

Prediction of consumer palatability in beef using visual marbling scores and chemical intramuscular fat percentage

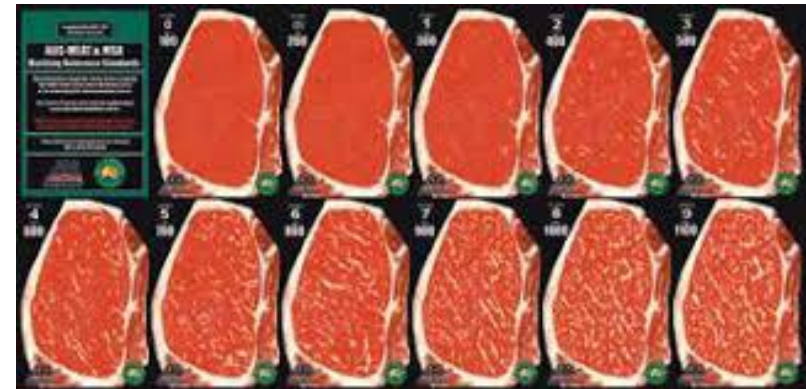
Garth Tarr



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Rod Polkinghorne, John Thompson

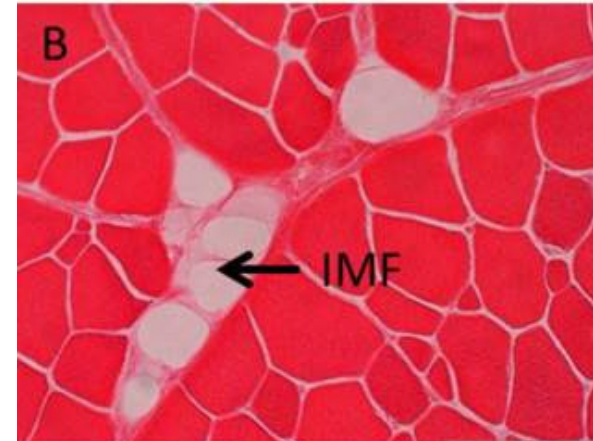
Visual marbling and carcass grading

- Visual representation of intramuscular fat (IMF%)
- Meat Standards Australia grading system
- Cut surface of the loin eye
- Subjective assessment of quantity and distribution
- Predictor of consumer palatability
(Watson et al 2008, Smith et al 1984, Savell et al 1987, Platter et al 2003)



Intramuscular fat (IMF%) and eating quality

- Objective chemical measurement
- Positive effect on beef palatability
 - Tenderness, flavour, juiciness
- Describes approx. 15% of variation in consumer scores in beef (Thompson 2004).
- May not always be captured by visual grading at a single site
 - Three dimensional, small fat particles



Hypothesis 1

Higher IMF => higher eating quality

in the same way that

Higher MSA marbling => higher eating quality

How do we define eating quality?



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Tenderness



Juiciness



Liking of Flavour



Overall Liking



Experimental design

MSA eating
quality
database



**Eating quality
(MQ4) scores**

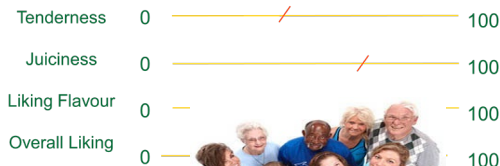


Experimental design

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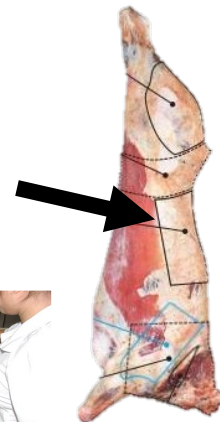
Eating quality
(MQ4) scores



The University of Sydney

Anterior Striploin
*M. longissimus
lumborum*

Aged 14 days
Cook method = Grill



Experimental design

MSA eating
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Eating quality
(MQ4) scores

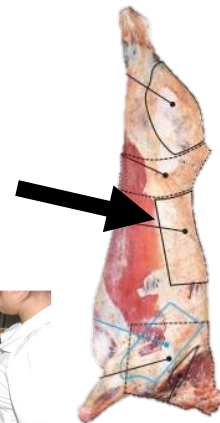


The University of Sydney

$n \sim 3000$

Anterior Striploin
*M. longissimus
lumborum*

Aged 14 days
Cook method = Grill



Chemical IMF data
NIR spectroscopy



Statistical analysis

MSA model inputs

Sex

Hot carcass weight

Hump height

Feed type

Hormone growth promotant status



Ossification
score



Subcutaneous rib fat depth



Ultimate pH

The University of Sydney

Linear
Model

Eating
quality
score
(MQ4)

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Ultimate pH

The University of Sydney

Covariates



Expert grader
MSA marbling

Linear
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Chemical IMF%

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Expert grader
MSA marbling

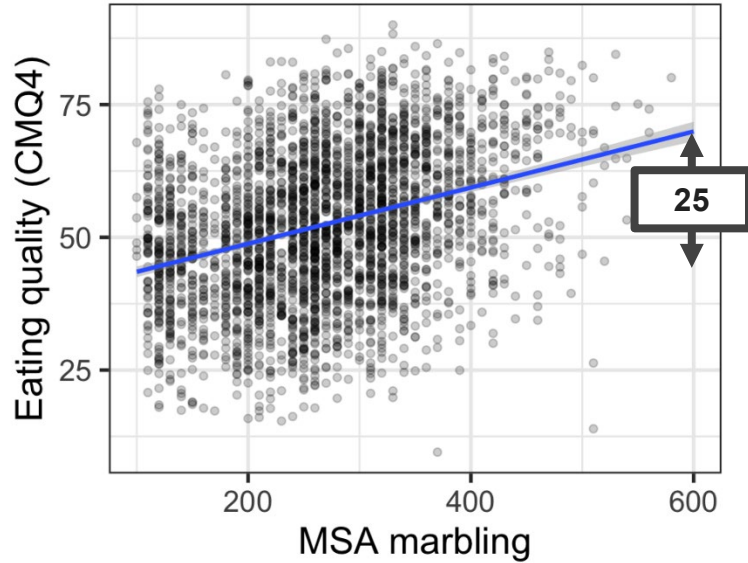


Chemical IMF%

Linear
Model

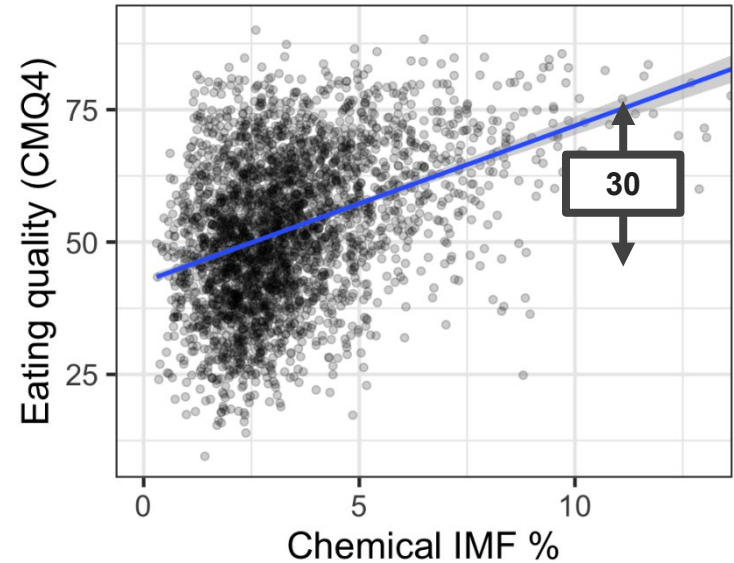
Eating
quality
score
(MQ4)

Results – MSA visual marbling



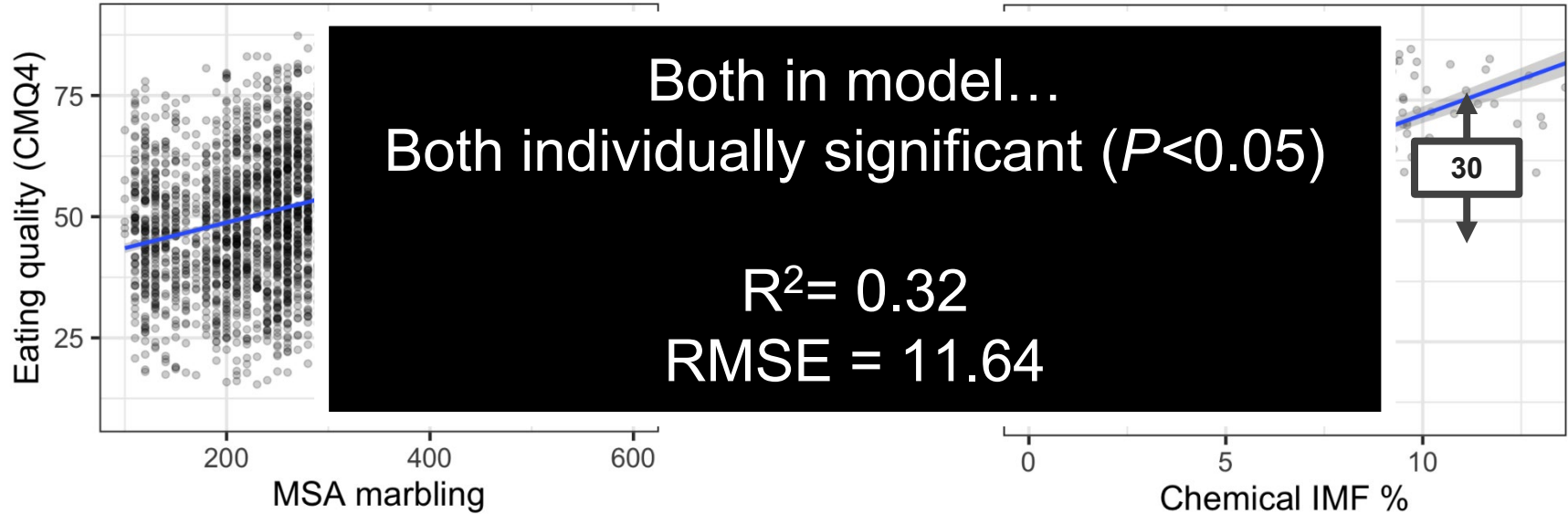
$R^2 = 0.28$
RMSE = 11.93

Results – Chemical IMF %



$R^2 = 0.30$
 $RMSE = 11.75$

Results – Combined model



$R^2 = 0.28$
RMSE = 11.93



$R^2 = 0.30$
RMSE = 11.75

How important is marbling?



**Without any
marbling
traits**

$R^2 = 0.21$



**With MSA
marbling**

$R^2 = 0.28$

33%
improvement



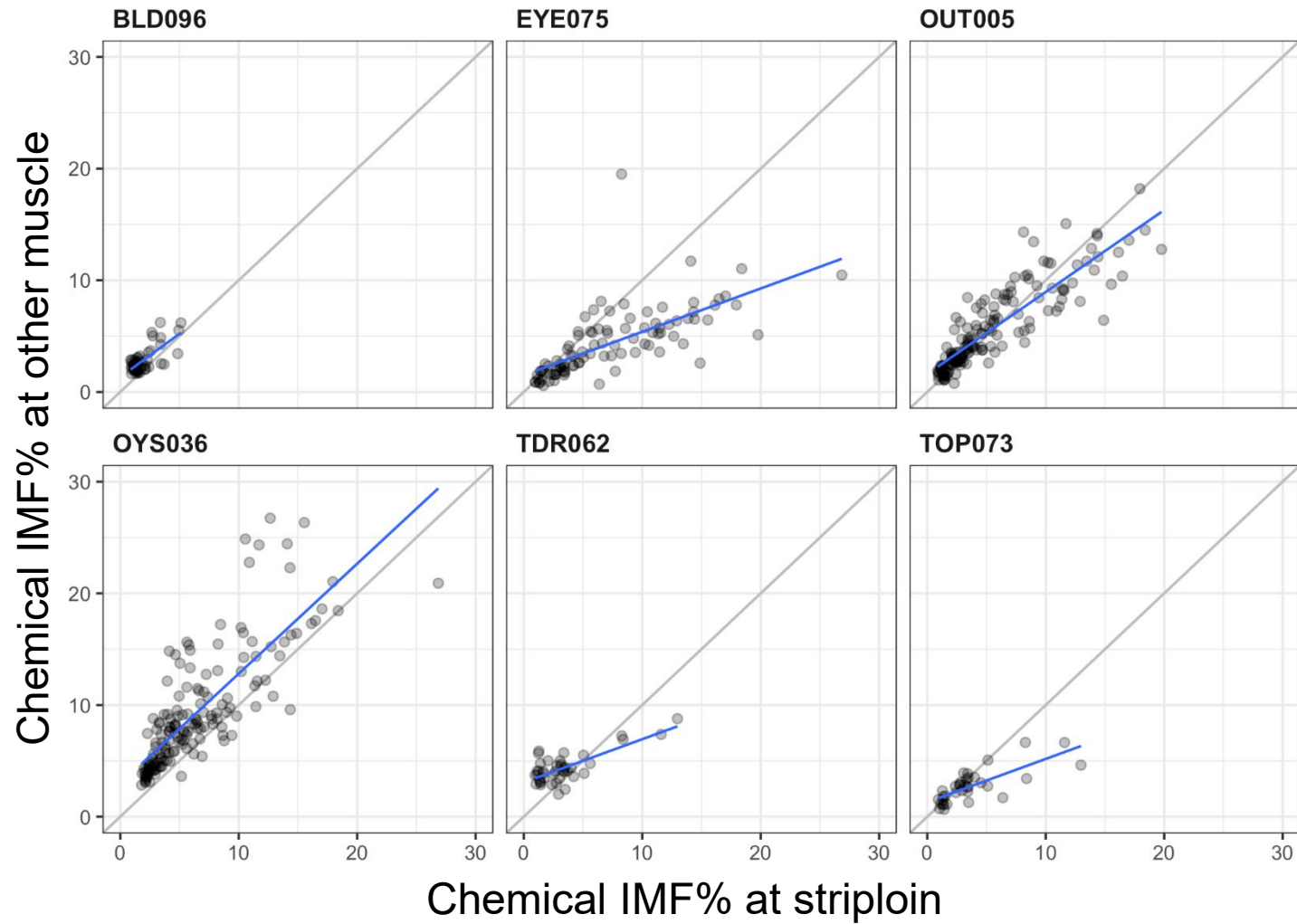
With IMF%

$R^2 = 0.30$

43%
improvement

Hypothesis 2

There is correlation between IMF in the striploin and IMF in other muscles



Why is this important?

- Correlation between muscles underpins cut x cook eating quality models.

Muscle	Days aged	n	MSA marbling R ²	Striploin IMF% R ²	Cut specific IMF% R ²
EYE075	7	59	0.07	0.05	0.12
OUT005	7	128	0.14	0.14	0.13
OUT005	28	59	0.15	0.23	0.23
OYS036	7	158	0.06	0.10	0.11

Where to next?

- AUS-MEAT accreditation of IMF% as a trait
- Accreditation of objective grading technologies for IMF% prediction
- MSA model with IMF% as an input
- Non-cut surface IMF% prediction



Find out more

Stewart SM, Gardner GE, McGilchrist P, Pethick DW, Polkinghorne R, Thompson JM, Tarr G (2021). Prediction of consumer palatability in beef using visual marbling scores and chemical intramuscular fat percentage. *Meat Science* **181**, 108322.



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