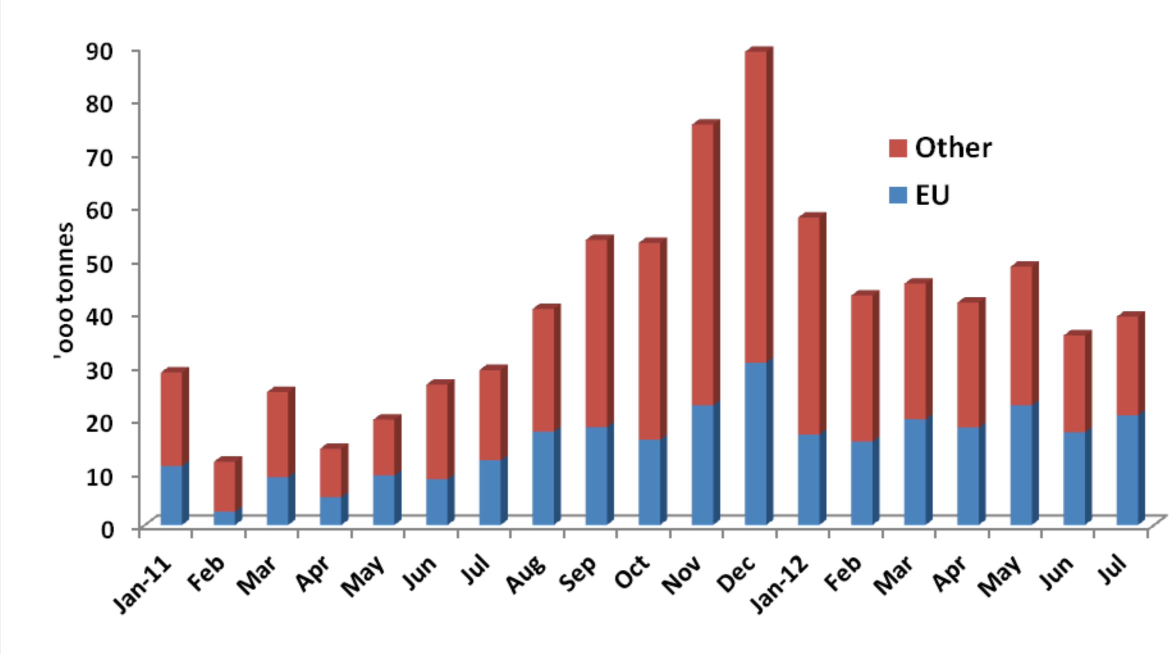
Major Global Import Markets

Chinese import demand

China is becoming a key player on the global pigmeat market with its high import requirement, however market demand can be variable. Chinese pork imports in 2011 were up 135 per cent to 467,000 tonnes. The United States accounted for 54 per cent of these imports, while the EU accounted for 35 per cent. This year imports have grown further with volumes in January-July 2012 double those of a year earlier at 312,000 tonnes. Shipments this year from the EU are up 130 per cent while US imports were up 87 per cent.

After reaching a peak last December the month on month Chinese import pork figure has fallen and in June and July shipments were nearly 60 per cent lower than the December figure although still up 35 per cent on a year earlier. Not only have imports eased back but so has the average import price which having reached a peak of US$2,100 per tonne at the end of last year was down 17 per cent by April 2012 and subsequently has moved up but only to a limited extent only.

Chinese monthly pork imports



Changing domestic market

Chinese producer prices have fallen significantly since the start of the year on the back of strong import volumes and domestic supplies. Prices had fallen to the extent that since April the Government has purchased pig meat for storage according to an agreed formula when the pig price/maize price ratio falls to below six. This comes under the Government pork price monitoring system to ensure a stable pork supply on the market and to protect farmers against market volatility. There are indications that domestic demand for pig meat has also edged back with even processing companies under pressure from tight margins while some have shut down. Chinese consumers have become more cautious about their spending with the food service sector in particular suffering.

Import demand to build up again

The recent sharp rise in global feed prices is having an impact on Chinese pig producers even though an excellent Chinese harvest which will reduce import demand for feed. Despite the Government market support producers have moved into a loss making situation and many smaller ones (that account for 30 per cent of Chinese pork production) are culling their sows. Some local commentators are forecasting a modest downturn in production by early next year.

However, contradicting this the USDA are predicting that Chinese pork production will rise by two per cent to 52.7 million tonnes, while consumption is expected to also increase by a similar level to 53.1 million tonnes, which is expected to drive on import volumes further. Either way China will continue to have a major impact on global trade over the coming year.

Japan and South Korea import demand now falling

Import demand in both countries was firm in 2011 in response to domestic shortages but these have eased in 2012 and coupled with some fall in consumer demand, imports have fallen this year. There were especially marked shortages in South Korea with production down 25 per cent in 2011 as a result of the FMD outbreak of late 2010 and early 2011. In Japan production fell by two per cent given the 2010 FMD outbreak and then the tsunami and earthquake before recovering slightly this year.

Japanese pork imports in 2011 were up five per cent in 2011 to 793,000 tonnes with shipments from the United States, the largest supplier with a 41 per cent market share, up nine per cent. The EU was the second largest supplier (28% market share) and shipments were up seven per cent in 2011. In January-July 2012 pork imports were down two per cent and although US shipments were unchanged imports from the EU were down 10 per cent mainly due to lower volumes from Denmark.

In South Korea imports increased by 68 per cent to 487,000 tonnes last year. The EU was a major beneficiary with all major EU suppliers experiencing a marked rise in trade. Some zero duty tariff quotas were extended into 2012 but shipments in January-July 2012 were down 24 per cent on a year earlier although still up 45 per cent on January-July 2010. Both the United States and the EU signed free trade agreements with South Korea in 2011 and this should boost their pork trade in the longer term.

Steady Russian import demand

Import demand has been steady helped by good consumer demand although imports are somewhat restricted by tariff quotas which were reduced in 2012. In 2011 pork imports were up two per cent to 657,000 tonnes but were down three per cent in the first seven months of 2012.

Russia remains a critical market for the EU accounting for up to a quarter of total EU exports. The EU is also the largest supplier to Russia with a 51 per cent market share in 2011 although our market share has fallen this year as EU shipments were 10 per cent lower.

The TRQ quota for pork in 2012 of 400,000 tonnes (down from 472,100 tonnes in 2011) plus trimmings of 30,000 tonnes will remain as it already satisfies WTO commitments. The quota tariff rates on pork has been reduced to 0% having previously been 15% (min. €0.25 per kg) within quota and reduced to 65% (from 75%) outside it.

Improving pig welfare reduces carcass and financial loss

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Introduction

Recently the Department of Agriculture Food and the Marine agreed to support a project led by Teagasc to investigate the potential for including measures of pig health and welfare in the meat inspection process at pig slaughter factories. Currently ante mortem inspection of slaughter pigs and meat inspection (post-mortem) in Irish abattoirs fulfils a public health role whereby the primary function is to ensure food safety. The project proposal was underpinned by two studies that were conducted by a collaborative team of researchers from Teagasc, UCD and Queens University Belfast. Preliminary findings from the first project in which data from over 36000 slaughter pigs was collected from six factories in Ireland and Northern Ireland (NI) were presented at the 2010 Teagasc Pig Conference. These data were subsequently analysed further and interesting factory and jurisdiction differences in the condemnation rate and reasons for condemnations will be presented in this paper. Subsequently a 2nd study conducted in April 2012 and which was based in one factory in Ireland focused on the relationship between different types of welfare lesion and carcass condemnations. In addition to tail biting lesions, the prevalence and carcass condemnation/trimming implications of loin bruising (associated with excessive mounting behaviour) and hind-limb bursitis were also investigated. Estimates of the financial impact of carcass condemnations were made from the data collected in both studies.

Methodology

<u>Study 1</u>

Over 35,000 pigs killed at five abattoirs (three in the Republic of Ireland [ROI] = Factories A, B and C and two in Northern Ireland – Factories D and E) during July and August 2010 were included in the study. They were in 250 different batches from 221 farms. Two trained observers recorded the gender, tail length and tail lesion score of each pig. Tails were scored according to severity on a 5-point scale (Figure 1).

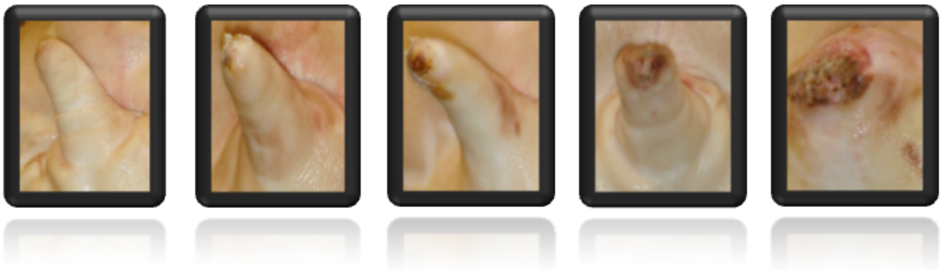

Figure 1 Tail-lesion scoring system (Scores 0-4, left to right)

Batch-level results on reasons for and anatomical location of partial and entire carcass condemnation were obtained from abattoir records. Post-mortem meat inspection was carried out by trained Meat Inspectors in NI and Temporary Veterinary Inspectors (VI) in ROI.

Study 2

Data were collected in a single abattoir in the Republic of Ireland (ROI) by four people over seven days during April 2012. Measurements were taken from every 3rd pig on the slaughter line. A full dataset was available for 3433 pigs in 79 batches from 49 farms. Tails were scored using the same scoring system as in Study 1. Loin-bruising was recorded using a score of 0 or 1 (Figure 2).

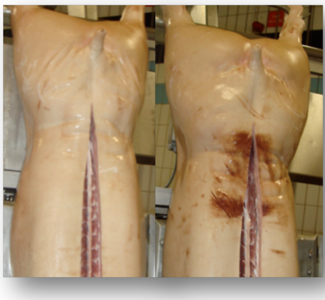

Figure 2 Scoring system used to assess loin bruising (0=no/mild, bruising; 1 = severe bruising)

The reasons for, and anatomical locations of, carcass condemnation and carcass trimmings were recorded at the point of meat inspection and were based on the decision of the acting VI. Hind limb bursitis was recorded as present or absent. Partial condemnations and trimmings were weighed by a 3rd person. It was not possible to weigh carcasses that were condemned entirely.

Results

Study 1

Docking and tail lesions

Over 99% of the study pigs were docked and 58.1% had some sort of tail lesion. The majority of tail lesions were mild and severe lesions were detected in 1.03% of pigs. There was a higher prevalence of tail lesions in males (61.6%) than females (54.3%), and this trend became more pronounced with increasing lesion severity (Scores 3 and 4: 1.52% of males affected vs. 0.50% of females affected).

Differences between factories and jurisdictions

Tail lesions

There was huge variation between factories in the proportions of pigs with different tail injury scores (Table 1). At the worst factory (Factory A) only 24% of pigs had normal tails with 1.78% having severe injuries. This level of damage was higher than the national average of 1.36%. At factory C, 50% of the pigs inspected had normal tails but this factory had the second highest rate of severely damaged tails (1.32%). Factory E had the lowest rate of severely damaged tails (0.34%). As there is a lower risk of disease (and injury) in smaller herds it is possible that part of the reason why factory E had the lowest level of severe tail injuries could be related to the fact that it was supplied by the smallest herds (indicated by the low mean batch size of 75). Indeed Factory A had the worst results for tail injuries and it was supplied by the largest farms as indicated by the largest mean batch size of 179 pigs.

Although fewer pigs were sampled in NI than in ROI a similar number of batches and farms were sampled in both jurisdictions (Table 1). A slightly higher proportion of pigs in NI had normal or only mildly damaged (i.e. score 1) tails compared to ROI. However, jurisdiction differences were most pronounced for severe tail-lesions (scores >2) with more than double the amount of pigs affected in ROI (1.36%) compared to NI (0.53%).

Condemnations

The condemnation rate varied between 0.74% and 2.28% between factories. Partial condemnations accounted for over 60% of condemnations (except for abattoir B, 42.6%) (Table 1). Both the rate of entire and partial condemnations differed significantly between factories. Forequarter condemnations varied between 0 and 38.4% while hindquarter condemnations varied between 34.1 and

93.1%. Abscessation and arthritis were important causes of condemnation in all factories.

Some of the variation between factories could be accounted for by the variation in the quality, consistency and accuracy of the meat inspection data obtained from the abattoirs. The data ranged from standardised and computerised records, to hand-written, and sometimes barely legible sheets of paper using variable terminology. It is impossible to fully explain why condemnations in pigmeat factories vary so much while these inconsistencies persist. There are likely to be a myriad of other issues at play and these include farm level factors, transportation factors, pre-slaughter handling and management in the lairage and pre-stunning. The fact that in one factory condemnations due to bruising were notably high (13.2%) compared to the others (c. 2%) reflects poor pig welfare possibly because of poor handling and/or overstocking during transportation or in lairage. Factory E was the only factory in which there were no condemnations for bruising suggesting that pigs might be handled more gently there. This could be related to the low daily throughput of pigs (4000 pigs slaughtered per week) in that factory.

The condemnation rate was higher in ROI (1.45%) compared to NI (1.13%) and there were was a much higher condemnation rate of entire carcasses in ROI compared to NI (37.8 vs. 11.1%) (Table 1). Correspondingly there was a lower proportion of partial carcass condemnations in ROI (61.2%) compared to NI (88.9%). There was at least one carcass condemned in over 40% of the batches sampled in ROI while only 14.3% of the batches sampled in NI had at least one carcass condemned. Jurisdiction was also a significant factor in forequarter condemnations with more than double the number of forequarters condemned in NI (36.8%) compared to ROI (16.5%). More hindquarters were condemned in ROI than in NI. The frequency of abscessed lesions in ROI (64.7%) was 20% higher than in NI (42.0%) whilst NI recorded over nine times the frequency of arthritis of ROI (44.4% vs. 4.68%).

Differences between jurisdictions could result from differences in health and welfare standards on farms and during transport between NI and ROI. The lower proportion of pigs affected by severe tail lesions and the related finding of fewer condemnations for abcessation in NI go some way towards supporting this. There is a strong relationship between batch size and farm size. Hence the smaller average size of batches supplied to factories in NI is linked to the smaller size of herds in the north. As the risk of disease and injury is lower in smaller herds this could partially explain the substantially lower rate of condemnation of entire carcasses in NI compared to ROI. Nevertheless, both judiciaries are governed by the same EU legislation governing pig welfare on farm and during transport.

Table 1: Differences between factories and between jurisdictions in tail lesion and condemnation data

	Abattoir					Jurisdiction	
	Rep. Irl. (ROI)			Northern Irl. (NI)			
	A	B	C	D	E	ROI	NI
No. pigs inspected	4655	7962	8566	10784	3232	21183	14016
No. batches	26	48	51	82	43	125	125
No. farms	24	38	48	73	42	104	115
Mean batch size	179	166	170	132	75	168	112
Batch size range	14-482	34-314	10-473	16-555	14-212	Not applicable	
Tail injury scores (% pigs affected)							
Score = 0 (unblemished)	24.0	44.4	50.1	41.6	41.0	39.5	41.3
Score = 1 (mild)	65.8	48.5	42.3	52.9	54.4	52.2	53.7
Score = 2 (moderate)	8.36	6.10	6.31	4.74	4.30	6.92	4.52
Score >2 (severe)	1.78	0.97	1.32	0.72	0.34	1.36	0.53
Condemnations							
Condemnation rate (%)	2.28	1.33	0.74	0.99	1.26	1.45	1.13
Entire	20.6	54.4	38.5	19.6	2.63	37.8	11.1
Partial	79.4	42.6	61.5	80.4	97.4	61.2	88.9
Reason for carcass (entire + partial) condemnations %							
Abscesses	79.4	47.1	67.7	39.3	44.7	64.7	42.0
Arthritis	2.06	7.35	4.62	46.7	42.1	4.68	44.4
Other	18.5	45.6	27.7	14.0	13.2	30.6	13.6
Reasons for entire condemnations (%)							
Abscessation	55.0	27.0	36.0	33.3	100	39.3	66.5
Arthritis	5.00	5.41	0	19.0	0	3.47	9.5
PPPP*	25.0	40.5	60.0	38.1	0	41.8	19.1
PST**	0	5.41	0	4.9	0	1.80	2.45
Other	15.0	21.7	4.0	4.7	0	13.6	2.35
Anatomical region of partial condemnations (%)							
Hindquarter	76.6	93.1	34.1	57.0	37.8	67.9	47.4
Forequarter	22.1	0	27.3	38.4	35.1	16.5	36.8
Other region	1.3	6.9	38.6	4.6	27.1	15.6	15.9
Reason for partial carcass condemnations (%)							
Abscessation	85.7	75.9	72.7	40.7	43.2	78.1	42.0
Arthritis	1.30	10.3	6.82	53.5	43.2	6.14	48.4
Bruising/haematoma	2.60	13.8	2.27	2.33	0	6.02	1.17
Other	10.4	0	18.2	3.47	13.6	9.53	8.5

*PPPP=pleurisy/ pneumonia/ peritonitis/ pericarditis; **PST= pyaemia/septicaemia/toxaemia

Finally, the fact that abattoirs in NI are also supplied by farms from ROI suggests that abattoir level (meat inspection criteria and data capture) rather than farm level (management, herd health status) or transportation differences were also likely to contribute to the variation between jurisdictions. For example the specific codes for conditions causing condemnation used in the automated APHIS-online systems in NI means that there is likely to be much less variation than in ROI where terminology varies from factory to factory.

Financial impact of carcass condemnations

Economic analysis was restricted to the NI abattoirs from which data on carcass condemnation weights were available as such information is not routinely collected in ROI. Data for economic analysis were also available from a 3rd factory in NI (Factory F). Based on the EU-27 market price (€/kg) for July 2010 (EU Pig Management Committee, 2010) losses of €5,492.63 were incurred from the 171 condemnations that occurred in these three NI factories. This equated to an average loss of €0.37 per pig slaughtered in the study population of 14,794 pigs which was over 5% of the net margin for pig production at the time of the study (BPEX, 2012).

Study 2

Welfare (tail injuries, loin bruising and bursitis) lesions

Study 2 was conducted at one factory in ROI in 2012 and a much higher percentage of pigs were affected by tail lesions (i.e. Tail score >0 = 72.5%, Table 2) compared to the mean figure of 58.1% recorded over 5 factories in Study 1. Furthermore, 2.5% of pigs had severe tail lesions (i.e. TS >2). Similar to Study 1, males were more frequently affected than females, a trend which also became more exaggerated with increasing tail lesion severity. Severe loin-bruising affected 16% of pigs and severe hind limb bursitis was detected in 44% of the study population. In contrast to tail damage, there was no difference between the genders.

Table 2: Prevalence of tail lesions of different severities between male and female pigs

	% pigs affected		
Tail scores (TS)	**Males**	**Females**	**Total**
TS = 0	22.4	32.8	27.4
TS > 0	77.6	67.2	72.5
TS >1	30.0	22.6	26.4
TS >2	3.8	1.2	2.5

Condemnations

The condemnation rate was 2.5% with the majority of carcasses being partially condemned (Table 3). The hindquarters were the most commonly affected anatomical region. Over 85% of carcass condemnations were due to infectious conditions. Abscessation lesions alone accounted for almost 70% of carcass condemnations. Carcass trimming occurred more frequently than carcass condemnation with 3.2% of carcasses affected. Cumulatively 5.5% of carcasses in the study population were either trimmed or condemned.

Table 3: Prevalence of carcass condemnations and trimmings

			Total no.	% study population
Entire carcasses condemned			14	0.4
Partial carcasses condemned			71	2.1
Total			85	2.5
Causes	Infectious		73	2.1
		Abscessation	58	1.7
		Arthritis	7	0.2
		Other	8	0.2
	Non-infectious		12	0.3
Anatomy	Hindquarter		49	1.5
	Forequarter		10	0.3
	Head		8	0.2
	Other		18	0.5
Trimmings			111	3.2
Trimmings + condemnations*			190	5.5

*5 pigs had both trimmings and condemnations

Tail lesion severity affected all carcass condemnation outcomes (Table 4). Of total carcass condemnations, 2.5% of carcasses with tail score ≥1 and 14.9% of carcasses with a tail score ≥3 were condemned respectively (Table 4). There was also a 10-fold increase in the proportion of trimmed carcasses between tail scores ≥1 (3.4%) and tail scores ≥3 (32.2%). The other welfare lesions (i.e. loin-bruising and hind limb bursitis) did not show a relationship with any of the condemnation outcomes shown in Table 4. Multivariate analysis revealed that while tail lesions increased the risk of condemnation being female was protective for carcass condemnation.

Table 4: Number and percentage of pigs in each of the tail lesion, loin lesion and hind limb bursitis score categories that had their carcasses condemned (CC) or trimmed at meat inspection

Condemn. outcomes	Welfare lesions number and (%)								Total
	Tail score				Loin score		Bursitis score		
	0	≥1	≥2	≥3	Absent	Present	Absent	Present	
Total CC	22 (2.3)	62 (2.5)	33 (3.6)	13 (14.9)	39 (2.9)	9 (1.6)	58 (3.0)	26 (1.7)	85 (2.5)
Entire CC	1 (0.1)	13 (0.5)	7 (0.8)	2 (2.3)	8 (0.6)	1 (0.2)	11 (0.6)	3 (0.2)	14 (0.4)
Partial CC	21 (2.2)	49 (2.0)	26 (2.9)	11 (12.6)	31 (2.3)	8 (1.5)	47 (2.4)	23 (1.5)	71 (2.1)
Abscess CC	14 (1.5)	45 (1.8)	25 (2.8)	10 (11.5)	21 (1.5)	9 (1.6)	40 (2.1)	19 (1.3)	58 (1.7)
Infectious CC	18 (1.9)	56 (2.2)	32 (3.5)	13 (14.9)	31 (2.3)	9 (1.6)	49 (2.5)	25 (1.7)	73 (2.1)
Trimmings	26 (2.8)	85 (3.4)	51 (5.6)	28 (32.2)	64 (4.7)	8 (1.5)	68 (3.5)	43 (2.8)	111 (3.0)

Financial impact of carcass condemnations

Partial condemnations and trimmings from the study pigs at the point of meat inspection were weighed by one of the investigators. It was not possible to weigh carcasses that were entirely condemned. The direct financial losses were calculated by multiplying recorded weights by the average Irish pig meat price during the study (€1.49/kg). For entirely condemned carcasses the average weight recorded in the NI abattoirs during the 2010 study was used. Almost €2,700 of pig meat was lost from the 85 carcasses that were partially or entirely condemned from the study population. Because of the high condemnation rate at this factory (2.48%) this equates to €0.79 per pig, increasing to €0.82 per pig if costs associated with the c. 1900 kg of trimmings made at the point of meat inspection are included (Table 5).

Table 5: Weight (kg) and cost (€) of carcass condemnations and trimmings from study 2

	No. (% of total)	Kg	kg/ study pig	% mean carcass weight	Cost* (€) Total	Cost* (€) Per study pig
Carcass condemnations						
Entire^	14 (16.5)	977.6	0.28	0.36	1456.65	0.42
Partial	71 (83.5)	828.4	0.24	0.30	1234.3	0.36
Hindquarter	50 (58.8)	712.9	0.21	0.26	1062.34	0.31
Abscessation	58 (68.2)	1003	0.29	0.37	1494.6	0.44
Infectious	73 (85.9)	1570	0.46	0.58	2339.81	0.68
Total	85 (100)	1806	0.52	0.66	2690.95	0.78
Carcass trimmings						
Tail	48 (43.6)	26.27	0.01	0.01	39.14	0.01
Infectious	76 (69.1)	51.60	0.02	0.02	76.89	0.02
Total	110	87.19	0.03	0.03	129.91	0.04
Cumulative carcass condemnations and trimmings						
Total	197	1893	0.55	0.69	2820.86	0.82

* based on average Irish value of pig meat over the study period (€1.49/kg)

^ based on average weight of entirely condemned carcasses recorded in NI in 2010

Implications of these findings

<u>Welfare lesions (tail injuries, loin bruising and bursitis)</u>

- Routine tail docking is prohibited yet 99% of Irish slaughter pigs were docked. The high prevalence of injured tails indicates that docking does not prevent tail biting
- The high prevalence of tails with lesions observed in both the 2010 and 2012 study confirms tail-biting as a major and potentially increasing problem in Irish pig production
- As tails were always scored by the same person and the impact of transportation on tail injury scores is negligible the marked variation between factories in the prevalence of severely bitten pigs can only be attributed to variation in the housing and management of pigs on the farms supplying the factories and not to the factories themselves
- The prevalence of tail injuries in the 2012 study is twice the figure reported for slaughter pigs in Finland and 10 times greater than equivalent figures for Sweden

- Males are more frequently bitten than females. Although the frequency of biting is similar between the genders females bite more intensely than males. There is a need to investigate whether separation of the genders would reduce tail biting
- The 2012 study confirmed anecdotal reports from processors that loin bruising is a problem in Irish slaughter pigs. This lesion is caused by mounting behaviour by entire males. On-farm factors such as over crowding exacerbate it. The trend towards lighter sale weights could help address this welfare problem
- Carcasses with severe loin-bruising also incur costs associated with additional trimming to remove damaged tissue which increases labour and disposal costs. Affected cuts are downgraded, diminishing the retail value by over 50%
- High prevalence of severe hind-limb bursitis recorded in this study indicates that flooring used for pigs is suboptimal. The lower prevalence observed in finishing pigs in the UK, where straw-based systems are more common supports this theory

Condemnations

- The proportion of carcass condemnations in the study population reflect what is reported in the literature for other countries
- The majority were due to infectious conditions, the risk of which can be substantially reduced by improvements to the pigs environment
- Abscessation was the greatest single reason for carcass condemnations corroborating the findings of other European studies. The relationship between abscessation and tail-biting was confirmed. Up to 61.7% of abscesses result directly from tail-biting
- There was an increased proportion of (infectious) disease lesions in victims of severe tail-biting, compared with pigs showing mild/no detectable tail lesions
- Of all the factors tested tail lesions had the greatest effect on carcass condemnations. This is not surprising as lesions arising from tail-biting provide not only a route of entry for infection but three separate routes for its dissemination around the body (venous, lymphatic and cerebro-spinal drainage)
- Female pigs are less likely to be condemned because they are less likely to be bitten

- The lower condemnation rate and lower loss of entire carcasses in NI is likely to be related to the lower proportion of pigs affected by severe tail lesions in that jurisdiction
- The potential impact of increasing herd size on pig health and behavioural vices warrants investigation
- Variation in the quality, consistency and accuracy of meat inspection data precludes a clear understanding of reasons for differences between abattoirs and jurisdictions

Financial

- There are significant direct financial implications of pathological conditions found at slaughter which can be as high as €0.78/pig when the condemnation rate is over 2%
- This is greater than the profit margin for Irish pig producers. In the context of increased production costs - over 20c/kg in a number of EU countries since 2010 (BPEX, 2012) – such losses represent a serious threat to the viability of pig farms.
- In reality the financial losses are likely to be much higher as indirect costs of carcass lesions were not accounted for in either study. These include costs incurred at farm level including wasted feed, medicines and labour at the processing stage because of the detection, removal and disposal of rejected parts and at retail in the form of lost market opportunities
- Furthermore, costs associated with condemned viscera and fat trimming beyond the point of meat inspection were not included in the economic evaluation. These would push the cost of poor welfare, disease and injury leading to condemnations much higher.

Conclusions

There is no doubt that the ability to reduce many of the financial losses associated with condemnations is within the control of the producer. Abscessation and other infectious conditions are the main causes and control of these can be achieved by addressing welfare issues on farm such as: re-mixing, over crowding, poor hygiene, damaged/inappropriate flooring, absence of manipulable substrates and poor husbandry (i.e. injecting, tail and teeth clipping) techniques. If these issues can be resolved the pigs welfare (and consequently health status) should concurrently improve and there should be a reduction in behavioural vices such as tail biting which as this paper shows have an overwhelming impact on carcass condemnations.

Energy Use on Irish Pig Farms

Gerard McCutcheon, Oak Park

Introduction

Energy is a resource that must be used efficiently and effectively. It makes no sense to waste it. Fuel costs (heating oil) have risen by 77% since 2009, and there is concern that they will become an even more significant cost in the future. Typically a 1000 sow integrated pig unit (ie rearing pigs from birth to slaughter) will spend €80,000 each year on fuel and electricity for the production of pigs.

As you read this paper ask yourself the following questions:

1. Have you had an energy audit done for your farm?
2. How closely is energy use monitored on your farm?

What is the energy usage on pig farms?

In 2006 a Teagasc survey of 8 Irish Pig Farms with a total of 4701 sows (approximately 3% of the National Pig Herd) showed an average usage of 27kWh per pig produced (with a range of 17 to 37 kWh/pig produced – Reference: Clarke).

More recent audits done on 23 pig farms show a huge variation in the energy usage ranging from 18 up to 45kWh /pig produced with an average figure of 28kWh/pig produced. These audits for 23 farms included over 20,000 sows. The high variation from one farm to another suggests that a greater emphasis needs to be put on energy efficiency.

Another source of data available is from 83 pig farms recording on the Teagasc Pigsys records (2011). The energy cost (heat, power and light) is €3.39 per pig produced (or €81/sow /year based upon 24 pigs produced/sow/year). This Pigsys data covers approximately 38% of the national pig herd.

Energy on pig farms is mainly used for:

- Heating the farrowing and first stage weaner houses,
- Ventilation systems and fans,
- Lighting throughout the buildings,
- Feed delivery and mixing, power-washing and
- Manure pumps to mix and agitate slurry tanks.

This paper discusses the first three items in greater detail.

1. Heating the Farrowing and First Stage Weaner houses

Heat must be provided to the younger pigs on a pig unit. The temperature in the farrowing rooms is critical for the survival of newly born piglets. The ideal is to have a farrowing room temperature of 24°C once the first piglet is born in the room. This should be reduced to no more than 20°C when the youngest piglet in the room is over 2 days old.

Pig producers may use paper to supplement the heat source at farrowing rather than an infra red bulb. If the average gestation period is 115 days, it is not necessary to heat up the creep area on Day 113 of gestation. Poor temperature control can lead to unnecessary overheating of pads resulting in wasted heat production and wasted ventilation energy. This applies particularly in the first two weeks after farrowing.

First stage weaners (ie 7kg to 17kg liveweight approx.) also require a source of heat. The aim is to have newly weaned pigs kept at 28°C to 29°C initially, with a reduction of approximately 2°C in room temperature each week thereafter.

It is critical to check if the ventilation system is working in tandem with the heating system. The ventilation system may control house temperature at a massive cost to the heat supply system if the two systems are not working in tandem with each other. A lag time may occur before the temperature sensor shuts off the "call" for heat. This problem can be compounded by the fan cutting in to remove the excess heat provided. Air quality will be fine but at a cost to energy usage.

Is there a potential to make cost effective improvements to reduce heat input? There may be scope to do so if weaning weights have increased. An extra one kilo body weight at weaning can reduce energy requirement by 8% in this stage of growth. So weaning heavier pigs will reduce the energy requirement.

Insulation of pig buildings

The provision of heat in buildings is very wasteful if there is a poor level of insulation in the building. The walls and ceilings should be insulated to achieve suitable U values. Check the insulation to see if it has been damaged by pests. The temperature fluctuation in the pig house should also be checked by using maximum-minimum thermometers to monitor if house temperatures vary considerably between day and night-time.

Heat pumps

A number of units have installed heat to air pumps to heat the heat pads in the farrowing units. These systems extract the heat from ambient air and use it to heat water via heat exchange systems. This can be ideal to heat water to temperatures of 55°C.

The capital costs of these systems can be high but they are effective in reducing fuel costs. A **hybrid** system also exists where the heat pumps operate to certain parameters but if the ambient temperature drops too low a boiler backup steps in to provide the heat supply. This system links to computerised controls which can adjust to changing costs of electricity prices, fuel costs etc as programmed.

2. Ventilation Systems and Fans:

Pig houses are ventilated to control the levels of gas (ie carbon dioxide, ammonia, methane and hydrogen sulphide are the main ones) and airborne pathogens in the pigs environment. This is done to achieve good growth performance in terms of growth rates and feed conversion efficiencies.

Some pig houses are controlled without the use of mechanical fans to pull fresh air through the house. This system relies on the "stack" effect which relies on warm air rising and being replaced by cooler fresh air from outside the building and is referred to as natural ventilation.

The only energy used in this system is to control the air inlet and outlets in the building. This system has very low running costs but may be a difficult system to manage particularly in very changeable weather or on very exposed sites.

Ventilation and feeding systems are the main users of energy in the weaner and finisher section of a pig farm. If the ventilation system chosen is Automatically Controlled Natural Ventilation (ACNV) and the feeding system is a liquid one the power usage is greater for the feeding system. Where the ventilation system is fan powered with restricted inlets and the feeding system is an augered wet/dry system, the consumption pattern may be reversed.

Mechanical ventilation relies on fans, air inlets and controllers to manage the volume of air to be moved through a house. This system has higher running costs because of the use of fans.

Fans

Fans are "ever ready" to consume electricity, sometimes with no advantage to improving the pig environment. How often do you see fans at full speed in a dry sow house in mid winter, or first stage weaner houses with fans at full speed and heaters glowing? Remember that when fans are set, either manually or on a curve, they will carry out that function, be it correct or incorrect until the settings are changed.

When assessing or choosing a fan the following should be checked at a minimum:

- Fan size must be matched to the stock type (ie weaners , finishers etc.) and numbers to be accommodated in the pig house to be ventilated – will the fans move adequate air to keep the air in the pig house fresh?
- Inlet size versus fan capacity – is there a risk of over ventilating the room thereby chilling pigs and wasting energy?
- Fan efficiency: How much air is moved by the fan versus the power required by the fan? You need to check the data sheet provided by the manufacturer to get this information.
- The "back pressure" is the resistance to air flow at the fan outlet. This needs to be factored into the equation also to determine fan efficiency. This efficiency may vary with different fan sizes and models supplied by different manufacturers.

Natural Power Ventilation:

This is a new system which is designed to work as a naturally ventilated house when possible. It could be described as an adaptation of the natural system with the ability to mechanically ventilate when necessary. Extra air outlets are installed to allow the natural ventilation system operate. When there is a need for additional ventilation the fans begin to operate. This system may have a higher initial capital cost but is achieving a reduction in electricity usage for ventilation of approximately 80% for finishing houses where this was monitored on 3 farms and compared with similar mechanically ventilated houses. This system did not compare pig performance in the houses and it is assumed that the pigs achieved similar growth performance in each housing system.

3. Lighting

A typical 500 sow integrated pig farm has 5,000m^2 of floor area to illuminate, approximately 10m^2 per sow and progeny. Lighting power consumption accounts for 10-15% of electricity supplied onto the farm, (ie. 2 to 4 kWh per pig produced).

The relevant regulations (S.I. 311 of 2010) specify a minimum of 40 lux light intensity for a continuous period of at least 8 hours (in any 24 hour period) for pigs.
A recommended light intensity of 100 lux for inspection of animals is reasonable.
For dry sows and farrowing house 200 lux is recommended. Service houses should have light intensities of 300 lux for 14 to 16 hours each day to overcome seasonality effect of changing day-lenghts.

The standard incandescent (Tungsten) bulb is 5% efficient at converting energy to light and has an expected life of 1,000 hours versus a fluorescent at 7,000 to 16,000 hours. The compact fluorescents have been heavily promoted in recent years. They provide good energy efficiency and are easily fitted into the incandescent bulb holder.

Table 3 shows the "lumen efficacy" of different light sources. The higher the lumen efficacy the more efficient the source is at producing light.

Table 3 - Relative energy efficiencies of various light sources

Lamp Type	**Lamp Size (W)**	**Lumen Efficacy (Lumens/Kw)**	**Typical Lamp Hours**
Incandescent [Tungsten]	25-200	36-71	1,000
Compact Fluorescent	5-50	47-82	8,000+
Fluorescent T-5 Strip	32-120	66 - 82	16,000+
LED (Light emitting diodes)	25 (for 1500mm)	50 / 100	30,000 to 50,000

Source: SEAI

For efficiency, choose the T-5 (16 mm) tube instead of the T-8 (25 mm). Electronic control will further reduce energy usage by 20% and extend lamp life by 50%. These units are four times as efficient as regular incandescents and last 16 times longer.

The LED (light emitting diodes) is the latest technology in lighting. The light fittings are more expensive to install, but last much longer and are more efficient from an energy use perspective. They do not heat and use less energy as a result. They are well worth considering in new buildings because of their lower energy requirements – particularly in loose sow houses.

Conclusions

Energy is a cost that is increasing on pig farms. Do you know how your unit compares with other pig farms in terms kWh per pig produced? Are there savings to be made by investing in new technologies on your farm?

Notes:

1. A conversion factor of 10.5kWh was used per litre of kerosene to calculate energy usage.

References

Clarke, Seamas (2006) "Economising on Electricity usage on the pig farm". Teagasc Pig Farmers Conference 2006.

S.I. 311 of 2010 - European Communities Welfare of Farmed Animals Regulations.

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Getting to better times – what top producers are doing?

Seamas Clarke, Ballyhaise

"If you are producing less than 1,820 kg carcass per sow per annum, it is time you investigated your areas of failure and righted them before the next pig crisis" (S. Clarke, Teagasc Pig Farmers' Conference October 2008).

"As a modern day pig producer your target is to efficiently produce the greatest amount of pig carcass per sow annually on your farm as efficiently as possible" (S. Clarke / G. McCutcheon, Teagasc Pig Farmers' Conference October 2011).

Back in crisis mode! October 2012

As feed prices rose steadily through the spring and summer of 2012 many pig farmers wondered was there any future in pig farming. We in the Pig Development Department struggled to come to terms with the new feed crisis and investigated all types of strategies for client survival. Options examined included reduce sale weights, selling weaners, reduced creep and link feeding, destock / repo population, by-product substitution, etc; all part solutions to survival or are they?

In late July 2012, the Pig Development Dept carried out a quick survey of the Irish sow herd of 148,000 sows. We came to the conclusion that 25% of the herd was in immediate danger of closure if feed was to remain at the composite high price of €331 and pig price remain at €1.64. Another 25% were vulnerable and 50% would survive come what may!

As I prepared this paper I pondered, 'what makes this 50% secure, or at least less vulnerable than the rest?' Why were their margins better than other farmers? ***What top producers do!*** (S.Clarke, Teagasc Pig Farmers' Conference October 2005). Simple answers such as better buying price for their feed or better carcass price returns might be the answer, but was it the full story?

Back to the 2 tonne sow story!

What had the 'strong' producers in common? Our Pigsys Recording System might have some answers! I selected the 'strong' clients on the basis of selling finishers at or above 80 kg carcass. Their average carcass sale weight was 84.26 kg. They had hit the heady heights of 2,054 kg carcass per sow for the year ending June 2012. There were eight pig farmers in the bunch with almost 7,000 sows.

Next I looked to the weaker, more vulnerable group. I assembled the performance returns of the eleven 'weaker' clients selling below 80 kg; their average carcass sale weight was 75.41 kg. Their annual carcass sale per sow was a meagre 1,770 kg carcass. This group had a combined herd size of almost 6,000 sows. Overall the 19 clients in the study represented 25% of the entire sow herd in the Northern region.

Factors considered:

- Carcass weight sold per sow
- Pigs sold per sow
- Born alive per litter
- Litters per sow per year
- Weaning age
- Sow feed per annum
- Creep per pig sold
- Link per pig sold
- Weaner to Sale Growth Rate
- Weaner to Sale Feed Efficiency
- Composite feed price per tonne
- Carcass Feed Efficiency

Carcass sale weights:

Producer type	**4 year average***	**2012**	**2011**	**2010**	**2009**
Strong	**1973**	2054	1997	2004	1909
Weak	**1709**	1770	1729	1648	1639

Weighted average

Pigs sold per sow per year:

Producer type	4 year average*
Strong	23.63
Weak	22.53

Production data:

Producer type	Factor	4 year average*	2012	2011	2010	2009
Strong	Litter size	12	12.4	12	11.8	11.8
Weak	Litter size	11.8	12.2	11.9	11.6	11.4
Strong	Litters/sow/yr	2.33	2.3	2.3	2.3	2.3
Weak	Litters/sow/yr	2.3	2.3	2.3	2.3	2.3
Strong	Weaning age	27.1	28	27	27	27
Weak	Weaning age	28.6	28	28	29	29

Growth rates:

Producer type	4 year average* (gramme/day)	2012	2011	2010	2009
Strong	674	676	668	691	660
Weak	637	628	634	623	626

Weaner feed usage:

Producer type	Diet type	4 year average* (Kg per pig sold)	2012	2011	2010	2009
Strong	Creep	2.7	3.5	3	2.7	3.4
Weak	Creep	3.8	3.2	3.5	3.9	3.8
Strong	Link	7.8	7.5	6.5	7.2	7.8
Weak	Link	6.7	6.9	6.4	6.7	6.9
Strong	Weaner	45.8	43.7	43.2	43.7	39
Weak	Weaner	39.6	39.7	38.1	37.7	43.3

Weaner to Sale FCE:

Producer type	4 year average* (Kg per pig sold)	2012	2011	2010	2009
Strong	2.47	2.45	2.49	2.48	2.47
Weak	2.53	2.54	2.5	2.5	2.52

Sow feed annual:

Producer type	4 year average* Tonne per sow per yr	2012	2011	2010	2009
Strong	1.24	1.24	1.25	1.22	1.21
Weak	1.21	1.17	1.2	1.18	1.19

Composite feed price:

Producer type	4 year average*	2012	2011	2010	2009
Strong	**€267**	€295	€268	€233	€267
Weak	**€269**	€300	€275	€238	€275

FCE Feed to Carcass:

Producer type	4 year average*	Carcass wt kg	Feed used kg	Cost of Feed at 4yr ave.	Market Return at €1.45/kg
Strong	**3.71**	**84.26**	**313**	**€83.57**	**€122.18**
Weak	**3.83**	**74.41**	**285**	**€76.66**	**€107.89**

Margin over feed [May 2008 – June 2012]:

Producer type	4 year average* Composite feed price	4 year average Pig margin over feed	Margin per Kg over feed	Total margin over feed 650 sow herd
Strong	**€267**	**€38.61**	**€0.46**	**€593,030**
Weak	**€269**	**€31.23**	**€0.42**	**€457,348**

This paper is a review of the herd performance on nineteen pig farms in the northern region of the Irish Republic from June 2009 to June 2012. The data was gathered in the normal quarterly Teagasc recording system and the findings are based on a snapshot analysis. They may not adhere to full scientific research statistical methods as factors such as herd health, feeding method, genetic type and housing system may have influenced the outcome. However what ever conclusion you may reach from the above data / results, you must surely accept that a difference of over €200 margin over feed per sow requires your attention!

Projecting forward [July 2012 – June 2013]:

Producer type	**2012 /2013 average Composite feed price**	**Carcass Wt kg**	**Feed cost per pig**	**Carcass Return at €1.75**	**Margin over Feed per kg carcass**	**Total margin over feed 650 sow herd**
Strong	**€350**	**84.26**	**€109.41**	**€147.45**	**€0.45**	**€582,386**
Weak	**€352**	**75.41**	**€101.66**	**€131.97**	**€0.40**	**€442,737**

The category you belong to be it '**Strong**' or '**Weak**' may have serious implications for your survival over the next twelve months! Sale weight in combination with growth rate and carcass feed efficiency are the critical areas in times of high feed prices.

Note: Present factory slaughter weight band policies militate against slaughter weights much above 80 kg thus making the 2 Tonne Sow less achievable into the future!

Teagasc Service to the Pig Industry

Teagasc provides a range of services to the pig industry in research, advice and training, as well as confidential consultancy on all aspects of pig production, meat processing, feed manufacture, economics and marketing. Contact numbers are as follows:

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Notes