

Beef Monitor: tracking beef cattle growth and predicting carcass characteristics of live animals

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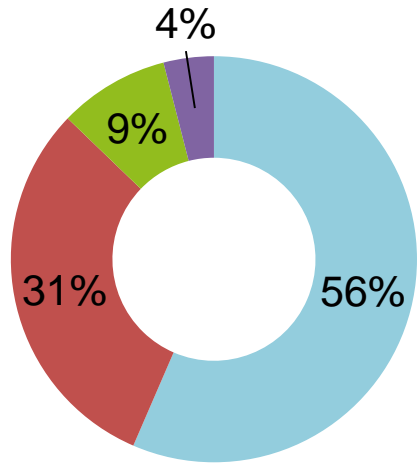
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Beef Monitor

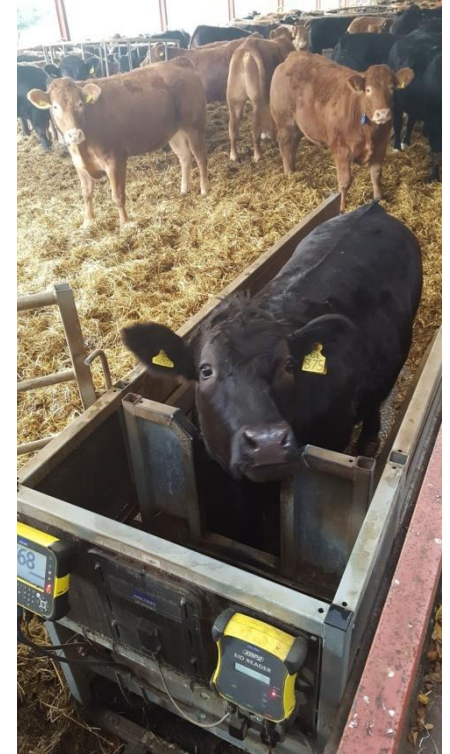


- Target (E-R conformation 1-4L fat)
- Lean and poor conformation
- Too fat
- Too fat and poor conformation

- Two pronged approach:
 1. Automated weigh crate
 2. 3D imaging system

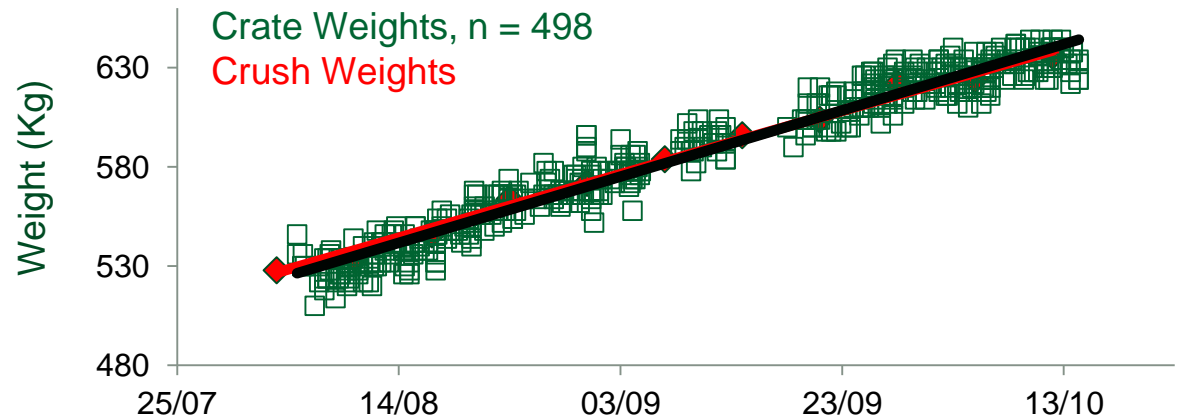
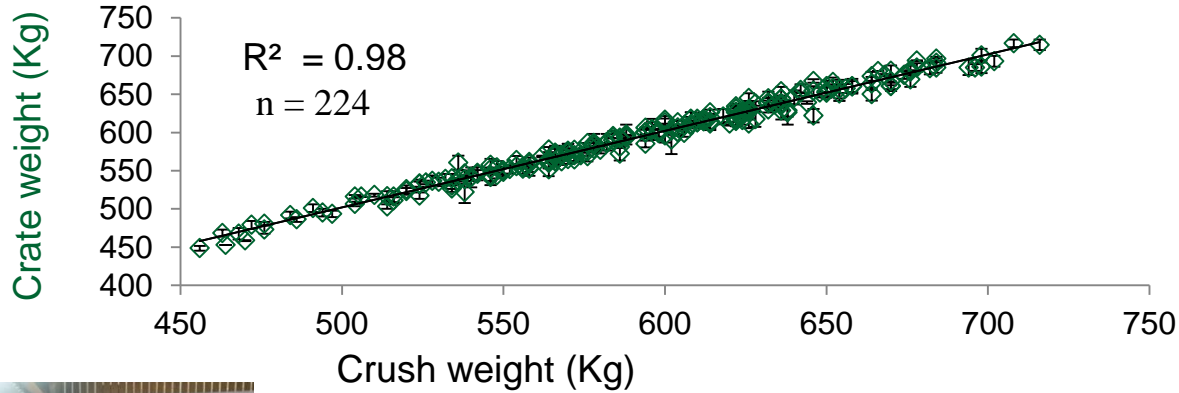


Automated weigh crate



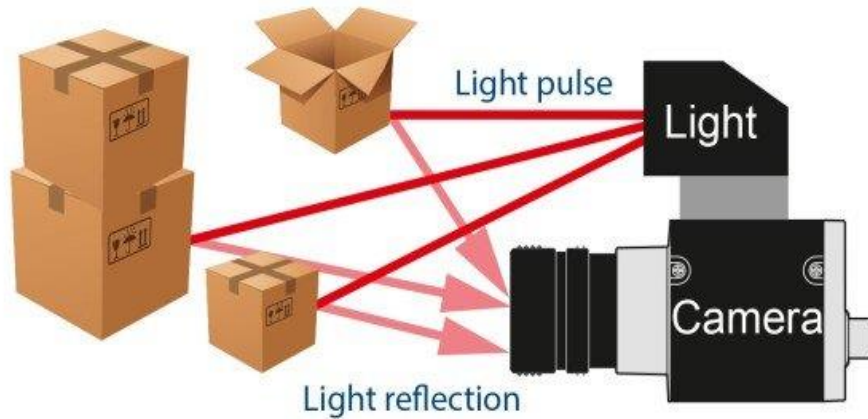
- EID technology
- Weigh platform
- Integrated water trough
- Multiple weights per day

Automated weigh crate



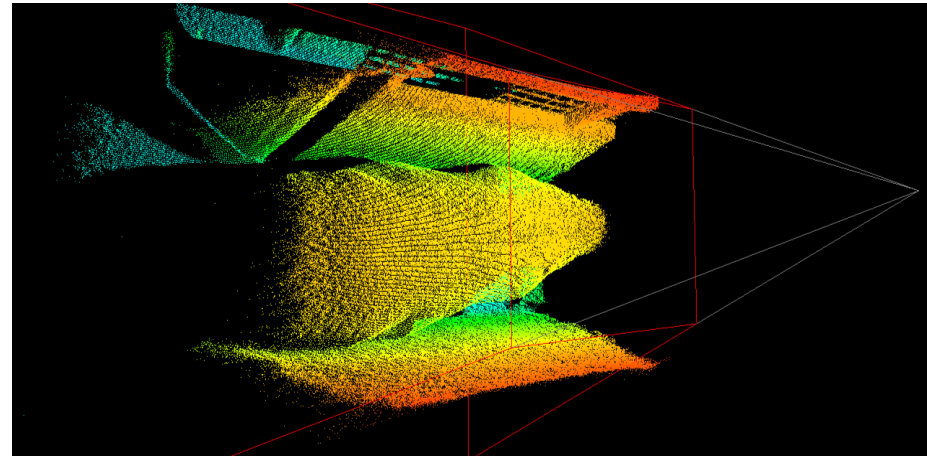
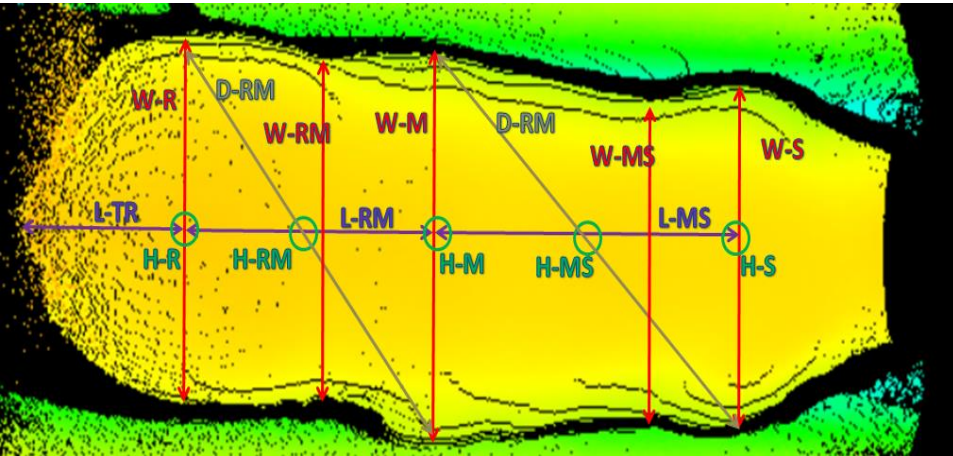
3D Imaging Technology

- NIR 3D camera

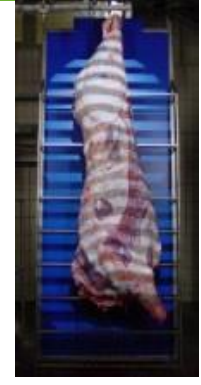
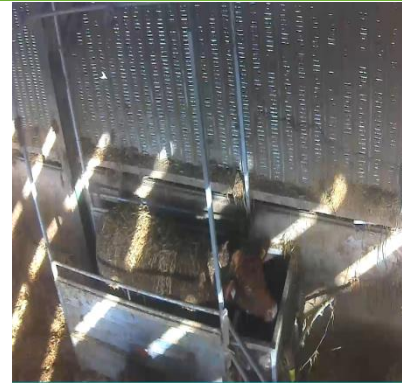
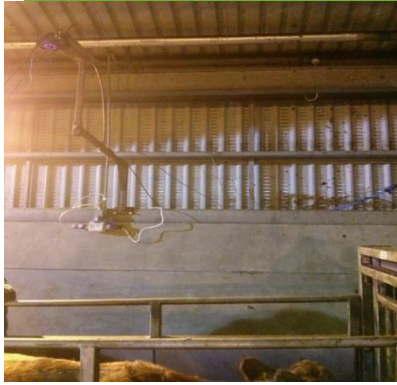


3D Imaging Technology

- 60 variables (widths, lengths, areas, volumes, heights and ratios)
- Accuracy: +/- 1cm

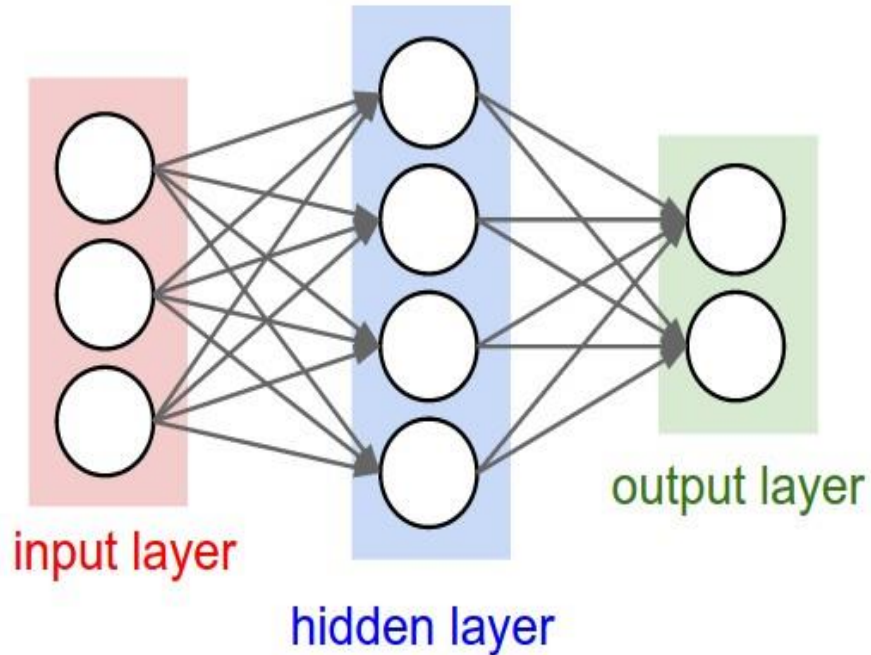


Data Collection



- In the abattoir immediately pre-slaughter
- On commercial farms over finishing window
- Fat and conformation grades determined by VIA
- Cold carcass weight (CCW) and saleable meat yield (SMY)

Data Analysis



- Machine learning: Artificial Neural Networks (ANNs)
- Regularised, cross validated models
- Sex / breed 'type' included in model

Conformation Class



		VIA Predicted Conformation Class					
ANN Predicted Conformation Class		P+	-O	O+	R	-U	U+
P+		0	0	0	0	0	0
-O		5	58	37	2	0	0
O+		4	61	146	50	10	0
R		0	2	23	55	13	0
-U		0	0	1	11	11	1
U+		0	0	0	0	0	0
Sensitivity		0.00	0.48	0.71	0.47	0.32	0.00
Specificity		1.00	0.88	0.56	0.90	0.97	1.00
Observations in validation dataset		9	121	207	118	34	1

55% Accuracy

15 Point Scale	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Conformation	-P		P+	-O		O+		R		-U		U+		E	
Fat		1			2			3		4L		4H	5L		5H

Fat Class

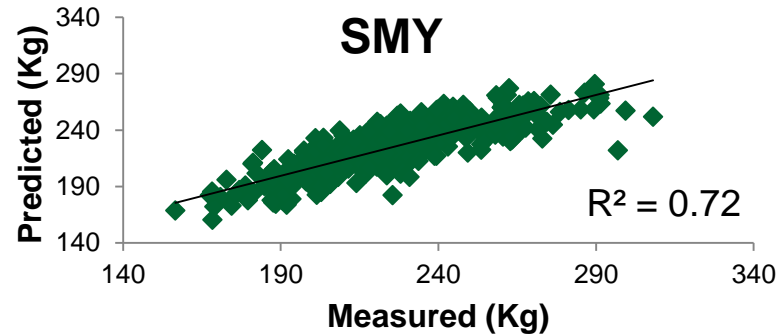
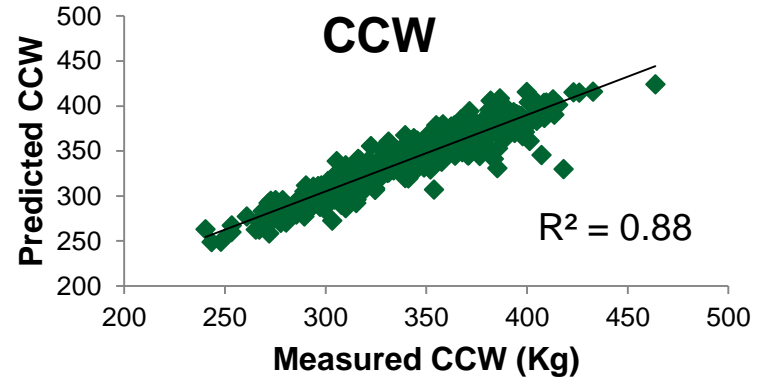
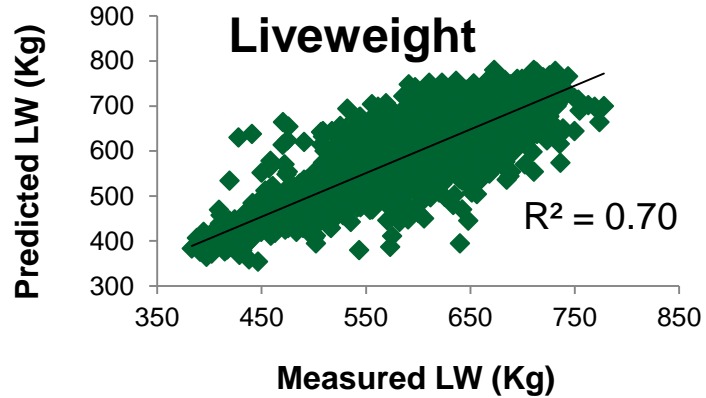


ANN Predicted Fat Class	VIA Predicted Fat Class				
	1	2	3	4L	4H
1	0	0	0	0	0
2	24	191	98	16	1
3	3	40	62	25	1
4L	0	0	9	12	7
4H	0	0	0	0	0
Sensitivity	0	0.83	0.37	0.23	0
Specificity	1	0.46	0.78	0.96	1
Observations in validation dataset	27	231	169	53	9

54% Accuracy

15 Point Scale	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Conformation	-P		P+	-O		O+		R		-U		U+		E	
Fat		1			2			3		4L		4H	5L		5H

Results



Results



	All breeds Steers&Heifers	Aberdeen Angus (x) Steers
Conformation Grade	55%	62%
Fat Grade	54%	78%
CCW	$R^2 = 0.88$	$R^2 = 0.92$
Liveweight	$R^2 = 0.70$	$R^2 = 0.76$
SMY	$R^2 = 0.72$	$R^2 = 0.79$

15 Point Scale	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Conformation	-P		P+	-O		O+		R		-U		U+		E	
Fat		1			2			3		4L		4H	5L		5H

Benefits of Beef Monitor

- Accurate weights
- Live-animal carcass characteristics
- Potential cost savings: £35/head
- More consistent product
- Inform on diet and ill health?





SRUC

Innovate UK

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