The effect of sire line breed on the lifetime performance of slaughter generation pigs

by

Elizabeth Magowan and M. Elizabeth E. McCann

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The Agricultural Research Institute of Northern Ireland was amalgamated with DARD Science Service to become the Agri-Food and Biosciences Institute (AFBI) on 1st April 2006.

1. Executive Summary

Using a total of 192 Landrace/Large White F1 dams, genetics from four terminal sire lines representing three different breeds were evaluated at AFBI, Hillsborough during 2007. Sire lines were representative of genetics being used on Northern Ireland pig herds and included Tempo, Pietrain (Austrian line), Pietrain (Belgium line) and Landrace. The performance of all piglets were assessed between birth and weaning. Pietrain Austrian litters were numerically larger with one extra pig per litter (14.1 piglets born per litter vs 12.9) but on average Pietrain Austrian piglets were lighter at birth (1.39 kg vs 1.53 kg) and had a higher mortality rate (26.8% vs 16.2%) than pigs from the other sire line breeds. Overall, the average daily gain of piglets was similar for each sire line breed as was the number of piglets weaned and the total weight of piglets weaned per litter (average 87.1 kg). A total of 240 progeny from each terminal sire line breed were then used to establish growth rate, feed intake and feed use efficiency from weaning to finish (target 100 kg). In addition the carcass quality of a sub-section of pigs taken to slaughter weights of 95, 105 and 115 kg live weight was assessed. The health of all pigs was above average and mortality during the experiment was low (on average 1.5%). There were no significant differences in growth rate, feed intake, feed use efficiency or variable weight or growth rate between wean and 10 weeks of age due to sire line breed. However, sire line breed had a significant effect on the performance of pigs during finishing. The growth rate and feed intake of Tempo pigs between 10 weeks of age and finish was 84 g/day and 80 g/day, respectively, higher than that of any other pigs. However, the feed use efficiency of Tempo pigs (2.23) was similar to that of the Pietrain (Austrian) (2.29) whereas the feed use efficiency of Pietrain (Belgium) pigs and Landrace pigs was poorer (2.35 and 2.42 respectively). Variability in weight (at 20 weeks of age) and growth rate (between 10 and 20 weeks of age) was greater with Landrace pigs compared with the other terminal sire line breeds which were all similar. Landrace pigs were significantly fatter (P_2 13.9 mm) than the other pigs (average P_2 12.8 mm). However, the kill out percentage (KO%) and lean meat percentage of Pietrain pigs (77.2% and 61.0% respectively) were higher than that of the Tempo and Landrace pigs (average KO% 76.0% and lean meat % 60.1%). When slaughter weights were taken to 115 kg, the backfat depth and cold weight of all pigs increased significantly although kill out percentage remained constant. Furthermore, the growth rate of pigs taken to slaughter weights of 115 kg remained high and no ‘plateau’ effect was observed.

Economically, Tempo and Pietrian (Austrian) pigs had a similar margin over feed which was approximately £4.40 more than Landrace pigs and £1.40 more than Pietrain Belgium pigs. In conclusion, Tempo pigs grew faster and were more efficient than Pietrain or Landrace pigs. However, the carcass performance of Pietrain pigs was superior to Tempo and Landrace pigs. There was a lower financial cost associated with the rearing of Tempo pigs but when carcass value was taken into consideration it was found that Tempo and Pietrain (Austrian) pigs had a similar margin over feed. Due to their high growth rate, more efficient use of housing could be achieved using Tempo pigs as they reached 105 kg approximately one week earlier than Pietrain (Austrian) pigs which were the next fastest growing sire line breed.

2. Introduction

Historically, the terminal sire breed of slaughter generation pigs in Northern Ireland was Landrace or Large White. However, during 2003-2005 Post Weaning Multi Systemic Wasting Syndrome (PMWS) afflicted many herds. At that time anecdotal evidence suggested that the Tempo and Pietrain breeds were 'resistant' to PMWS. Tempo and Pietrain breeds therefore became a very popular choice of terminal sire. A vaccine for PMWS has now become available and producers need to make decisions whether to return to the traditional breed of Landrace/Large white or continue with the use of Pietrain and/or Tempo as terminal sires.

Scientifically, some studies have compared the effect of various breeds on pig performance, for example, Kim *et al*. (2007) compared the growth performance of progeny from Duroc, Birkshire and Duroc x Birkshire terminal sires. However, most breed comparison studies focus on the effect of breed on carcass and meat quality (Gispert *et al*., 2007, Renaudeau and Mourot, 2007). There are no known scientific studies which have compared the use of the breeds now common in Northern Ireland with the traditional breeds of Landrace or Large White. Commercial information regarding the performance of the Tempo and Pietrain breeds is available from the respective companies supplying the genetics. However, these results have largely been taken from trials where the pedigree animals are individually housed and therefore can express their optimum growth potential and are not directly applicable to the commercial situation.

To provide the industry with an indication of how the different genetics performed on a typical commercial herd, a large evaluation study was instigated at AFBI, Hillsborough, comparing the production performance, carcass quality and meat quality of representative genetics from specific lines within the Landrace, Tempo, Pietrain Austrian and Pietrain Belgium breeds, which were all available from Northern Ireland studs.

In previous 'breed comparison' studies, a number of sires were used per 'treatment' i.e. breed type. Using this approach, no significant difference between breeds were noted due to the large degree of variation within each breed (McCann *et al*., 2008). In order to avoid this scenario, the genetics used in the current experiment was narrowed to represent a line within the breed.

An additional aim of the study was to compare the carcass and meat quality of pigs from the different breeds when taken to heavy slaughter weights. The average carcass weight of pigs in NI during 2006/2007 was 79.9 kg equating to a live slaughter weight of approximately 107 kg. Increasing the slaughter weight of pigs is an attractive method to reduce overhead costs per sow. Weatherup *et al*. (1998), using Landrace progeny sourced in NI, concluded that taking pigs to carcass weights of 90 kg did not affect production performance but pigs were significantly fatter and therefore the economic optimum slaughter weight was advised as 80 kg. Currently the upper carcass weight limit to attain optimum price in some slaughter contracts is 90 kg.

3. Materials and Methods

3.1. General health status of herd

The herd operated a three-week batch farrowing system and over the course of the three weeks, an 'all in/all out' policy. The breeding herd was vaccinated against Parvo virus, Erysipelas and was routinely wormed. All progeny were also vaccinated against pneumonia. The herd showed signs of having PMWS/PDNS for a time during 2004 and the mortality of the finishing pigs rose to approximately 7%. The pigs used in the experiment were born between January and July in 2007. No signs of PMWS/PDNS were evident in the herd during 2006 (average mortality 1.6%) and during the

experiment the mortality of the post weaned pigs (to 10 weeks of age) was 1% and that of the finishing pigs was 1.5%.

3.2 Genetic background

Dams were $^{1}/_{2}$ Landrace x $^{1}/_{2}$ Large White F1. The sire line breeds included Landrace, Tempo, Pietrain (Austrian line) and Pietrain (Belgium line). The sire lines breeds were sourced from the 3 main breeders in Northern Ireland (Deerpark Pedigree Pigs, Glenmarshall Pedigree Pigs and Elite Sires). Each breeder provided semen from a specific line within their herd i.e. all Landrace semen came from the same breeder and line of genetics over the course of the experiment. Dams were artificially inseminated within a 3-week batch farrowing system. All progeny were weighed and individually identified at birth. All progeny were weighed again at weaning (28 days of age) and the performance of a representative proportion of pigs within each breed was monitored from weaning to slaughter.

3.3 Reproductive performance

Over 12 time replicates a total of 192 sows were inseminated with semen from one of the above sire line breeds. Dam parity was balanced for each sire line breed. The total number of pigs born, number of live pigs born, number of still births and number mummified was recorded. Pigs were weighed within 2 hours after birth. The number of pigs weaned and the mortality of pigs between birth and weaning was also recorded. There were minimal interventions to improve the survivability of piglets and therefore pre-weaning mortality rates largely reflect the robustness of the sire line breed for survivability.

3.4 Production performance from weaning to slaughter

Over 12 time replicates, the production performance of 960 pigs were tested (240 per sire line breed). Pre-weaning pigs were offered a starter diet from 18 days of age. Pigs were weighed at weaning and within each breed 20 pigs per replicate were selected on the basis of weight and sex to represent the average pigs weaned respective of sire line breed. Pigs of the same sire line breed were penned together (groups of 20) from weaning to slaughter. Pigs were transferred at 10 weeks of age from combined stage 1/stage 2 accommodation to finishing accommodation. All pigs were offered the same diets from weaning to slaughter. Pigs were weighed and feed intakes were recorded at 7,

10, 12, 15 and 20 weeks of age. Pigs were weighed weekly thereafter and sent for slaughter at a target weight of 105 kg. The average daily gain (ADG), average daily feed intake (ADFI) and feed conversion efficiency (FCR) were subsequently calculated. The coefficient of weight and growth rate was also calculated by dividing the standard deviation of the respective dataset by the average of that dataset.

3.5 Carcass quality

The hot carcass weight was recorded at the factory as was the backfat depth of pigs at P_2 using the online Ulster probe. The kill out percentage (KO%) of pigs was calculated. The lean meat percentage was calculated using the following equation:

$$\text{Lean meat \%} = 71.4384 - (0.84119 * \text{Ulster probe } P_2).$$

Carcass feed conversion ratio was calculated by dividing the total feed used from weaning to finish by the cold weight of the carcass.

3.6 Meat quality

A sub-section of pigs (144 pigs) were taken to a slaughter weight of either 105, 110 or 115 kg (12 pigs (6 boars + 6 gilts) per weight band within each sire line breed). The meat quality (ultimate pH, drip loss, cooking loss, shear force and colour) from each of these pigs was analysed. Results from this analysis are pending.

3.7 Statistical analysis

The effect of sire line breed on litter and lifetime pig performance was tested using Analysis of Variance. The effects on carcass quality were tested on the individual data using Analysis of Variance for unbalanced data. Where applicable, finish weight was used as a covariate. Pen mean data were used to test for effects of breed on growth rate, feed intake and feed efficiency. Individual data were used to test for all other effects. Significance of effect was tested at the 5% level.

4. Results

4.1 Litter performance

Table 1 reports the effect of sire line breed on litter performance. Sows between parity 2 and 12 were used in the experiment and there was no significant difference between the parity of dams across sire line breed treatment (Table 1).

Although not significant, Pietrain Austrian litters were larger with one extra pig per litter born alive compared with Landrace and Pietrain Belgium litters. However, the mortality of pigs between birth and weaning was significantly higher for Pietrain Austrian litters compared with litters of the other sire line breeds. Furthermore, the birth weight of all pigs born and pigs born alive was significantly lower for Pietrain Austrian pigs compared with that of pigs from the other sire line breeds. The wean weight of Pietrain Belgium pigs was significantly lower than that of pigs from the other sire line breeds. However, the number of pigs weaned per litter, the total weight of pigs weaned per litter and the average daily gain of piglets between birth and weaning did not differ between sire line breeds. Sire line breed had no significant effect on the coefficient of variation for birth or wean weight or average daily gain of pigs.

4.2. Performance from weaning to finish

Table 2 reports the effect of sire line breed on pig performance between weaning and finish. Sire line breed had no significant effect on growth rate, feed intake, feed efficiency or coefficient of variation for weight or growth rate between wean and 10 weeks of age.

Tempo pigs were significantly heavier at 15 and 20 weeks of age and had higher ADG and ADFI between 10 and 20 weeks of age and finish compared with pigs from the other sire line breeds. Feed efficiency of Tempo pigs was similar to that of Pietrain Austrian and Pietrain Belgium pigs with Landrace pigs having the poorest FCR. Overall from wean to finish there was no significant effect of sire line breed on ADFI but Tempo pigs had the highest ADG and best FCR. Landrace pigs had a similar ADG to Pietrain pigs between wean and finish but the poorest FCR.

Table 1. Effect of sire line breed on litter performance

	Landrace	Pietrain Austrian	Pietrain Belgium	Tempo	SED	Sig.
Parity of dams	6.00	5.97	6.13	6.22	0.767	NS
No. born/litter	12.87	14.14	12.93	13.13	0.729	NS
No. born dead/litter	1.196	1.255	1.333	1.132	0.396	NS
Mortality at birth (%)	8.87	7.69	10.53	8.02	2.596	NS
No. born alive/litter	11.65	12.89	11.60	12.00	0.686	NS
Total No. pigs weaned from litter	9.98	9.39	9.67	9.66	0.631	NS
Mortality birth to wean (%)	14.36[a]	26.79[b]	15.94[a]	18.41[a]	3.287	***
Birth weight (kg)	1.54[b]	1.39[a]	1.54[b]	1.52[b]	0.024	***
Litter weight at birth (kg)	19.32	19.87	19.30	19.11	0.949	NS
Birth weight of pigs born alive (kg)	1.58[b]	1.47[a]	1.59[b]	1.59[b]	0.024	***
Birth weight of pigs born dead (kg)	1.20[b]	1.22[b]	1.31[c]	0.97[a]	0.120	*
Wean weight (kg)	9.04[b]	9.05[b]	8.72[a]	9.12[b]	0.116	**
Litter weight at wean (kg)	90.2	84.1	86.0	88.0	5.85	NS
Average daily gain birth to wean (g/day)	267	267	263	272	3.788	NS
CV birth weight (all pigs)	0.199	0.210	0.199	0.231	0.015	NS
CV birth weight (pigs born alive)	0.182	0.202	0.185	0.191	0.013	NS
CV wean weight	0.150	0.164	0.164	0.148	0.012	NS
CV average daily gain	0.164	0.183	0.166	0.159	0.015	NS

NS = Not significant, * = <0.05, ** = <0.01, *** = <0.001
CV = Coefficient of Variation

Table 2. Effect of sire line breed on pig performance from weaning to finish

		Landrace	Pietrain Austrian	Pietrain Belgium	Tempo	SED	Sig.
Weight (kg)	Wean	9.1	9.4	9.1	9.2	0.13	NS
	10 wks	29.0	29.8	28.9	29.3	0.58	NS
	15 wks	52.4^{ab}	54.2^{b}	52.0^{a}	57.5^{c}	1.08	***
	20 wks	82.6^{ab}	84.6^{b}	81.2^{a}	92.8^{c}	1.47	***
	Finish weight	99.7	100.7	98.1	104.7	1.28	***
ADG (g/day)	Wean - 10 wks	485	498	483	491	13.0	NS
	10 - 20 wks	769^{a}	786^{a}	749^{a}	912^{b}	19.1	***
	10 – Finish[1]	804^{a}	815^{a}	794^{a}	888^{b}	11.6	***
	Wean – Finish[1]	704^{a}	713^{a}	698^{a}	751^{b}	7.0	***
ADFI (g/day)	Wean - 10 wks	724	730	715	717	21.7	NS
	10 – 20 wks	1899^{a}	1887^{a}	1806^{a}	2146^{b}	52.0	***
	10 – Finish[1]	2083	2027	2006	2119	35.6	*
	Wean – Finish[1]	1639	1611	1601	1639	24.1	NS
FCR	Wean - 10 wks	1.53	1.46	1.49	1.49	0.026	NS
	10 - 20 wks	2.54^{b}	2.42^{a}	2.47^{ab}	2.38^{a}	0.043	***
	10 – Finish[1]	2.68^{c}	2.52^{ab}	2.59^{bc}	2.44^{a}	0.047	***
	Wean – Finish[1]	2.42^{c}	2.29^{ab}	2.35^{bc}	2.23^{a}	0.039	***
CV weight	Wean	0.094	0.107	0.092	0.100	0.0138	NS
	10 wks	0.113	0.115	0.119	0.127	0.0111	NS
	20 wks	0.121^{b}	0.098^{a}	0.111^{ab}	0.095^{a}	0.0108	*
CV ADG	Wean - 10 wks	0.149	0.153	0.156	0.168	0.0156	NS
	10 - 20 wks	0.165^{b}	0.116^{a}	0.139^{ab}	0.110^{a}	0.0173	**
	Wean – Finish[1]	0.104	0.087	0.105	0.100	0.0100	NS

[1] Finish weight applied as covariate
NS = Not significant, * = <0.05, ** = <0.01, *** = <0.001
CV = Coefficient of Variation

The coefficient of variation for the ADG of pigs between 10 and 20 weeks of age was lowest for Tempo and Pietrain (Austrian) pigs but greatest for Landrace pigs. At 20 weeks of age 21% of Tempo pigs were 100 kg or over compared with 3.5, 4.7 and 2.1% for Landrace, Pietrain (Austrian) and Pietrain (Belgium) pigs respectively.

Table 3 reports the effect of gender on growth performance. There were no significant interactions between sire line breed and gender at any stage of growth. Feed intake values could not be attained specific for gender as pigs were penned in mixed sex groups. Gilts grew faster than boars between wean and 10 weeks of age but boars grew faster than gilts during finishing. Overall between wean and finish the growth rate of boars was higher than that of gilts. This trend was similar for all sire line breeds.

Table 3. Effect of gender on growth performance

	Boar	**Gilt**	**SED**	**Sig.**
Wean – 10 weeks	480.60	500.10	5.358	***
10 weeks – Finish[1]	838.70	805.50	6.799	***
Wean – Finish[1]	722.80	707.30	5.081	**

[1] Finish weight applied as covariate
NS = Not significant, * = <0.05, ** = <0.01, *** = <0.001

4.3. Carcass performance

Table 4 reports the effect of sire line breed on carcass parameters. The finish weight of pigs differed significantly due to sire line breed. Finish weight was therefore used as a covariate to null the effect of finish weight in the statistical analysis of carcass parameters. The backfat depth of pigs at P_2 was significantly higher in Landrace pigs compared with pigs of any of the other sire line breeds. The cold weight, kill out percentage and lean meat percentage of Pietrain Austrian and Pietrain Belgium pigs were significantly higher than that of Landrace and Tempo pigs. Carcass FCR of Tempo, Pietrain Austrian and Pietrain Belgium pigs was similar between weaning and finish but that of Landrace pigs was poorest.

Table 4. Effect of sire line breed on carcass quality

	Landrace	Pietrain Austrian	Pietrain Belgium	Tempo	SED	Sig.
P_2 (mm)[1]	13.9[b]	12.8[a]	12.6[a]	12.9[a]	0.23	***
Lean meat %[1]	59.9[a]	60.8[b]	61.1[b]	60.3[a]	0.21	***
Cold wt (kg)[1]	77.7[a]	79.4[b]	79.0[b]	78.2[a]	0.30	***
Kill out %[1]	75.8[a]	77.4[b]	77.0[b]	76.1[a]	0.28	***
Carcass FCR[1]	2.76[c]	2.64[ab]	2.68[bc]	2.59[a]	0.048	**

[1] Finish weight applied as covariate
NS = Not significant, * = <0.05, ** = <0.01, *** = <0.001

Table 5 reports the effect of gender on carcass parameters. There were no significant interactions between sire line breed and gender on any carcass parameters. As expected, gilts had a higher KO% and hence higher cold weight than boars but gilts were fatter and therefore had a lower lean meat percentage.

Table 5. Effect of gender on carcass quality

	Boar	Gilt	SED	Sig.
Cold wt (kg)[1]	77.76	79.35	0.4179	***
Kill out %[1]	75.75	77.35	0.1966	***
Lean meat %[1]	60.7	60.4	0.14	*
P_2 (mm) [1]	12.82	13.21	0.1603	*

[1] Finish weight applied as covariate
NS = Not significant, * = <0.05, ** = <0.01, *** = <0.001

A sub-section of pigs within each sire line breed were taken to slaughter weights of either 95, 105 or 115 kg, mainly to test the effect on meat quality (results pending). However, carcass quality measurements were also taken and Table 6 reports the effect of slaughter weight on carcass parameters. There were no significant interactions between

slaughter weight and sire line breed. A breakdown of the carcass measurements respective of breed and slaughter weight is however provided in the Appendix. As slaughter weight increased from 95 to 105 and 115 kg so did cold weight and backfat depth of pigs at P_2 but the lean meat percentage of pigs decreased (Table 4). Slaughter weight had no significant effect on KO%. The backfat depth and lean meat percentage of pigs at slaughter weights of 105 and 115 kg were similar.

Table 6. Effect of slaughter weight on carcass quality

	Finish weight (kg)				
	95	**105**	**115**	**SED**	**Sig.**
P_2	12.2^a	13.5^b	14.1^b	0.36	***
Lean meat %	61.2^b	60.1^a	59.6^a	0.30	***
Cold wt (kg)	72.8^a	80.6^b	88.6^c	0.44	***
KO%	76.5	76.8	77.4	0.41	0.08

NS = Not significant, * = <0.05, ** = <0.01, *** = <0.001

It should be noted that the pigs taken to heavy slaughter weights were, in general, the faster growing pigs within the group as indicated by Figures 1-4. These figures also suggest that the average daily gain of pigs, albeit of the fast growing pigs, did not plateau out when pigs from any sire line breed were taken to the heavier slaughter weights.

4.4. Economic evaluation

The margin over feed, feed cost per kg of carcass weight and feed cost per kg of liveweight gain was similar for Pietrain Austrian and Pietrain Belgium pigs (Table 7). The feed cost per kg of carcass weight and feed cost per kg of liveweight gain was highest for Landrace pigs and lowest for Tempo pigs (Table 7).

Table 7. Economic evaluation of the sire line breeds

	Landrace	Pietrain Austrian	Pietrain Belgium	Tempo
Days to reach 105 kg (from weaning)	136.4	134.6	137.5	127.8
Feed used from wean to finish (105 kg) (kg/pig)	227.1	218.4	221.6	211.92
Total liveweight gain (kg)	94	94	94	94
Total cost of feed (£)[1]	63.14	60.83	61.67	59.15
Cost of feed (p/kg liveweight gain)	67.2	64.7	65.6	62.9
Carcass value (£)[2]	95.51	97.52	97.02	95.89
Feed cost/kg carcass weight (p/kg)	79.3	74.8	76.3	74.0
Margin over feed (£)[3]	32.37	36.69	35.35	36.79

[1] Based on feed costs and dietary regime: 3 kg/pig of starter 1 (£595/tonne), 6 kg/pig of starter 2 (£435/tonne), Grower diet to 12 weeks of age (£284/tonne), Finisher diet from 12 weeks of age to finish.
[2] Based slaughter weight of 105 kg and KO% of sire line breeds reported in Table 4 and price of 1.20/kg carcass weight
[3] Margin over feed = Carcass Value – Total feed cost

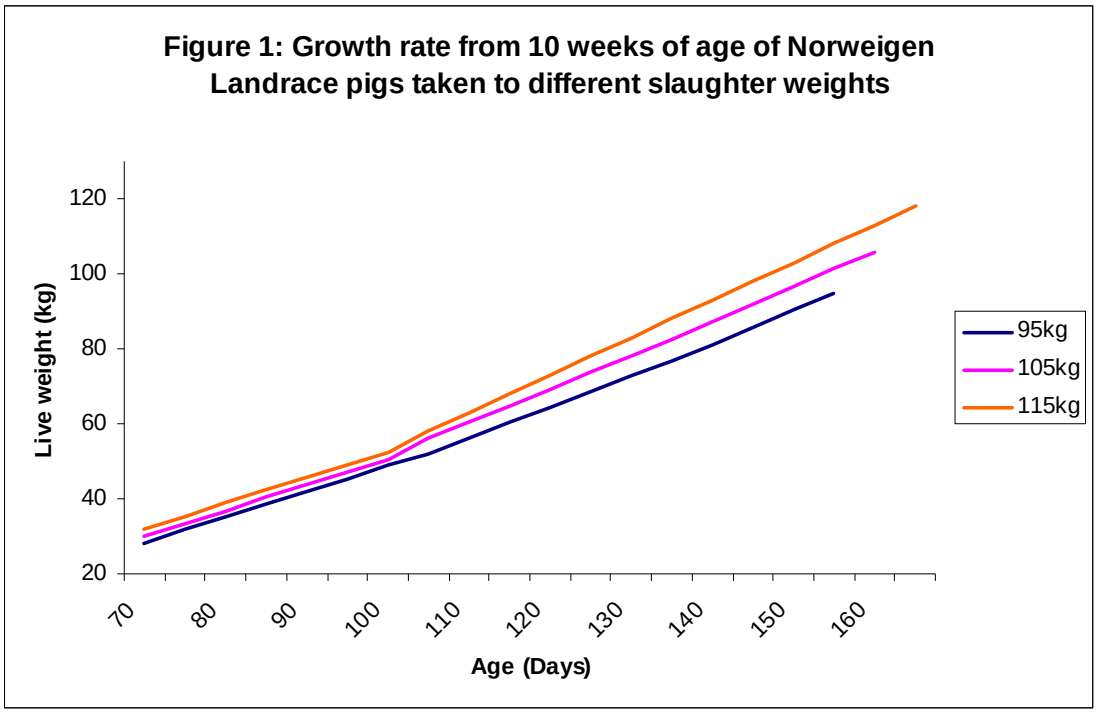


Figure 1: Growth rate from 10 weeks of age of Norweigen Landrace pigs taken to different slaughter weights
Live weight (kg)
120
100
80
60
40
20
70
80
90
100
110
120
130
140
150
160
Age (Days)
95kg
105kg
115kg

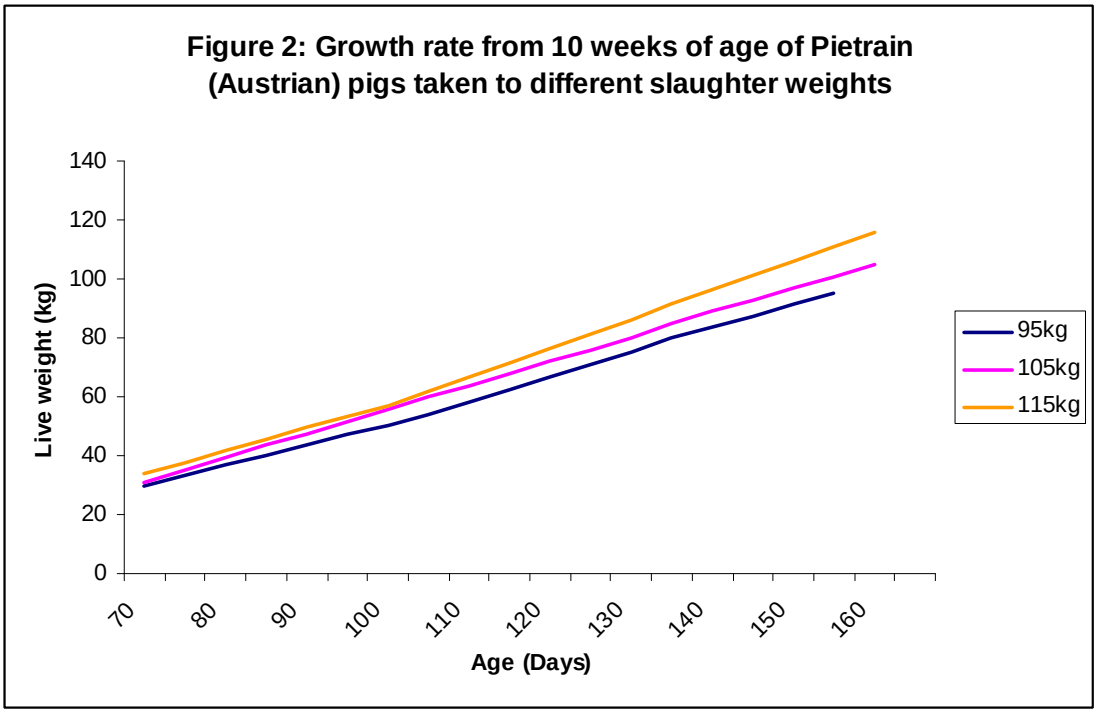


Figure 2: Growth rate from 10 weeks of age of Pietrain (Austrian) pigs taken to different slaughter weights
Live weight (kg)
140
120
100
80
60
40
20
0
70
80
90
100
110
120
130
140
150
160
Age (Days)
95kg
105kg
115kg

Figure 3: Growth rate from 10 weeks of age of Pietrain (Belgium) pigs taken to different slaughter weights

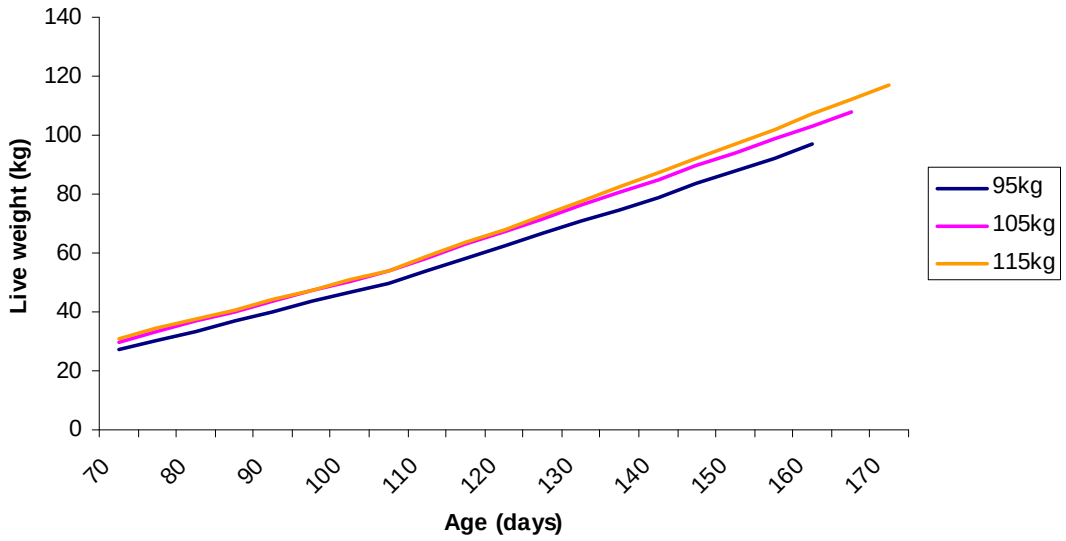
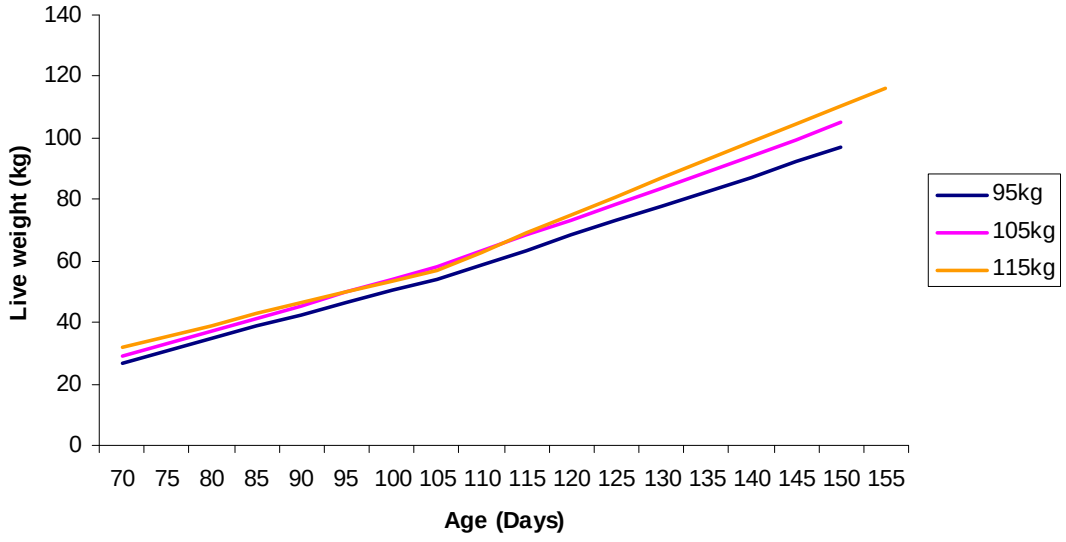


Figure 4: Growth rate from 10 weeks of age of Tempo pigs taken to different slaughter weights



5. Discussion

5.1 Pig evaluation programmes

During the 1990's a number of organisations across various countries undertook 'breed evaluation' projects to test the production performance of slaughter generation pigs from the various terminal sire lines that were available to producers in the respective country. In Ireland, Lynch and Allen, (1998) compared genetics from seven breeders, in the UK, the Stotfold report compared genetics from four sources (MLC, 1989), the French tested stock from five breeding companies (ITP, 1997), the USA compared a number of breeds e.g. Large White, Berkshire, Duroc, (NPPC, 1995) as did the Canadians (OPCAP, 1996) and the Danish pig industry continues to operate a comprehensive progeny and performance testing programme. All these programmes identified significant differences between genetic sources and terminal sires in the production performance, carcass performance and overall economic value of the tested pigs.

A major criticism of such programmes is the fact that results often lag 1-2 years after the genetics is available and being used on farm. However, Lynch and Allen (1998) noted that such 'evaluation' programmes are of value at two levels. In such programmes all pigs are compared under identical housing, nutrition and management conditions similar to those on commercial farms. Also, for a country like Ireland it encourages importers or agents to import the most up-to-date genetic material available.

This current study evaluated the performance and carcass quality of genetics available within the NI herd during 2007 and since the sires used were young stock, it is most probable that their genetics are still in circulation and at the very least their progeny's genetics are being used. The genetics of the dams used in the work were representative of those present throughout the NI sow herd i.e. first cross Landrace/Large White. McCann *et al*. (2008) noted that there was as much variation in pig performance within breeds of pig, i.e. between lines and sires, compared with between breeds of pig. Therefore, the genetics used in this experiment was purposely restricted to represent a specific line within a breed and was restricted to, at most, 2 boars within that line which is reflective of how the Danish pig industry conduct their testing programme (DS, 1996). It could be criticised as being very prescriptive, however, the sire line used within each breed was commonly used within the NI pig herd. Therefore, the results of the study

have direct relevance for the NI pig industry and reflect the degree of variation in growth rate that may be present within the industry due to genetics.

5.2 Effect of terminal sire line breed

The four sire line breeds that were used in the comparison were Landrace, Pietrain Austrian, Pietrain Belgium and Tempo. The Landrace terminal sire line was included as the control, traditional breed. At the time, anecdotal evidence suggested that the Pietrain Austrian, Pietrain Belgium and Tempo breeds were resistant to PMWS and the use of these breeds reduced the high mortality rates observed on farm due to PMWS. At the time of the experiment PMWS was not prevalent on the AFBI Hillsborough herd and mortality within the growing and finishing herd was 1 and 1.5% respectively. Therefore, there were no grounds to examine the effect of breed on pig mortality during the growing and finishing periods. The main aim of this experiment was to investigate the effect of breed on life time pig performance and carcass parameters on a commercial herd with an above average health status.

A total of 192 sows, (48 for each sire line breed) between parity 2 and 12 were used in the experiment. Parity did not differ between sire line breed and averaged 6. Sow performance in general could be considered as average compared with the DARD Benchmarking figures of 2007/2008 (average pigs sold per sow/year = 20.8). The number of pigs born within Pietrain Austrian litters was numerically greater than that of other sire line breeds. However, with this increase in numbers born, the birth weight of Pietrain Austrian pigs was significantly lower and the mortality of pigs was significantly greater than that of pigs from the other sire line breeds. Overall sire line breed had no significant effect on the number or total weight of pigs weaned per litter. Furthermore, sire line breed did not significantly affect pig performance post weaning. The growth rate of all pigs post weaning (4-10 weeks of age) was good and averaged 489 g/day which is comparable to the top performing growing pigs in Europe in 2006 (i.e. average daily gain of growing pigs in France was 470 g/day and in England/Scotland/Wales was 493 g/day in 2006) (Fowler, 2007). Post weaning feed intake was also similar for all sire line breeds but Landrace progeny tended (P=0.086) to be less efficient at converting feed compared with Pietrain Austrian pigs. Terminal sire line breed was found to have a significant effect on pig performance during the finishing period (30-105 kg). The growth rate of Tempo progeny was on average 84 g/day faster than that of the other pigs.

The growth rate of Tempo pigs during finishing was comparable to the average daily gains of the best performing finishing pigs in Europe during 2006 which were 873 g/day (Sweden) and 861 g/day (Denmark) (Fowler 2007). The feed intake of Tempo pigs was the highest, whereas that of the Pietrain Austrian and Pietrain Belgium pigs was the lowest. Landrace pigs were found to convert feed less efficiently than the Pietrain lines with the Tempo pigs having the best feed conversion efficiency. Overall from weaning to finish, Tempo pigs had the fastest growth rate (751 g/day) while the growth rate of the Landrace and Pietrain lines were similar (average 705 g/day). This faster growth rate resulted in Tempo pigs achieving a live weight of 105 kg approximately one week earlier than Pietrain (Austrian) pigs which were the next fastest growing. This has major implications regarding housing management where pens could be rested, which has benefits regarding disease control, or more sows could be kept and therefore more pigs reared per year. There was no difference in feed intake overall from wean to finish but Tempo pigs had the best feed conversion efficiency and Landrace pigs the worst. The production performance of the two Pietrain lines was similar.

Magowan *et al*. (2007) noted that pig herds with a high degree of variable growth rate within the herd, in general had overall lower performance which resulted in decreased profitability. In the current experiment, there was no significant difference in the variable birth or wean weight of pigs, however the variable growth rate of pigs during finish (10-20 weeks of age) and the variable weight of pigs at 20 weeks of age was significantly higher (5.5% and 2% respectively) for Landrace progeny compared with Tempo progeny with Pietrain progeny being intermediate.

Unfortunately it was not possible to attain AutoFom data within the experiment which would have provided values for the lean meat percentage of the primal cuts (ham, loin, shoulder and leg). Instead the lean meat percentage was calculated using the P_2 value as measured using the Ulster probe. The backfat depth of Landrace progeny at P_2 was 1.1 mm higher than that of any other pigs. However, the kill out percentage and lean meat percentage of both Pietrain lines were higher (average 77.2 and 61% respectively) than that of the Landrace or Tempo progeny (average 76.0 and 60.1% respectively). This is in agreement with Whittemore (1993) who reported that Pietrain pig types showed benefits over White types by up to 4% more lean and 3% better KO%.

As slaughter weight increased from 95 to 115 kg, P_2 also increased significantly but kill out percentage remained similar. This trend was similar for all sire line breeds. This is in agreement with Weatherup *et al*. (1998) who found significant increases in P_2 between carcass weights of 80 and 90 kg. However, in this study it was noted that the P_2 of Tempo and Pietrain Belgium pigs at 115 kg live weight was under 14 mm (within code 1) (Appendix). Therefore, it may be possible to take Tempo and Pietrain Belgium pigs to slaughter weights of 115 kg with no detrimental effects on grading. This study was not designed to evaluate the feed intake or feed efficiency of pigs taken to 115 kg, but it provided data on the growth rate of those pigs. Pigs taken to 115 kg live weight were commonly the faster growing pigs within the group and their growth was not found to slow up or 'plateau' when they were taken to these heavier weights. This is in agreement with Weatherup *et al*. (1998) who pre-selected the fast growing pigs from a group of pigs and took them to carcass weights of 70, 80, 90 and 100 kg. Weatherup *et al*. (1998) noted no 'plateau' effect on growth rate or feed efficiency when pigs were taken to slaughter weights up to 90 kg (approximately 117 kg live weight), but a deterioration in growth rate and feed efficiency was noted for pigs taken to carcass weights of 100 kg (approximately 130 kg live weight).

Overall the economic evaluation, which took into consideration the growth rate and feed efficiency of pigs, and the value of the carcass, found that the highest margin over feed (carcass value minus feed cost) was achieved using Tempo and Pietrain (Austrian) pigs. The margin over feed was £1.40 less for Pietrain (Belgium) pigs and £4.42 less for Landrace pigs compared with Tempo pigs.

6. Conclusions

- The genetics used in the current experiment are reflective of those used within NI.
- There was no difference in litter or post weaned pig performance from the various sire line breeds used in this study.
- There were major differences in finishing pig performance due to sire line breed with Tempo progeny having the best production performance and Landrace progeny having the worst.

- The carcass quality of Pietrain pigs was found to be superior to that of Tempo and Landrace pigs.
- Economically, Tempo and Pietrain (Austrian) pigs had a similar margin over feed value but Landrace pigs had the lowest.
- Similar to the findings of Weatherup *et al*. (1998), taking pigs to carcass weights of 90 kg (115 kg live weight) resulted in higher backfat depth and carcasses classed as code 2.
- However, it may be possible to take Tempo and Pietrain Belgium Pigs to carcass weights of 90 kg (115 kg live weight) with no detrimental effects on carcass quality.

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8. Appendix

Backfat depth at P_2 (mm) for each breed at each weight:

	Landrace	Pietrain Austrian	Pietrain Belgium	Tempo
95 kg	12.9	11.7	12.1	12.0
105 kg	14.9	13.0	13.3	13.0
115 kg	15.4	14.0	13.6	13.4

Kill Out % for each breed at each weight:

	Landrace	Pietrain Austrian	Pietrain Belgium	Tempo
95 kg	74.8	78.0	76.9	76.5
105 kg	76.2	78.1	76.6	76.5
115 kg	77.2	78.5	78.2	75.8

Cold weight (kg) for each breed at each weight:

	Landrace	Pietrain Austrian	Pietrain Belgium	Tempo
95 kg	71.2	74.2	73.2	72.7
105 kg	79.9	82.0	80.4	80.2
115 kg	88.3	89.9	89.2	87.2