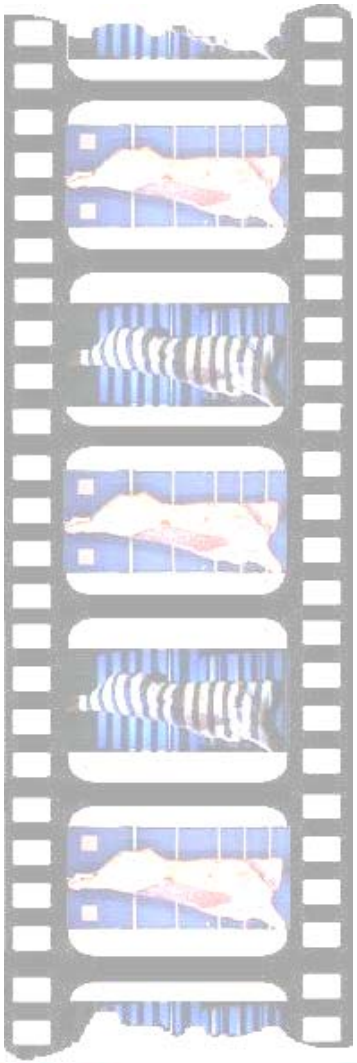


IRISH CATTLE BREEDING FEDERATION

Carcass Video Images in Genetic Evaluation and Breeding Program in Ireland

Thierry Pabiou

B3 - 29/05/2012
ICAR 2012 – Cork - Ireland

NDP
National Development Plan
Transforming Ireland

Beef production in Ireland

2 million cows

- **1,000,000 beef cows**
- **14 cows / herd**
- **6 major beef breeds**
  - CH LM AA SI HE BB
- **Large uses of cross breeding**

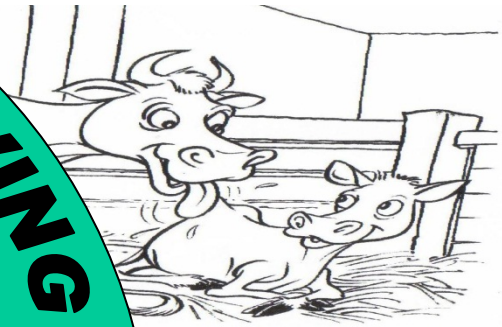
Destination

15% replacement

16% Live export

69% Slaughtered in Ireland

Beef breeding objective



REPLACEMENT

CALVING

Milk, Fertility

Scores, Mortality, Gestation

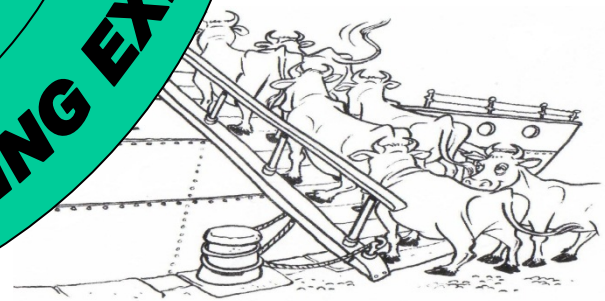
SUCKLER BEEF VALUE (€/calf)

Weight, Quality, Feed intake

Live weight, Prices, Quality

BEEF CARCASS

WEANLING EXPORT



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Current assessment of carcass quality

- The EUROP carcass classification
  - Assessment of conformation & fat grades by experts/machines

S > E > U > R > O > P

15 > > > > > > > > > 1

1 < 2 < 3 < 4 < 5

1 > > > > > > > 15

=> Current selection tool for carcass quality

EEC Regulations nº 1208/81 ; 2930/81 ; 1026/91

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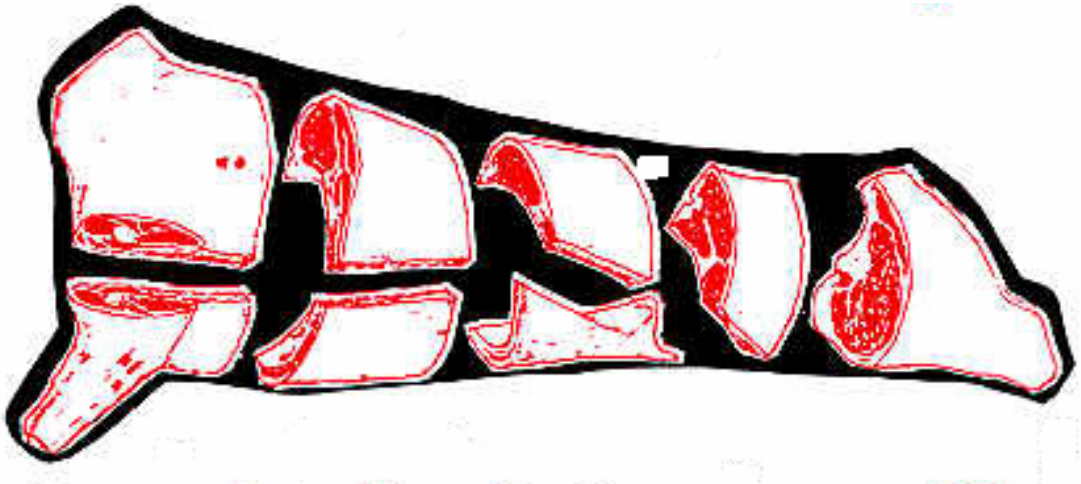
Motivations

- **Improving carcass quality**



Going deeper in the carcass => new selection tools for carcass quality?

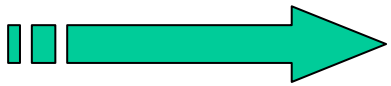
Objective

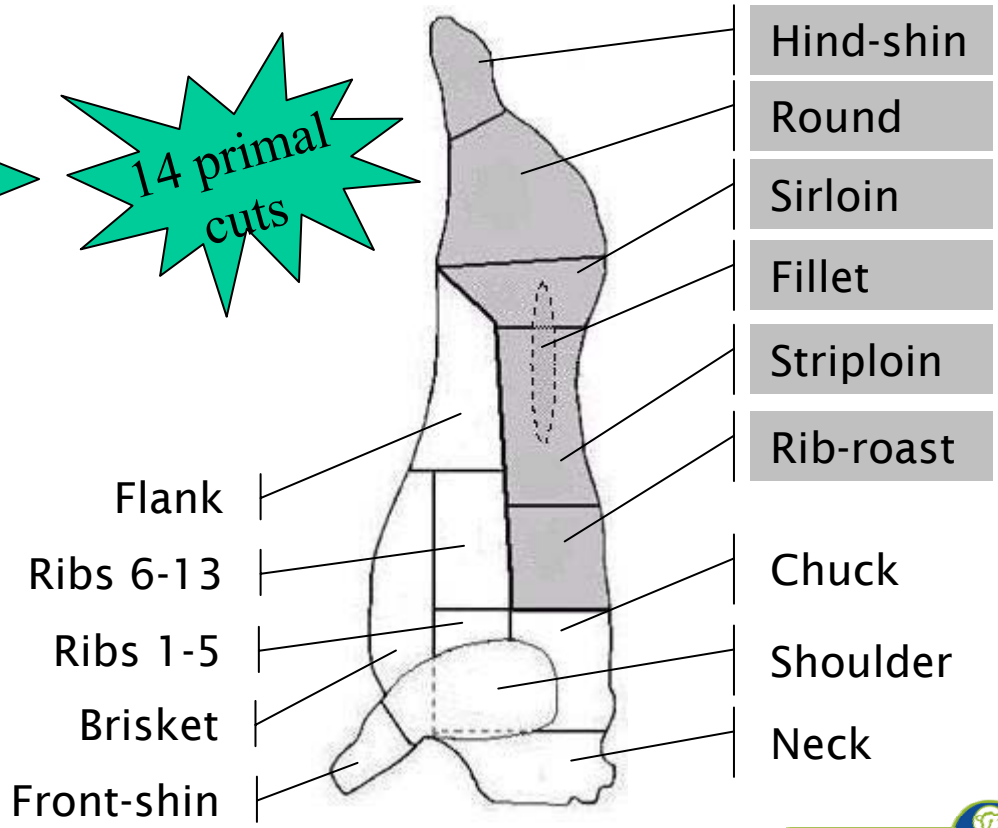
- Is it possible to create new carcass traits from digital images?

- Is that interesting/useful for farmers and the industry?

Data used: Primal cuts

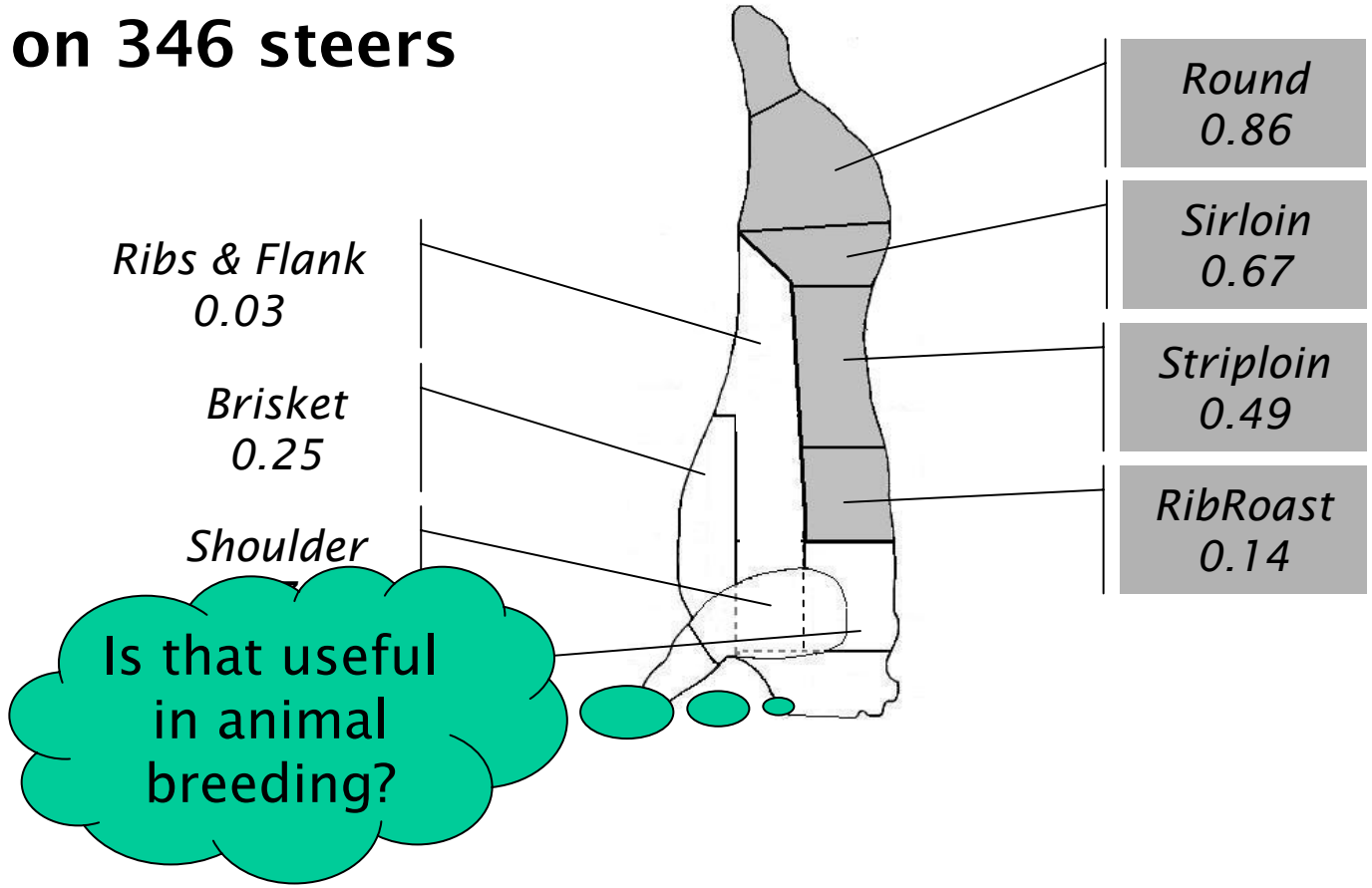
- **Research center: n = 413 (mostly) steers**
- **Commercial partner: n = 615 (mostly) heifers**





Heritability of primal cuts

- **Calculated on 346 steers**



Pabiou et al. (2009) J. Anim. Sci.

Why creating new traits?

Primal cuts

- Interest for farmers / industry…**Yes!**
- Genetic variability……**Yes!**
- Availability……**No**

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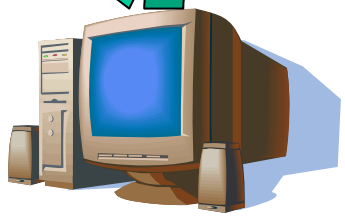
Mechanical grading of carcasses



EUROP grades

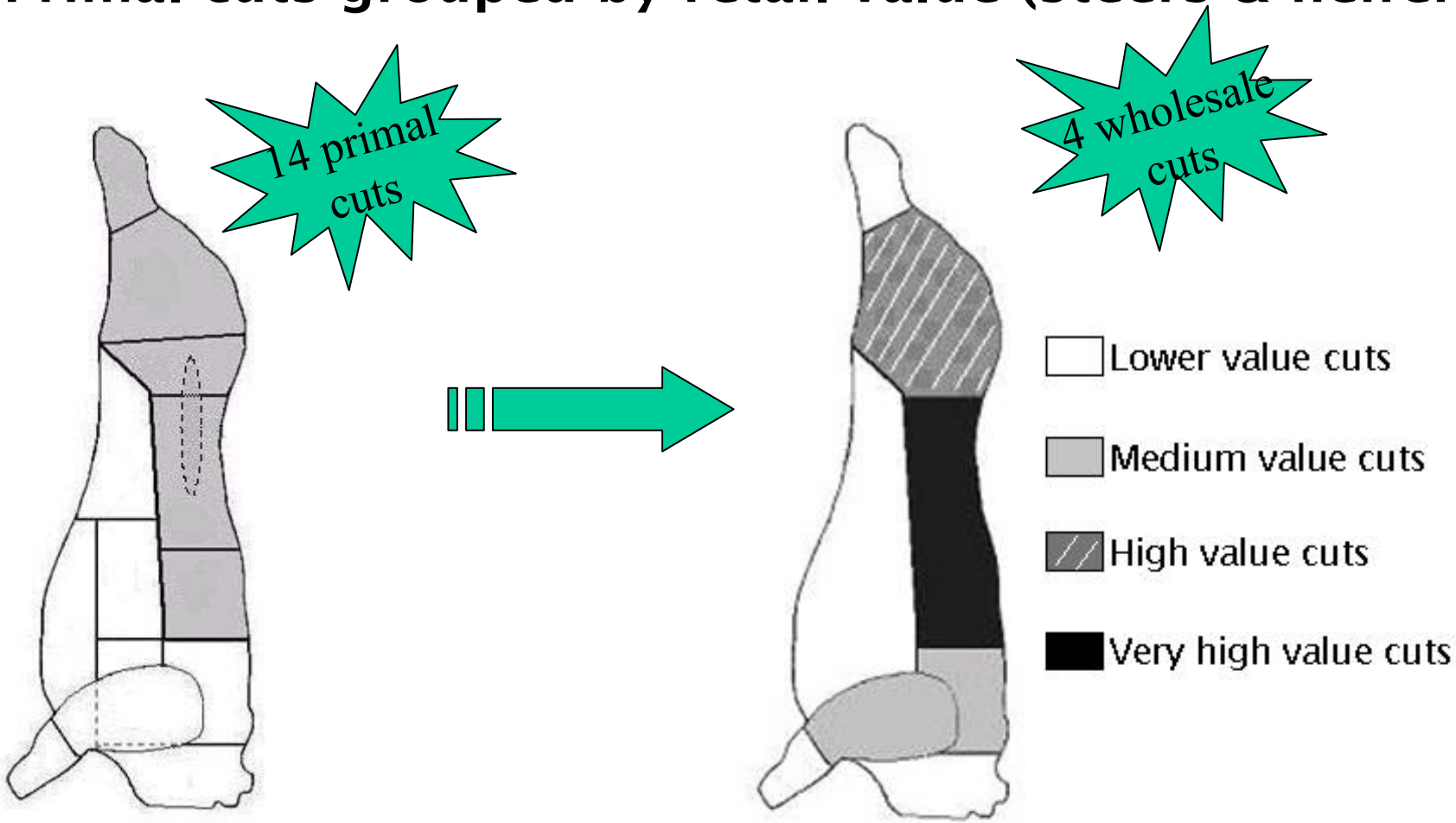
- Conformation
- Fat

Carcass digital images routinely stored since July 2005 (~15 million images)

Predict carcass cuts from images?

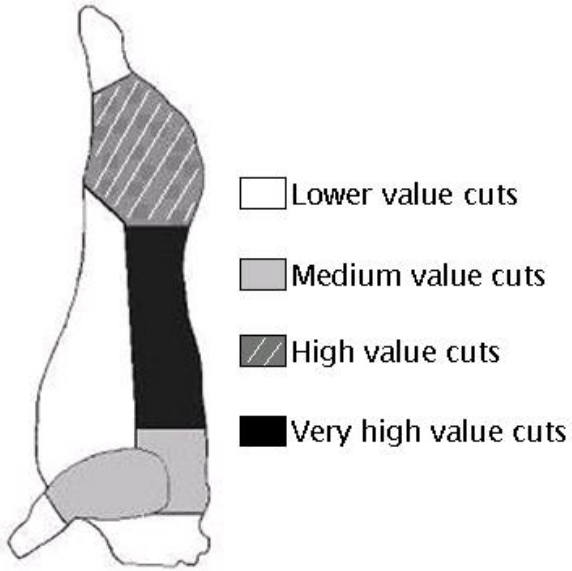
Data used : Wholesale cuts

- **Primal cuts grouped by retail value (steers & heifers)**



Predicting weights from images

- **Building prediction equations**
  - Using multivariate analysis



=

428 variables (contour, length, volume, surface…)

  - Calibration (2/3 data) / validation (1/3 data)
  - Built on 346 steers & 281 heifers

Pabiou et al. (2010) Livestock Sci.

Accuracy of prediction

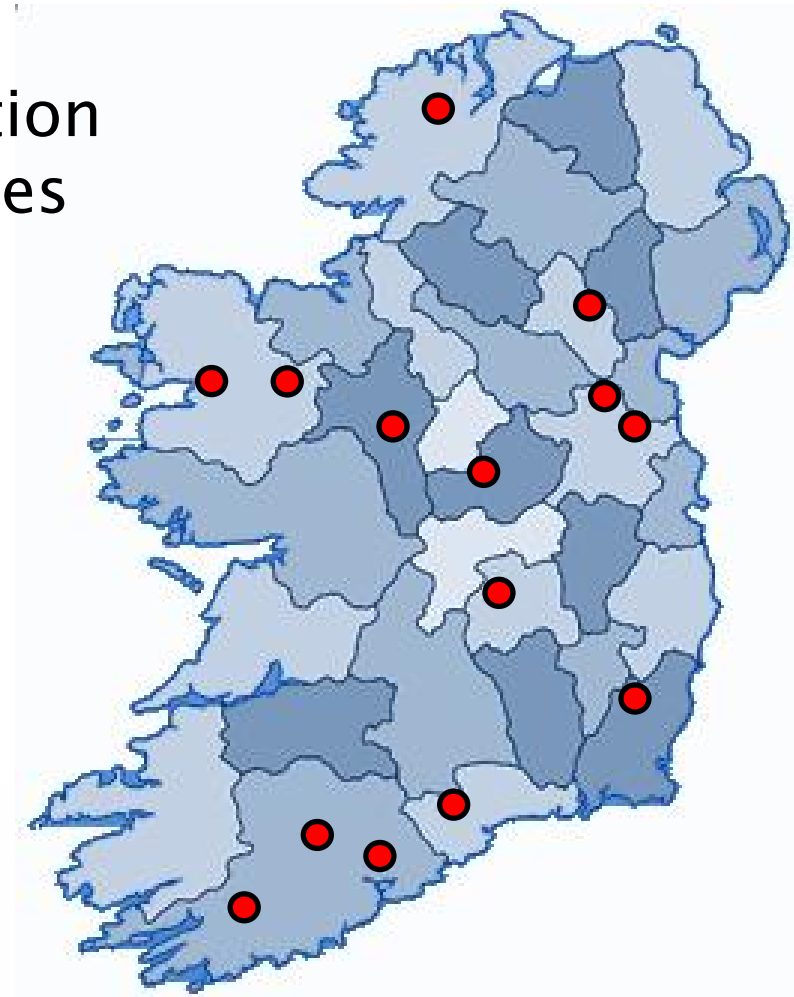
R^2 of prediction in validation datasets

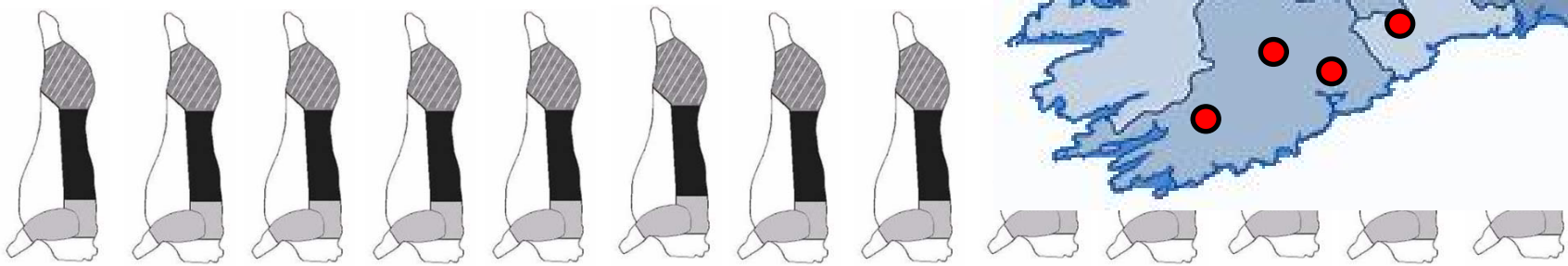
	STEER	HEIFER
Total meat	0.97	0.84
Total fat	0.77	*n/a*
Total bone	0.81	*n/a*
Lower Value Cuts	0.92	0.65
Medium Value Cuts	0.86	0.70
High Value Cuts	0.93	0.85
Very High Value Cuts	0.84	0.72

Generating new phenotypes

- Obtained by applying prediction equations to the digital images historically stored
- Across 14 slaughter houses

Access to large supply of carcass cuts





Genetics of predicted weights

- **Heritability on diagonal**
- **Genetic correlations off diagonal : HEIFERS & STEERS**

h^2 r_g HEIFERS / r_g STEERS	Total meat	Total fat	Total bone	LVC	MVC	HVC	VHVC
Total meat	**0.44**	-0.61	-0.24	0.71	0.78	0.93	0.80
Total fat	*n/a*	**0.14**	0.13	-0.50	-0.56	-0.58	-0.54
Total bone	*n/a*	*n/a*	**0.49**	-0.22	-0.23	-0.35	-0.62
LVC	0.87	*n/a*	*n/a*	**0.18**	0.45	0.66	0.57
MVC	0.75	*n/a*	*n/a*	0.47	**0.27**	0.79	0.86
HVC	0.89	*n/a*	*n/a*	0.80	0.82	**0.40**	0.89
VHVC	0.82	*n/a*	*n/a*	0.69	0.82	0.82	**0.17**

Pabiou et al. (2011a) Animals

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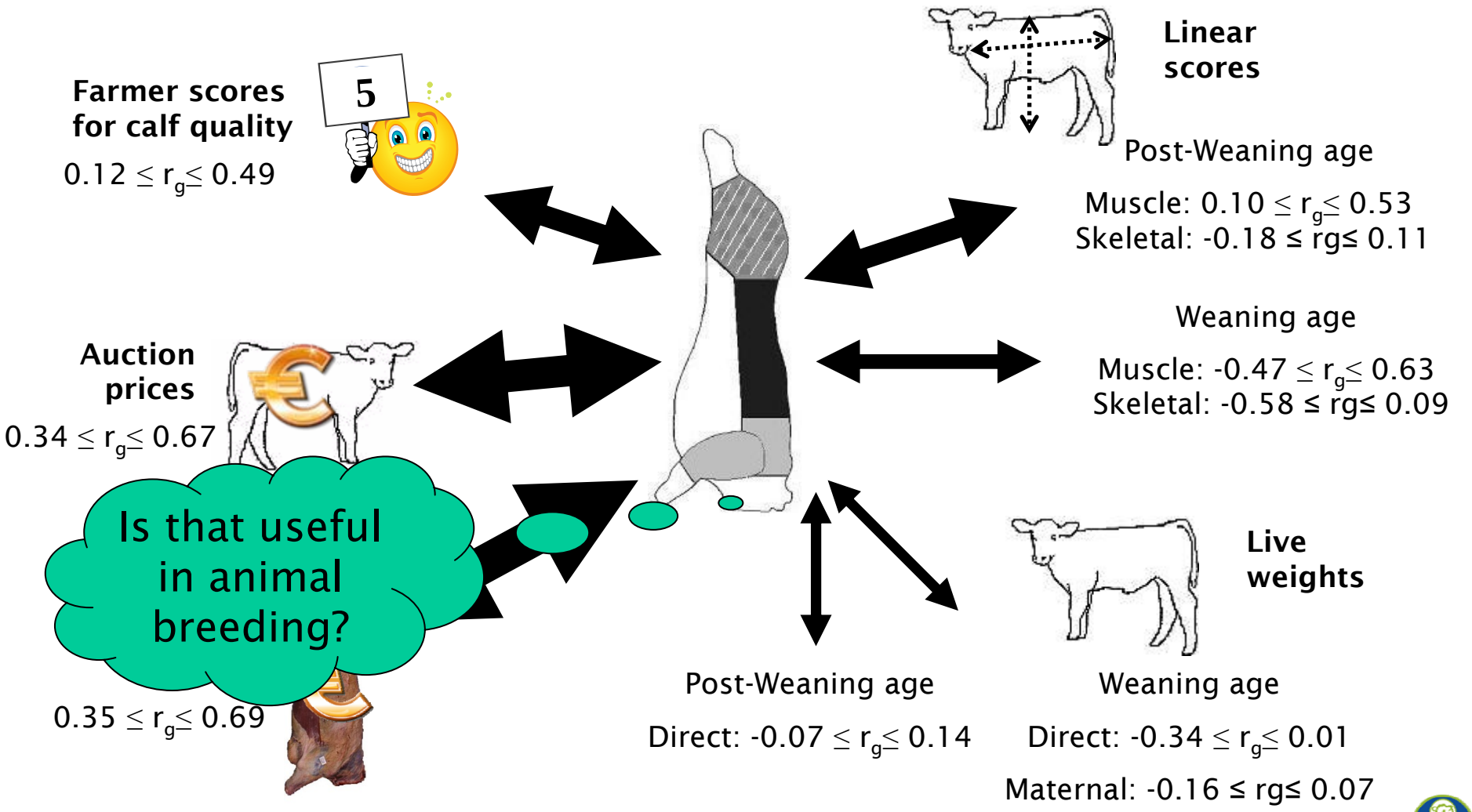
Relationship with pre-slaughter traits



Are we there yet?

Predicted wholesale cuts

- Interest for farmers / industry…**Yes!**
- Availability……**Yes!**
- Genetic variability……**Yes!**
- Correlations with other traits…. **Yes!**
- Potential benefit for industry **?**

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Objective & Indexes

Breeding goal = **Suckler Beef Value**

Calving	Weaning	Carcass	Replacement
		Built with predicted cut	

Selection indexes

Index 1	Index 2	Index 3	Index 4	Index 5
Live traits	Live traits Carcass weight	Live traits Carcass weight EUROP grades *(=current index)*	Live traits Carcass weight EUROP grades Predicted cuts	More accurate predictions

Benefits of adding predicted cuts to the carcass index

Expected benefit for the Irish industry

(million of Euros)

Scenari tested	Using carcass weight	Using EUROP grades	Using predicted carcass cuts	Using more accurate prediction of carcass cuts
Comparison of with	*Scenario 1 Scenario 2*	*Scenario 2 Scenario 3*	*Scenario 3 Scenario 4*	*Scenario 4 Scenario5*
10 years	+ € 7.3	+ € 0.6	+ € 2.4	+ € 0.6

Conclusions

- Using phenotypes predicted from VIA for selection purpose is feasible
  - Accurate regressions equations for steers and heifers
  - Routinely available supply of predicted carcass weights
- and beneficial for the Irish industry
  - Exploitable genetic variations
  - Strong genetic associations with early predictors
    - Auction price at weaning and post-weaning
  - New selection index including predicted cuts:
    - increased responses on Carcass sub-index and Suckler Beef Value
  - Potentially the next Quality Payment System?

In other words

- Is it possible to create new carcass traits from digital images?
  - YES

- Is that interesting/useful for farmers and the industry?
  - YES

Future research

- Strengthen current prediction equations
  - Heifers
  - Bulls & cows
- Investigate meat quality & other technologies
  - Tenderness
- Beef genomic selection will include in time carcass cuts traits
  - In progress
- Expand knowledge to sheep
  - Build on UK research
- Explore ways of collecting more phenotypes
  - Collective organisation

In other words

- This is only a beginning

Thank you.