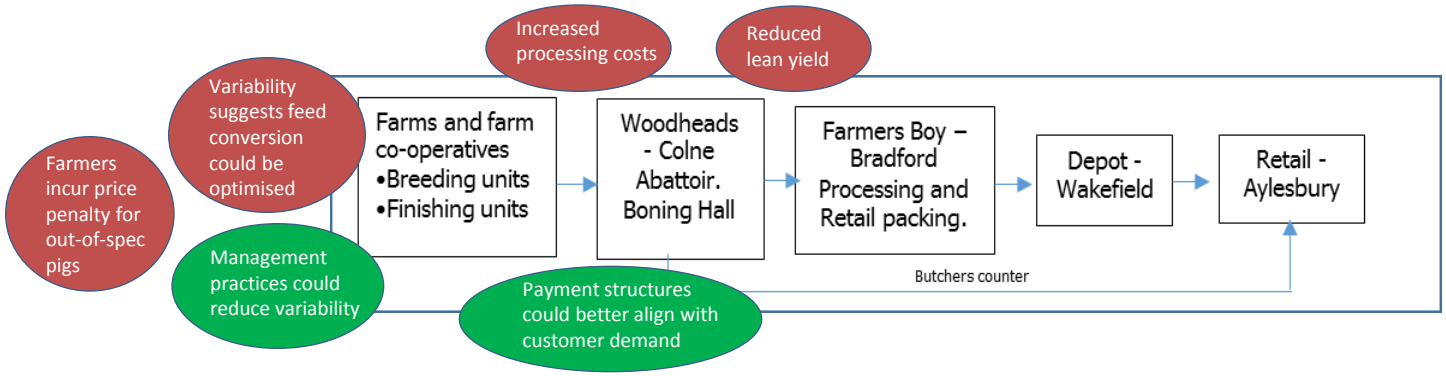
Significant potential savings for the Morrisons pork supply chain by reducing variability

This case study is based on a whole chain pork project we undertook with Morrisons, Woodheads and Farmers Boy. Having identified in-take variability as a 'hotspot' in the value chain, the focus of the project was on quantifying the cost and opportunities for reduction. Morrisons suggests potential procurement savings of over £1 million, achievable by working together with suppliers.

It clearly demonstrates:

- ✓ There is high variability in both pig weight and back-fat levels within in-take batches.
- ✓ This variability is both a cost to the pig farmer (because they receive less payment) and a cost to the processor (because it costs more to cut and trim the meat).
- ✓ There is a strong commercial case for working more closely with producers to reduce variability
- ✓ There is an 80:20 rule in play. The majority of Morrisons suppliers achieve good consistency, but a small number do not.
- ✓ This presents an opportunity to benchmark and share good practice.
- ✓ Management practices at herd level can be changed to help reduce variability



This work complements and builds on a project with the Co-operative Food and Tulip which looked more broadly at hotspots across the whole supply chain [case study].

Weight specification and intake variability

Figure 1 shows the weight distribution profile of 14,468 pigs supplied to Woodheads, and the 'in-spec' weight range of 65kg to 95kg. The data show that c. 4% of pigs are outside of specification on weight – which industry data suggests is good performance[1].

Figure 2 shows the profile of variability by individual batch supplied to Woodheads. This shows higher levels of inconsistency: within batches, weights can vary up to as much as 50kg. It also shows that the 80:20 rule applies. The majority of Morrisons pig suppliers appear to provide good consistency, but a small number do not.

This unpredictability can have a significant impact on the suitability of the batch from a processing perspective (see '*cost of variability*').

It can also affect the % of the pigs falling outside specification on back-fat, which in turn is closely correlated with customer requirements (see overleaf).

The range in performance provides Woodheads with an opportunity to identify good and poor performance and what good performing suppliers are doing that could be replicated.

1. Industry-wide bands are 70-90kg and data show 13% at >90kg and 12% at <70kg. BPEX Year Book 2014-15.

Figure 1: Pig intake weight distribution

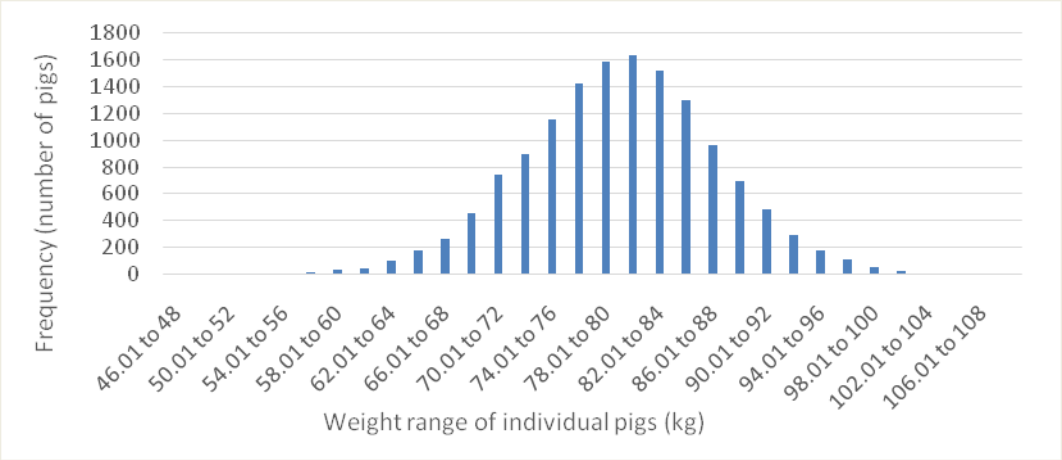
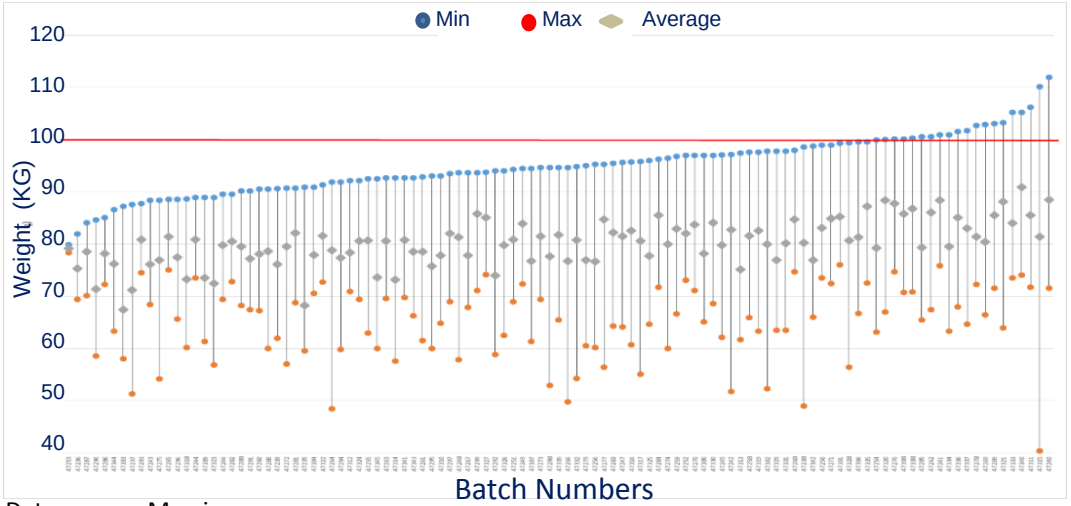


Figure 2: A profile of the variability within each batch



Data source: Morrisons

Back fat variability and correlation with consumer demand

Figure 3 shows the relationship between back-fat probe level and pig weight in the same sample of 14,468 pigs. The specification is 6mm-14mm and Figure 4 shows how the percentage of pigs falling out-of-spec (green and purple bars) increases with the weight of the pig. For example, 40% of the pigs over 100kg were out-of-spec. A similar finding can be seen in the Tulip/Coop supply chain [*case study*].

Figure 4 shows the relationship between probe depth and % lean meat for a sample of 200 pigs processed through Woodheads. This shows that the % lean drops by circa 0.9% for every 1mm increase in probe depth.

Assuming that there is a strong correlation between % lean and customer demand[1], this shows that there is a strong incentive to minimise the level of back fat, to increase saleable yield.

It also shows an incentive to reduce weight variability, as these datasets in combination show that heavier pigs are fatter - which in turn can reduce the yields of lean meat. This finding is set against a trend of increasing pig weights across the industry.

1. 'Eating quality' is difficult to quantify at the point of receipt at the abattoir and so in this study % yield lean meat was used as a proxy for consumer preference.

Figure 3: Morrisons' probe level spec by weight band

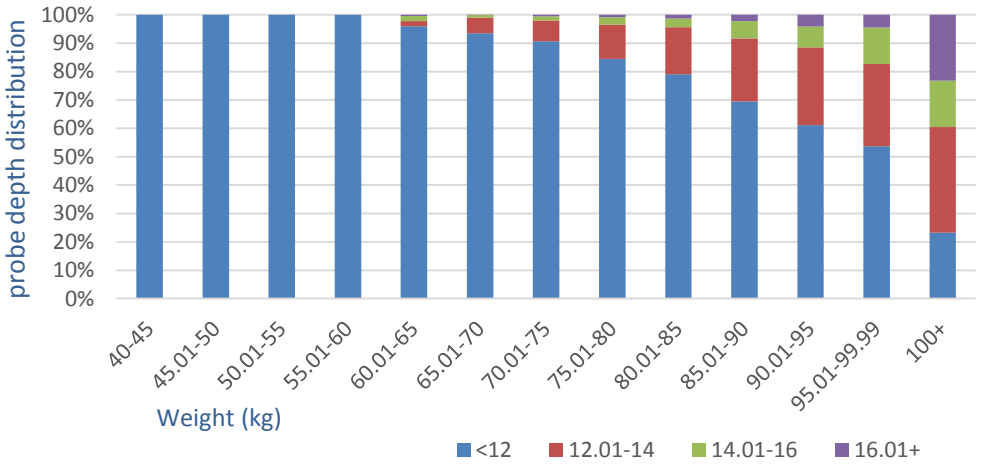
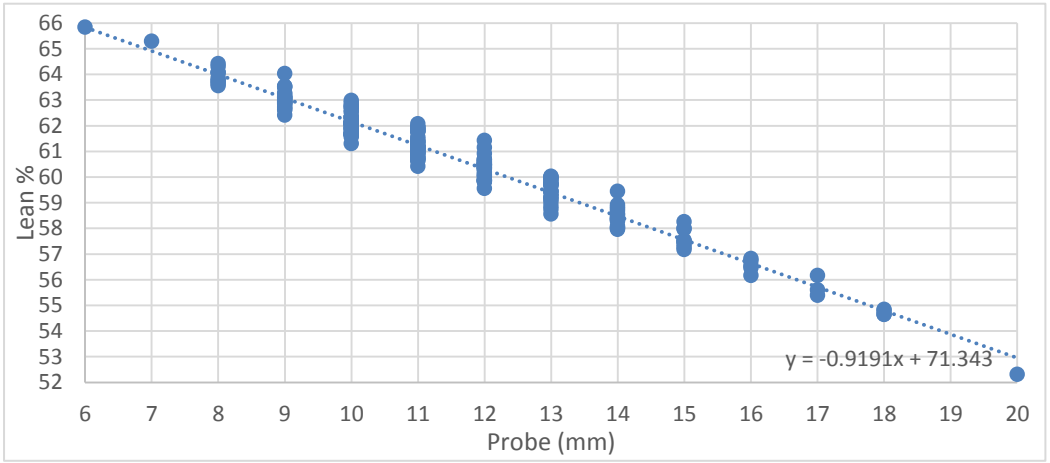


Figure 4: Correlation between probe depth and % lean meat



Data source: Morrisons

Feed cost

Feed is the single largest component of production costs, reaching around 70%. More efficient use of feed has the potential to reduce GHG emissions, environmental impact, decrease costs, improve productivity and increase returns for farmers. This can be delivered both by changing the make-up of feed and by reducing the amount of feed required to deliver pigs that achieve the optimum customer specification. Our evidence shows that batch variability can be significant. The efficiency of converting feed to live weight gain is also likely to decline as pigs grow larger and older.

Procurement costs

Farmers are currently paid a standard price for all probe depths that fall within the spec of 6-14mm - deductions apply where a probe depth is out of specification. Table 1 overleaf provides a normalised estimate of the actual cost of procuring saleable lean meat (the payment grid is normalised for commercial confidentiality around the current mean probe level of 11mm). This table shows, for example, that – when factoring in saleable yield - procurement costs for pigs at a probe depth of 6mm are 7% less than the average, and 12% less than pigs at top end of the spec (14mm). Or, in summary: the lower the probe depth (below 16mm), the lower the procurement cost.

Processing costs

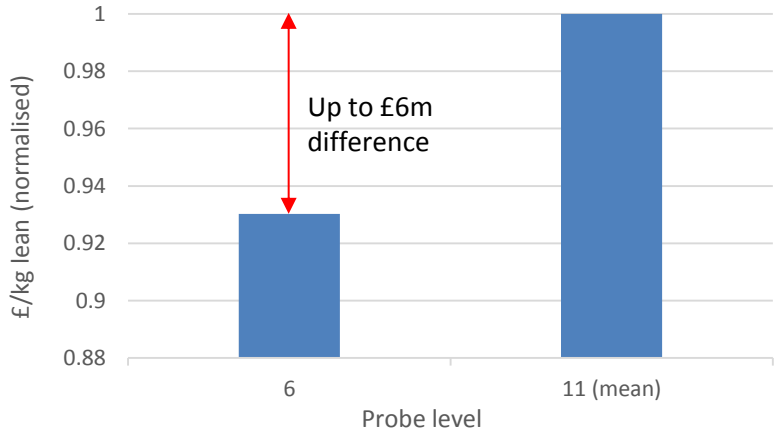
Processing costs are equivalent to c. 10% of procurement costs. Based on the same normalised payment grid used in Table 1, Table 2 overleaf shows normalised processing costs and demonstrates a 1-2% cost increase for every 1 mm increase in probe depth. Again, the lower the probe depth, the lower the cost of processing. Throughput of pigs remained the same irrespective of lean content.

Size-of-the-prize

Figure 5 shows that there is a 7% difference between procurement and processing costs for pork at 6mm and 11mm probe depths. For Morrisons, this equates to an annual difference of £6 million.

Whilst it is clearly not possible to have all pigs at 6mm probe depth, what this does show is the order of magnitude of potential efficiency savings – and Morrisons suggest £1 million could be a reasonable target.

Figure 5: Difference in projected procurement and processing costs by probe and weight



Normalised procurement costs

Table 1: A comparison between the normalised payment grid and the normalised cost per kg of procuring saleable lean meat

Spec	Probe Level	Current payment grid in £/kg carcass weight (normalised at £1 per kg 11mm probe)	Yield of saleable lean meat %	Normalised procurement cost in £/kg of saleable lean meat (at £1 per kg 11mm probe)
In	6	1.00	65.83	0.93
	7	1.00	64.91	0.94
	8	1.00	63.99	0.96
	9	1.00	63.07	0.97
	10	1.00	62.15	0.99
	11	1.00	61.23	1.00
	12	1.00	60.31	1.02
	13	1.00	59.39	1.03
	14	1.00	58.48	1.05
Out	15	0.94	57.56	1.00
	16	0.94	56.64	1.02
	17	0.87	55.72	0.95
	18	0.87	54.80	0.97
	19	0.80	53.88	0.91
	20	0.80	52.96	0.93

Source: Derived from Morrisons and AHDB data (BPEX Pig Year Book 2014-15)

Normalised processing costs

Table 2: Normalised processing costs

Spec	Probe depth (mm)	Yield of saleable lean meat %	Normalised processing cost[1] (at £0.10 per kg 11mm probe)
In	6	65.83	0.093
	7	64.91	0.094
	8	63.99	0.096
	9	63.07	0.097
	10	62.15	0.099
	11	61.23	0.100
	12	60.31	0.102
	13	59.39	0.103
	14	58.48	0.105
Out	15	57.56	0.106
	16	56.64	0.108
	17	55.72	0.110
	18	54.80	0.112
	19	53.88	0.114
	20	52.96	0.116

[1] Calculated using the formula:

$$\frac{\text{Total running costs of abattoir and deboning hall £/hr}}{\text{Mean pig weight x Lean meat \% x Throughput of pigs/hr}}$$

Reducing variability

The trial has demonstrated that there is a clear commercial case for working more closely with producers to reduce variability:

- ✓ Probe levels have a significant impact on the yield of saleable lean meat and associated costs
- ✓ Probe levels increase significantly with pig in-take weight
- ✓ There is significant difference in both the variability in pig weights and probe levels between batches

Potential solutions fall into three generic approaches:

- **Optimise the price grid to incentivise pig farmers to produce less fat pigs** – this is generally considered to be an industry-wide issue that would be difficult for a processor to act on independently
- **Benchmark good and poor performance to better understand those on-farm practices that deliver optimum pigs** – a data heavy exercise but which could deliver useful insights into what causes variability across poorer performing units
- **Build on work within Morrisons pig producer group to share information regarding best practice**– this could build on the Morrisons supply chain group and provide a useful vehicle for the existing on-farm programme

Key factors to reduce on-farm variability

A great deal of work has already been done by AHDB-Pork and others into helping pig farmers reduce variability in their herds. Factors which can cause variability and how these can be ameliorated are shown in Figure 7, which has been taken from recent AHDB –Pork work.

Figure 7: Causes of, and ways to reduce, variability in finishers

Causes of variation in weight	Ways to reduce variation
Use of mixed genotypes	Use fewer lines – nominate terminal sires
Home breeding – dam & sire lines	Minimise dam line finishing pigs
Boars (faster & leaner) than gilts	Split sex finishing – appropriate nutrition
Birth & weaning weight variation	Management to minimise & 'streaming'
Health – respiratory and enteric	Bio-sec. / All in - All out / vaccination
Nutrition / diet quality	Raw material analysis; diet specification
Feeder space, drinkers, - flow rate	1 space / 10 pigs; 1-1.5 litres / minute
Stocking density	Ideal 0.1m^2 / 10kg ; welfare code 0.07m^2
Number of pigs / pen	Fewer pigs / pen & more rooms / house
Stress and vices	Correct 'environment' / use enrichment
Temperature – absolute & variation	Relative to growth rate / housing; monitor
Seasonality	Ventilation / cooling / diet selection

Source: AHDB pig producer meeting – Autumn 2015 Coping with variation in finishing pigs

Understanding customer demand

'Eating quality' is difficult to quantify at the point of receipt at the abattoir and so % yield lean meat has been used in this study as a proxy. Ideally it would be possible to build a profile of actual customer orders and, from this, develop the best case in terms of the ideal pig weights to meet the orders.

Morrisons pork supply chain

Morrisons operate a vertically integrated pork supply chain as they own and manage Woodheads and Farmers Boy. Woodheads has strong links with the pig farmers who supply them, but these farms are not owned by Morrisons.

Another feature of Morrisons is that the retailer operates with in-store butchers who complement their pre-pack offer for consumers. This has enabled Woodheads to supply primals directly to stores, as well as through Farmers Boy, where they are pre-packed.

'As part of our farming programme we work with our farmers to support improvements in resource efficiency across the whole chain. We understand variability is an issue with unique challenges and this report helps demonstrate the impact this has across our whole supply chain'

David Evans, Head of Agriculture Morrisons

'This project clearly demonstrates the implications of intake variability across our supply chain. It has given us much to think about, in particular how we shape our relations with suppliers in order to deliver for our customers in a way that reduces the resource impact of production.'

Steven Butts, Head of Corporate Responsibility Morrisons

There is a significant financial and resource benefit to Morrisons and its pig producers to increase the lean meat yield. Our analysis shows evidence of good practice and hence the challenge going forward is to capture what these exemplar suppliers are doing well and to disseminate this to the whole supplier base.

Our analysis also suggests that there are even stronger resource efficiency benefits for the wider industry that will help build on those already taken, for example to reduce emissions and waste associated with feed.

These projects are undertaken to inform and to benefit the whole of the sector. For more information on the approach and the potential to work with your business, please contact karen.fisher@wrap.org.uk

WRAP's vision is a world where resources are used sustainably. It works in partnership with governments, businesses, trade bodies, local authorities, communities and individuals looking for practical advice to improve resource efficiency that delivers both economic and environmental benefits.

Our mission is to accelerate the move to a sustainable resource-efficient economy through:

- re-inventing how we design, produce and sell products,
- re-thinking how we use and consume products, and
- re-defining what is possible through recycling and re-use.

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For more information on the approach and on potential support for your business, please contact karen.fisher@wrap.org.uk

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