Lean tissue grows slower in the belly & loin regions of Australian domestic pork carcasses

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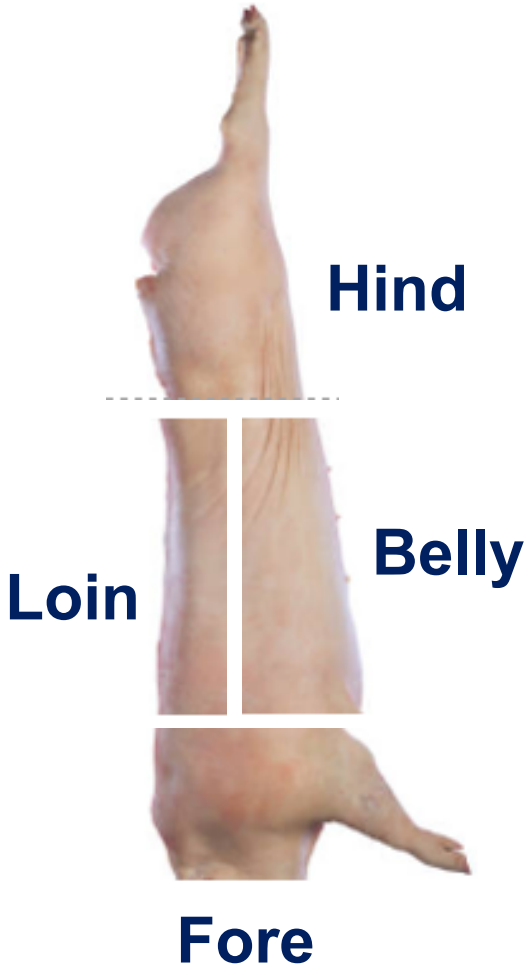
Murdoch University

ALMTECH ADVANCED LIVESTOCK MEASUREMENT TECHNOLOGIES

AUSTRALIAN Pork®

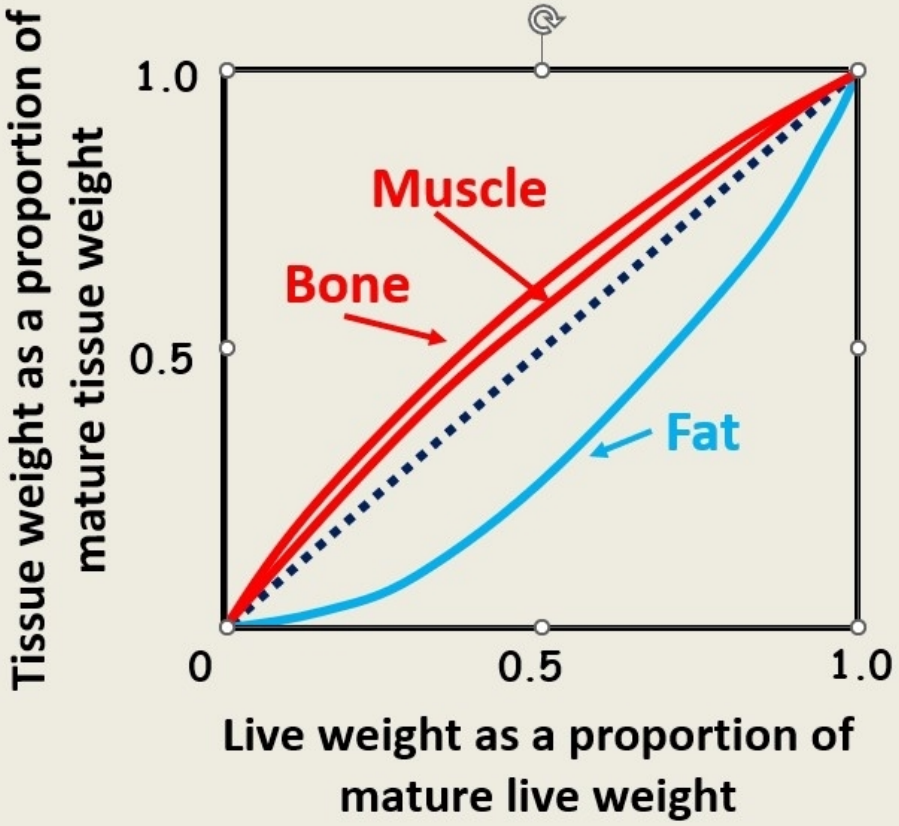
Objectives



- Australian pork supply chains select for faster lean maturation rates
- Allometric analysis of 360 carcasses from 3 major supply chains
- Lean / fat / bone maturation in regions relative to whole carcass

Allometric growth

$$y = ax^b$$

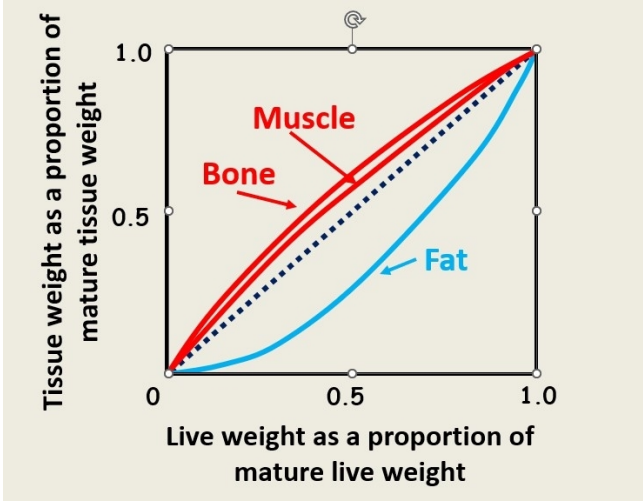


b > 1 slower maturation relative to whole carcass

b = 1 isometric maturation relative to whole carcass

b < 1 faster maturation relative to whole carcass

Allometric growth in lamb



b>1 slower

b=1 isometric

b<1 faster

Anderson et al., *Meat Science* 2015

Allometric growth in lamb

0.92

1.15

0.85

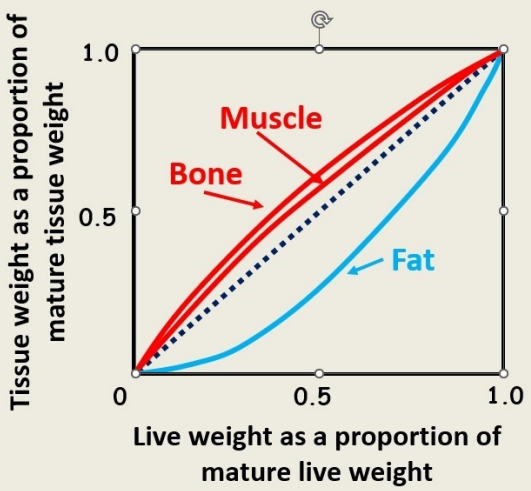
1.48

0.97

1.05

1.00

0.86



b>1 slower

b=1 isometric

b<1 faster

Anderson et al., *Meat Science* 2015

Hypothesis

faster?

slower?

slower?

faster?

slower?

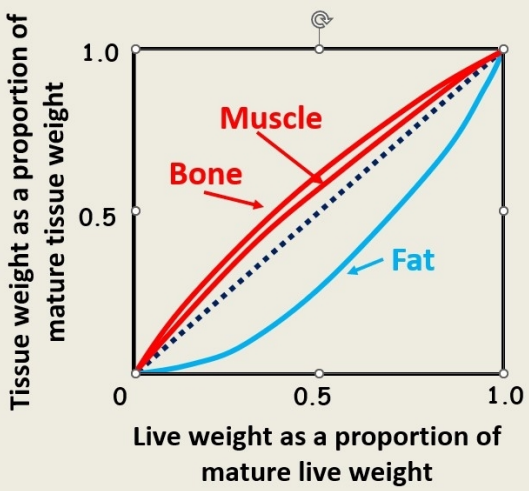
faster?

slower?

slower?

isometric?

faster?



b>1 slower

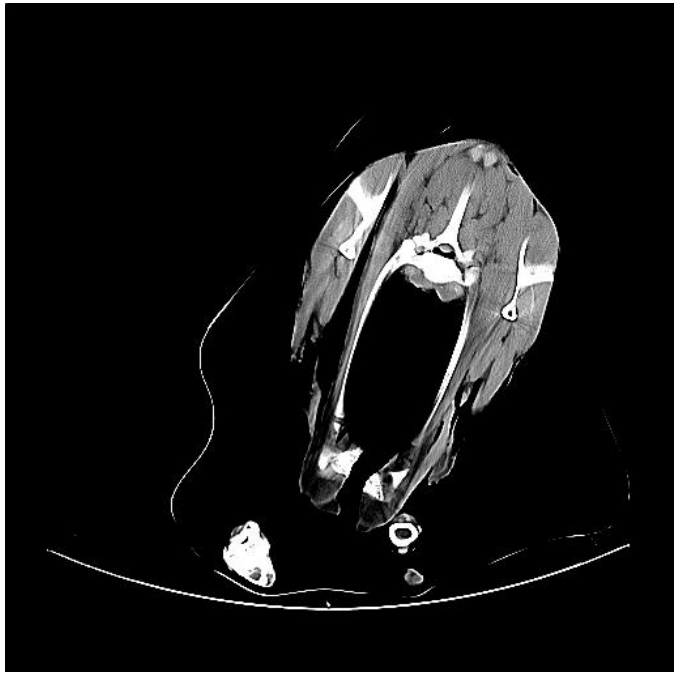
b=1 isometric

b<1 faster

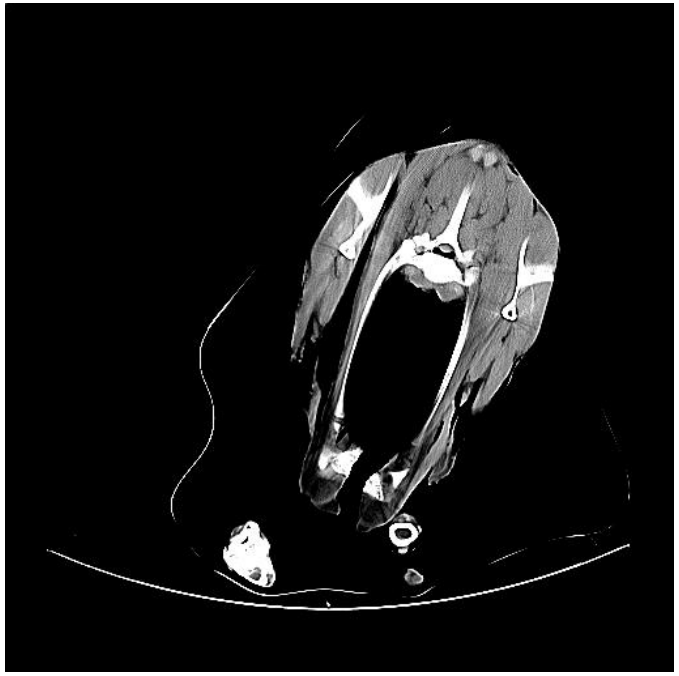
Method

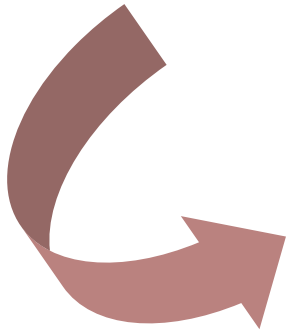
- Dataset updated since abstract submitted
- Selected for range of HSCW & P2 back fat thickness
- Balanced for each sex & genotypes of commercial interest
- Carcasses transported to Murdoch University
- Dissected into 4 primals & weighed

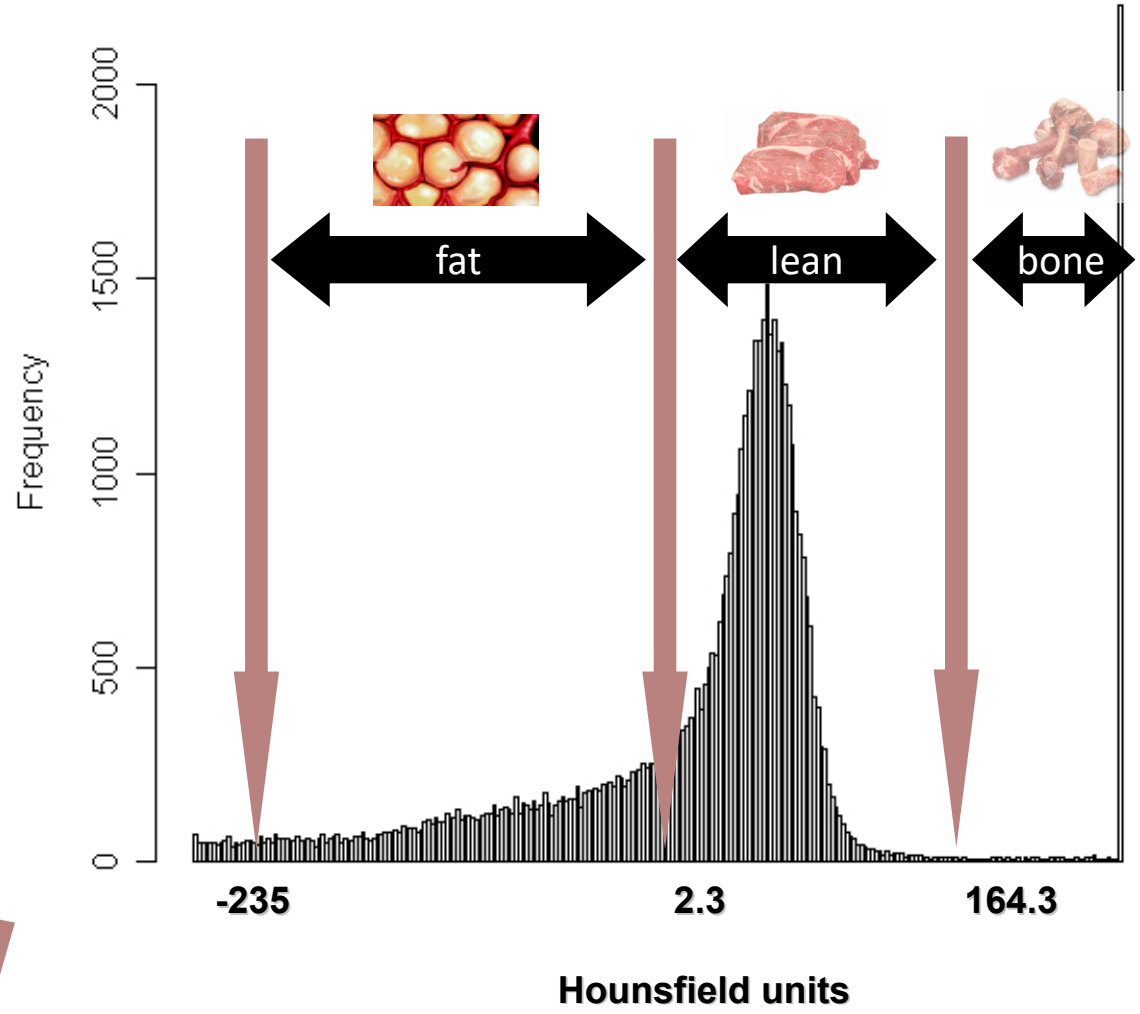
CT scanning



Converting image to tissue type

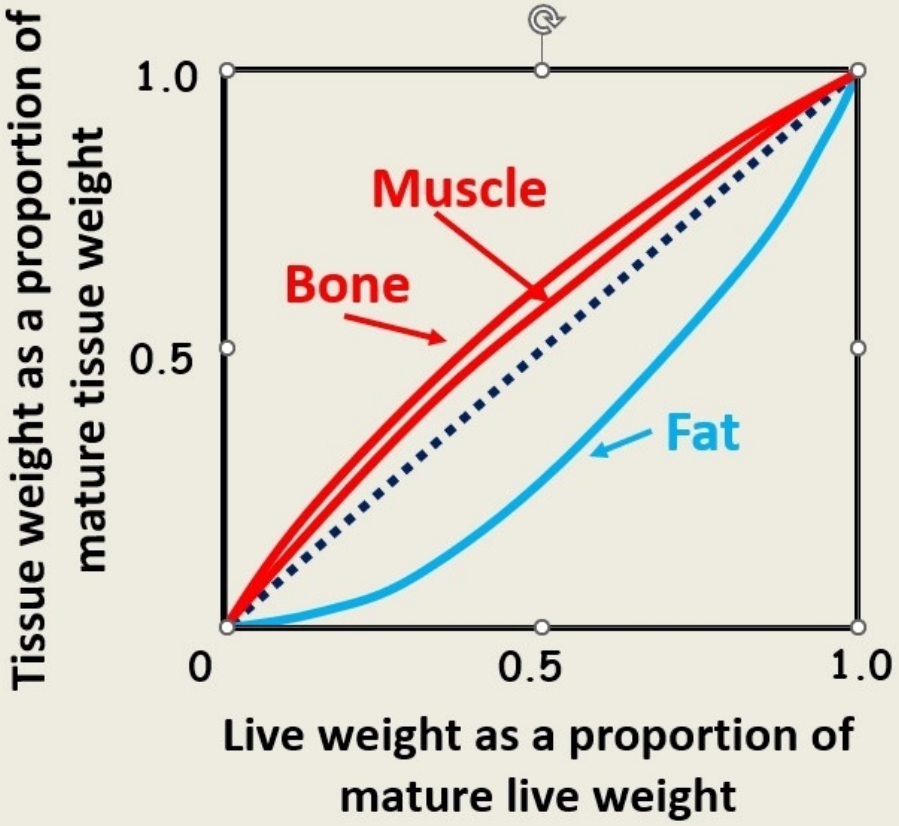






Allometric growth

$$y = ax^b \Rightarrow \log y = \log a + b \cdot \log x$$



b > 1 slower maturation relative to whole carcass

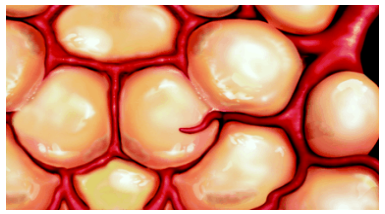
b = 1 isometric maturation relative to whole carcass

b < 1 faster maturation relative to whole carcass

Whole carcass composition

$$\log y = \log a + b \,.\log x$$

$$\log \text{fat weight} = \log a + b \,.\log \text{carcass weight}$$



Whole carcass composition

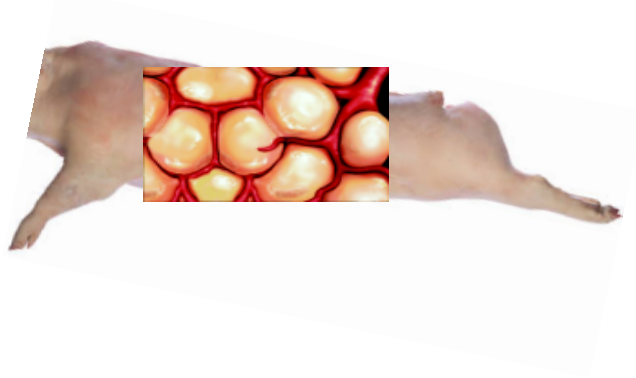
$$\log y = \log a + b \,.\log x$$

$$\log \text{lean weight} = \log a + b \,.\log \text{carcass weight}$$

Regional composition

$$\log y = \log a + b \,.\log x$$

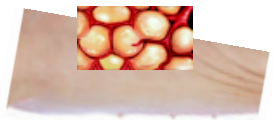
$$\log \text{fore fat weight} = \log a + b \,.\log \text{carcass fat weight}$$



Regional composition

$$\log y = \log a + b \,.\log x$$

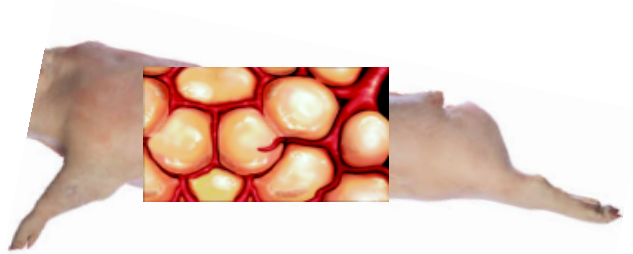
$$\log \text{belly fat weight} = \log a + b \,.\log \text{carcass fat weight}$$



Regional composition

$$\log y = \log a + b \,.\log x$$

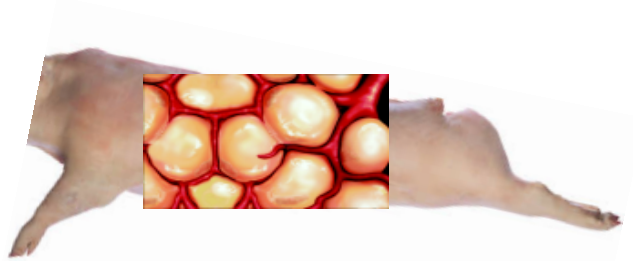
$$\log \text{loin fat weight} = \log a + b \,.\log \text{carcass fat weight}$$



Regional composition

$$\log y = \log a + b \,.\log x$$

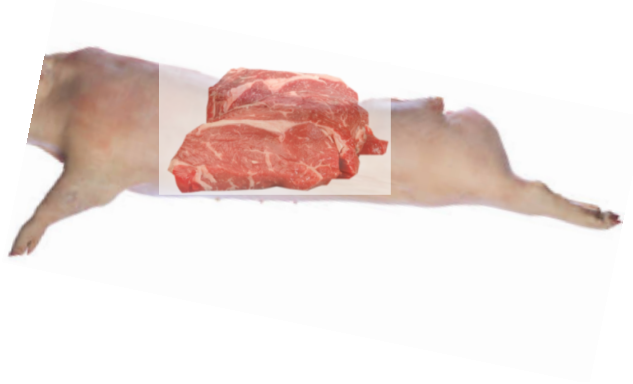
$$\log \text{hind fat weight} = \log a + b \,.\log \text{carcass fat weight}$$



Regional composition

$$\log y = \log a + b \,.\log x$$

$$\log \text{fore lean weight} = \log a + b \,.\log \text{carcass lean weight}$$



Regional composition

$$\log y = \log a + b \,.\log x$$

$$\log \text{belly lean weight} = \log a + b \,.\log \text{carcass lean weight}$$

Regional composition

$$\log y = \log a + b \,.\log x$$

$$\log \text{loin lean weight} = \log a + b \,.\log \text{carcass lean weight}$$

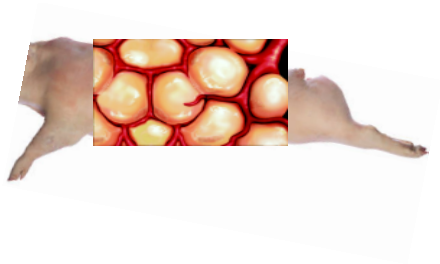
Regional composition

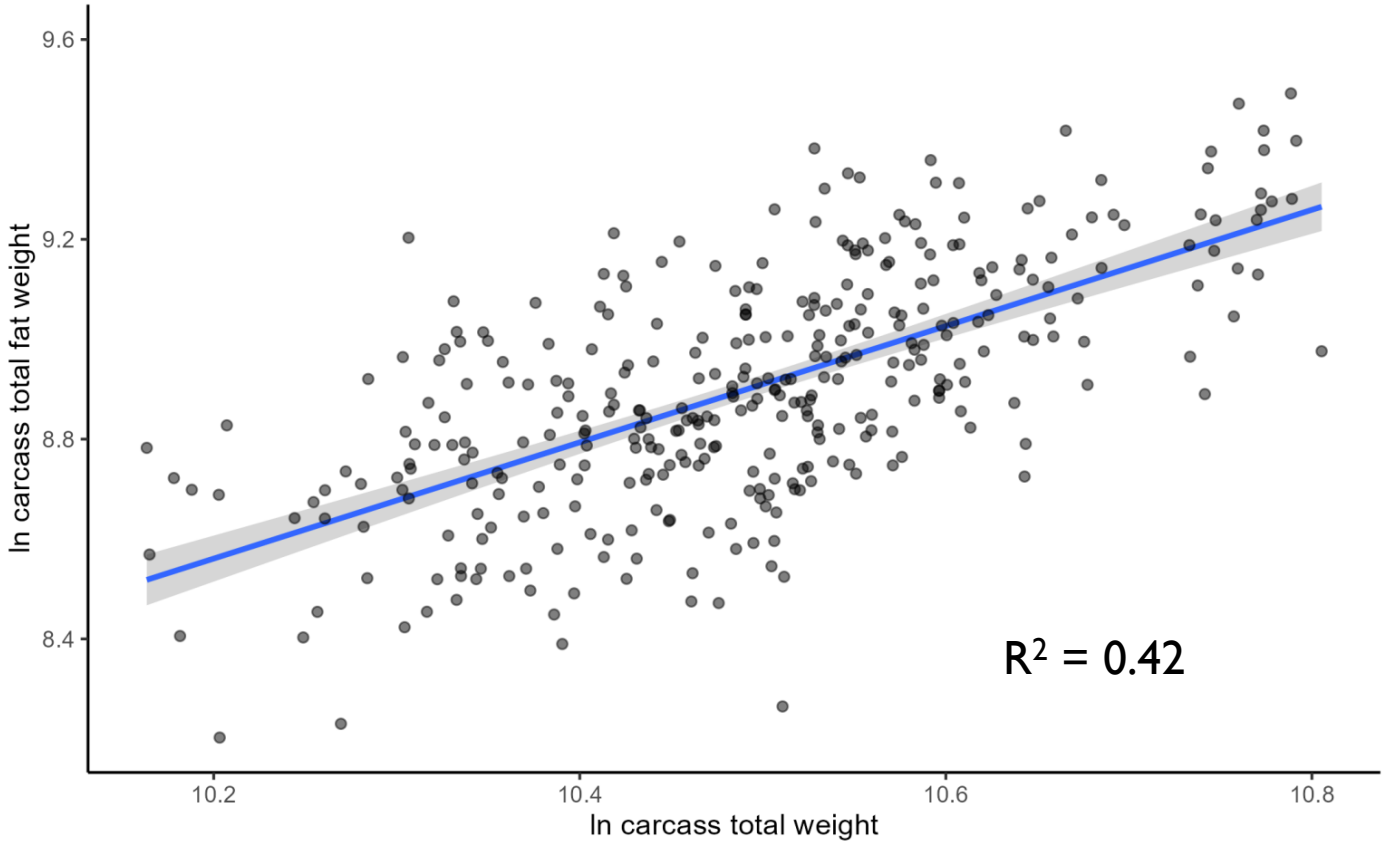
$$\log y = \log a + b \,.\log x$$

$$\log \text{hind lean weight} = \log a + b \,.\log \text{carcass lean weight}$$

Results: whole carcass fat

log carcass total fat weight = -5.206 + 1.349 * log carcass total weight

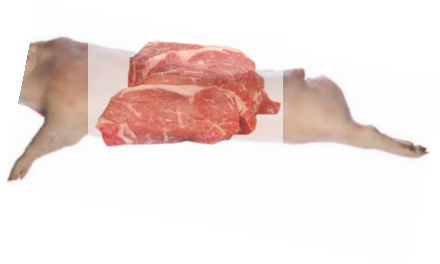


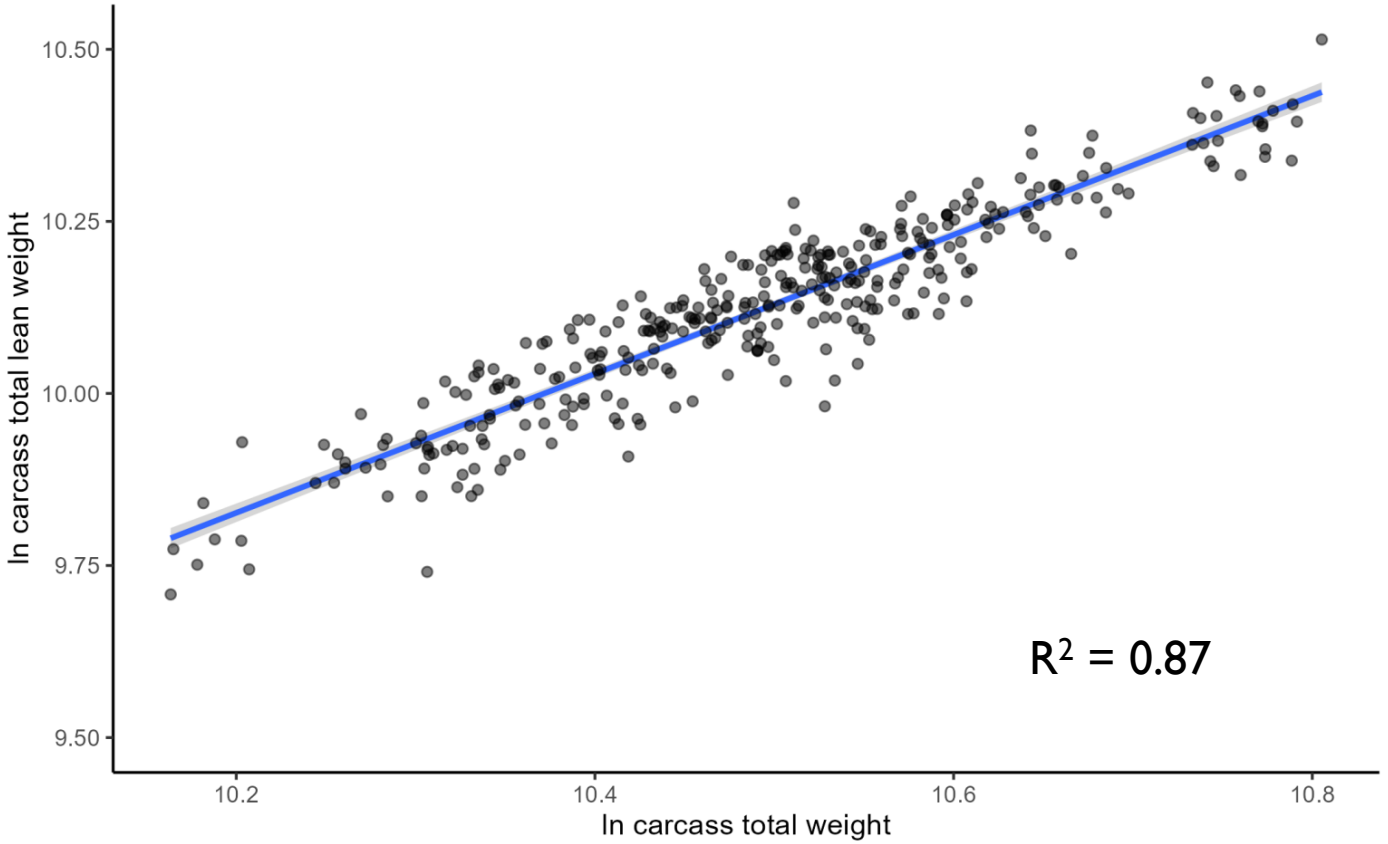


Late maturing carcass total fat weight relative to carcass total weight

Results: whole carcass lean

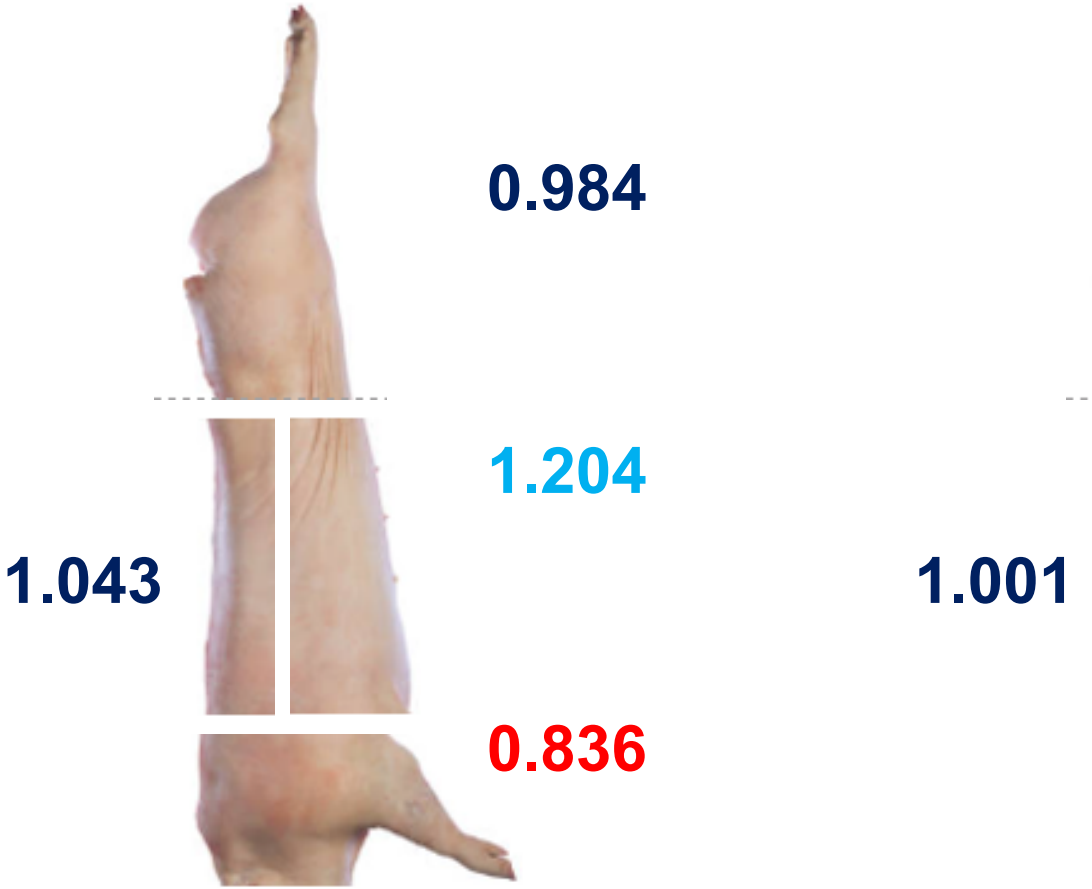
log carcass total lean weight = 0.235 + 0.941 * log carcass total weight

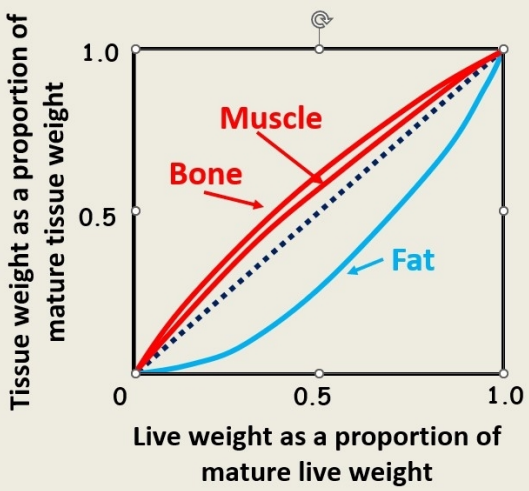




Early maturing carcass total lean weight relative to carcass total weight

Results





b>1 slower

b=1 isometric

b<1 faster

Hypothesis

faster? ✖ isometric

slower? ✓

slower? ✖ isometric

faster? ✓

slower? ✓

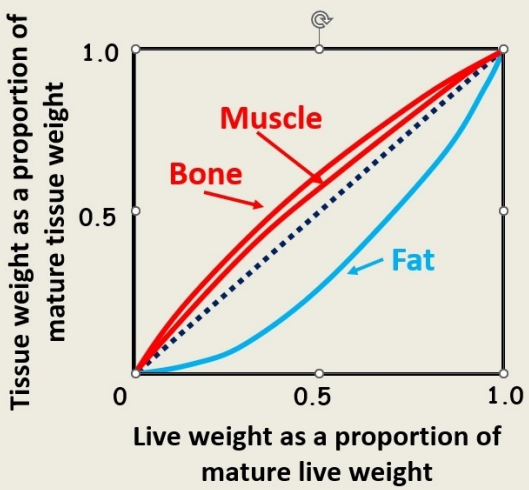
faster? ✓

slower? ✓

slower? ✖ isometric

isometric? ✓

faster? ✓



b>1 slower

b=1 isometric

b<1 faster

Conclusion

- fore & loin lean grow at a similar rate to carcass weight
- belly lean grows relatively slower
- whole carcass lean & hind lean grow relatively faster

- loin & hind fat grow at a similar rate to carcass weight
- whole carcass fat & belly fat grow relatively slower
- fore fat grows relatively faster

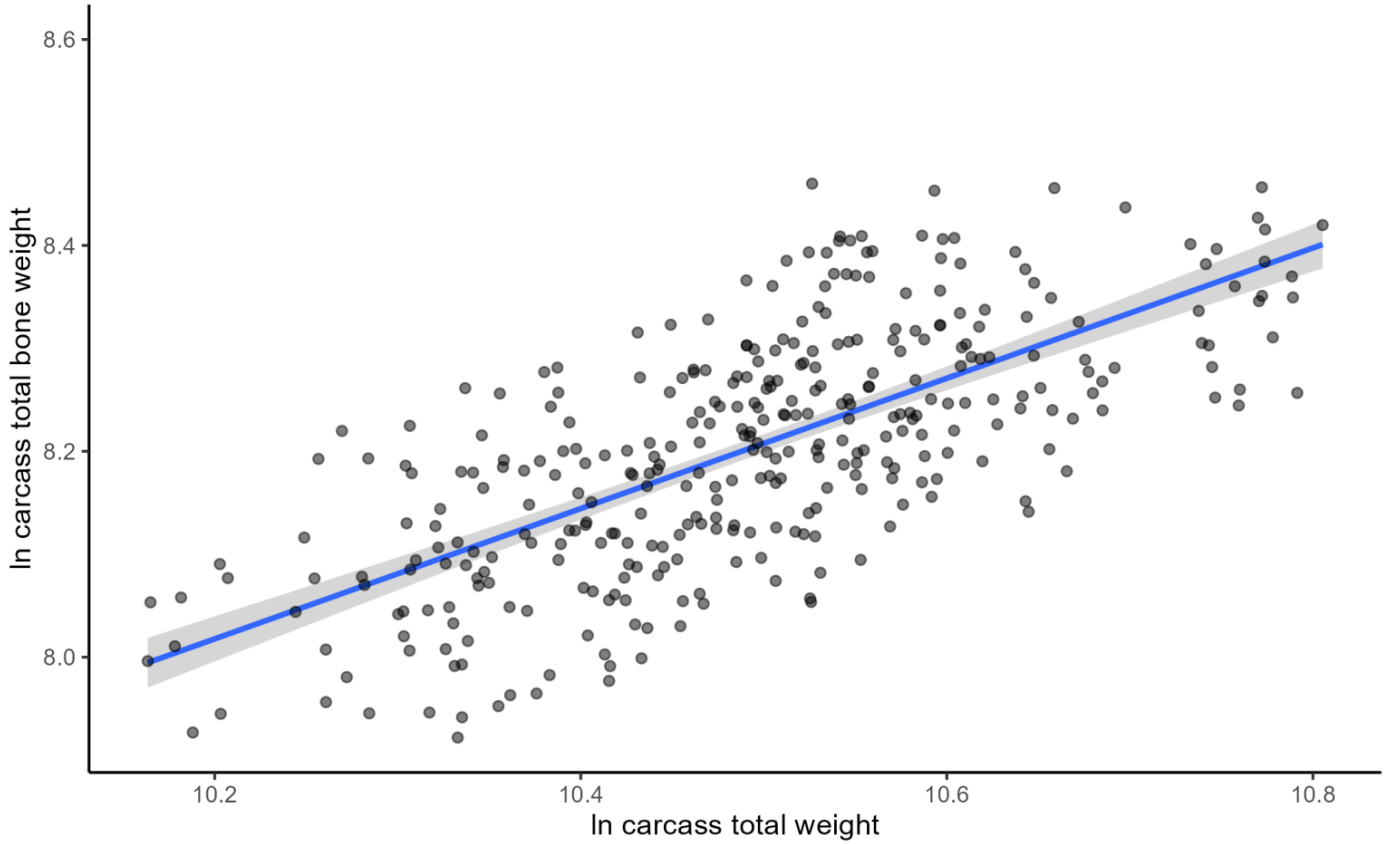
Industry implications

Production systems that optimise belly & loin cuts will benefit from finishing pigs to heavier weights allowing this lean to grow proportionately more than in other regions

CT weights (kg)						
	Site 1		Site 2		Site 3	
	mean ± SD	(min, max)	mean ± SD	(min, max)	mean ± SD	(min, max)
Carcass total	70.44 ± 8.33	(51.93, 86.34)	78.99 ± 10.12	(62.35, 99.35)	68.88 ± 6.96	(54.42, 83.96)
Carcass fat	14.93 ± 3.55	(7.57, 23.45)	15.61 ± 3.94	(9.40, 26.34)	14.63 ± 2.91	(7.33, 21.94)
Carcass lean	47.92 ± 6.02	(32.98, 60.30)	55.85 ± 6.60	(42.16, 74.28)	47.24 ± 5.47	(33.76, 60.71)
Carcass bone	7.60 ± 0.84	(5.54, 9.54)	7.53 ± 0.86	(5.72, 9.99)	7.02 ± 0.87	(5.51, 9.59)
Fore total	21.06 ± 2.63	(14.50, 26.12)	24.00 ± 2.84	(17.67, 30.62)	20.11 ± 2.39	(15.82, 26.40)
Fore fat	4.24 ± 0.90	(2.32, 6.61)	4.62 ± 0.98	(2.98, 7.14)	4.10 ± 0.78	(2.39, 6.14)
Fore lean	15.30 ± 2.10	(10.04, 19.64)	17.88 ± 2.07	(12.45, 23.85)	14.66 ± 1.97	(10.11, 20.19)
Fore bone	1.52 ± 0.18	(1.05, 1.90)	1.49 ± 0.17	(1.11, 2.00)	1.35 ± 0.18	(1.00, 1.79)
Loin total	15.65 ± 2.06	(10.93, 19.95)	16.25 ± 2.45	(11.77, 21.44)	15.34 ± 1.73	(11.87, 20.45)
Loin fat	3.87 ± 1.01	(1.72, 5.97)	3.68 ± 1.01	(2.12, 6.70)	3.89 ± 0.88	(1.83, 5.94)
Loin lean	10.00 ± 1.32	(7.25, 13.09)	10.85 ± 1.58	(7.65, 15.01)	9.77 ± 1.17	(6.92, 13.24)
Loin bone	1.78 ± 0.25	(1.31, 2.64)	1.71 ± 0.24	(1.17, 2.41)	1.68 ± 0.30	(1.14, 2.51)
Belly total	9.50 ± 1.54	(5.00, 13.30)	10.31 ± 1.78	(7.32, 14.93)	8.79 ± 1.13	(6.18, 11.83)
Belly fat	3.04 ± 0.95	(1.32, 5.55)	2.98 ± 1.01	(1.33, 6.35)	2.73 ± 0.64	(1.12, 4.29)
Belly lean	6.13 ± 0.99	(3.08, 8.87)	6.96 ± 0.94	(5.13, 9.80)	5.76 ± 0.86	(3.77, 8.04)
Belly bone	0.33 ± 0.06	(0.20, 0.52)	0.37 ± 0.08	(0.22, 0.64)	0.30 ± 0.06	(0.12, 0.45)
Hind total	22.72 ± 2.59	(16.67, 27.55)	27.07 ± 3.49	(21.13, 34.63)	23.30 ± 2.26	(18.57, 27.75)
Hind fat	3.79 ± 0.88	(1.93, 5.86)	4.34 ± 1.11	(2.65, 6.96)	3.91 ± 0.88	(1.99, 6.29)
Hind lean	16.49 ± 1.99	(11.54, 20.45)	20.25 ± 2.45	(15.69, 26.57)	17.05 ± 1.89	(12.65, 21.42)
Hind bone	2.44 ± 0.29	(1.74, 3.13)	2.47 ± 0.31	(1.78, 3.46)	2.35 ± 0.25	(1.79, 3.13)

Results: bone

log carcass total bone weight = 1.564 + 0.631 * log carcass total weight



Early maturing carcass total bone weight relative to carcass total weight