



Implementation of genetic evaluation for intramuscular fat in Norwegian beef cattle using ultrasound measurements

Technical Session 14

Beef cattle - genetic evaluation and recording

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Norwegian suckler cow production

The infographic consists of six panels. The top-left panel features a mountain landscape with a cow and calf, stating '~103,500 beef cows as of 2025'. The top-middle panel shows a barn icon with a herd of cows, stating 'Average herd size: ~22 cows/herd'. The top-right panel is a photo of a herd of white cows in a green field. The bottom-left panel shows hay bales and a cow-calf pair, stating 'Production largely based on roughage resources'. The bottom-middle panel shows a cow-calf pair in a field, stating 'Cow-calf production dominates'. The bottom-right panel is a photo of a cow-calf pair in a field. The central part of the collage is a large photo of a cow-calf pair in a field. To the right of this is a vertical photo of a long barn aisle with cows in stalls eating hay. Below that is a photo of a cow-calf pair in a field.

~103,500
beef cows
as of 2025

Average herd size:
~22
cows/herd

Production largely
based on roughage
resources

Cow-calf
production dominates

T4R
FRA AVL TIL BIFF

Aim

- Estimate genetic parameters for ultrasound-recorded IMF, fat depth and muscle depth in Norwegian beef cattle
- Evaluate the robustness of the genetic evaluation model
- Implement IMF in routine genetic evaluation



Breeding for higher IMF in Aberdeen Angus



2022

Unofficial
EBVs
IMF-selection
of AI-bulls



2023

Insemination
of cows with
high EBV for
IMF



2024

Selection of
first test
candidates



2025

IMF included
in routine
genetic
evaluation



Data recording



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Data recording

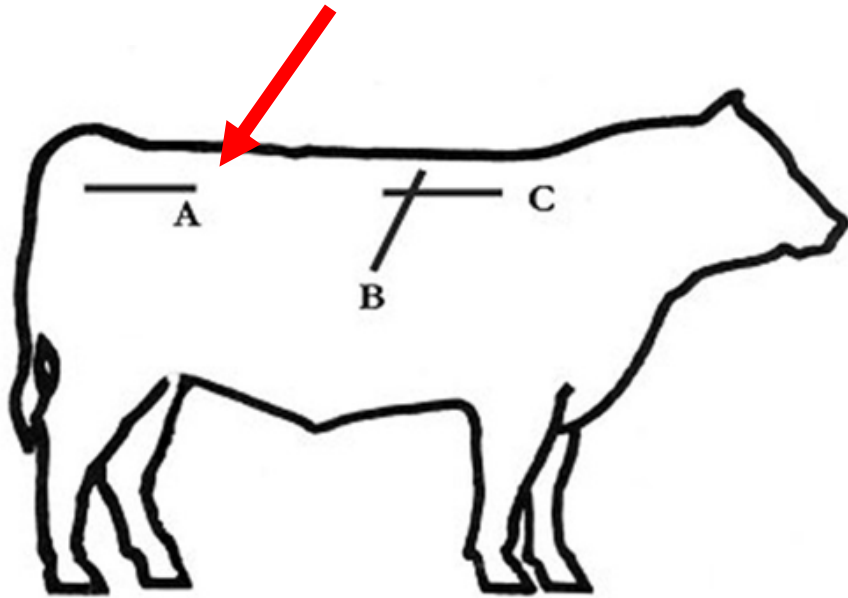
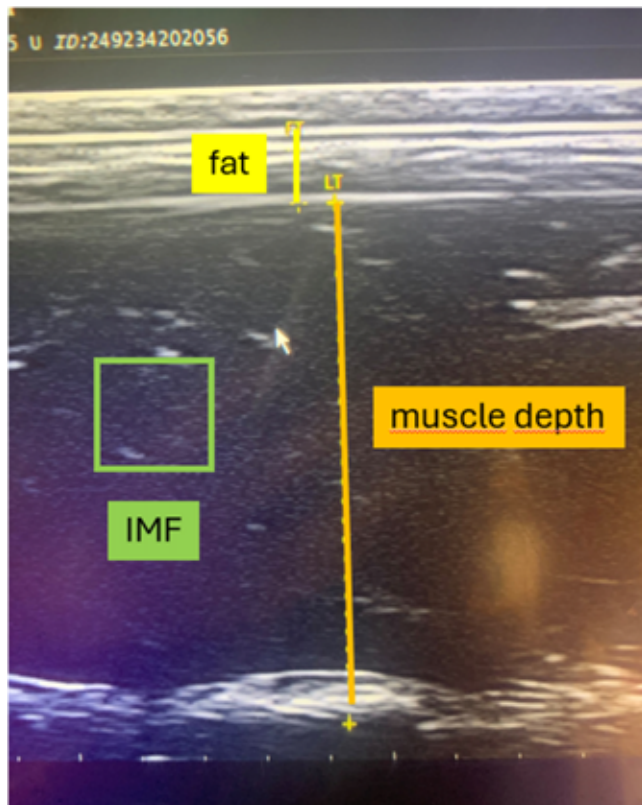


Figure 3.3. Areas of interest for ultrasound evaluation of carcass characteristics



Dataset



Traits

- Fat, in mm
- Muscle depth, in mm
- Intramuscular fat (IMF), in % → average IMF % within squares calculated by equations in the devices

Animals

- Bulls and heifers, age 290-455 days (380)
- Dataset 1: 12,748 animals (2008-2022)
- Dataset 2: 4,525 animals (2023-2024)

- Outliers removed

Descriptive statistics dataset 1

Breed	N	IMF %	Fat, mm	Muscle, mm
Aberdeen Angus	2,489	2.39 (1.03)	3.62 (1.64)	58.6 (9.4)
Charolais	4,990	1.87 (0.90)	2.97 (1.53)	68.2 (10.4)
Hereford	1,928	2.25 (0.99)	3.64 (1.76)	59.8 (9.8)
Limousin	2,003	1.71 (0.86)	2.72 (1.38)	71.7 (10.5)
Simmental	1,338	2.25 (0.99)	3.58 (1.78)	70.2 (9.4)

Models

Within breed

$$y = \underbrace{year + sex + device + classifier + interpreter}_{\text{Fixed}} + \underbrace{age (sex)}_{\text{Regression}} + \underbrace{herd * year + animal + e}_{\text{Random}}$$

Fixed

Regression

Random

Multi breed

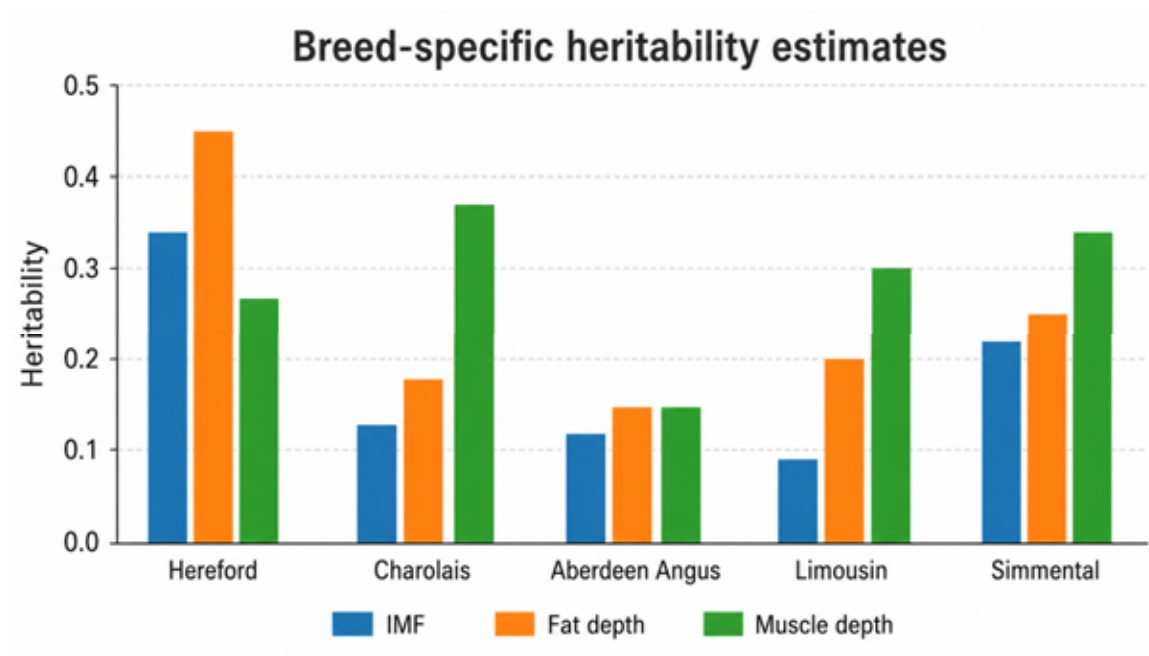
$$y = \underbrace{year + sex * breed + device + classifier + interpreter}_{\text{Fixed}} + \underbrace{age (sex * breed)}_{\text{Regression}} + \underbrace{herd * year + animal + e}_{\text{Random}}$$

Fixed

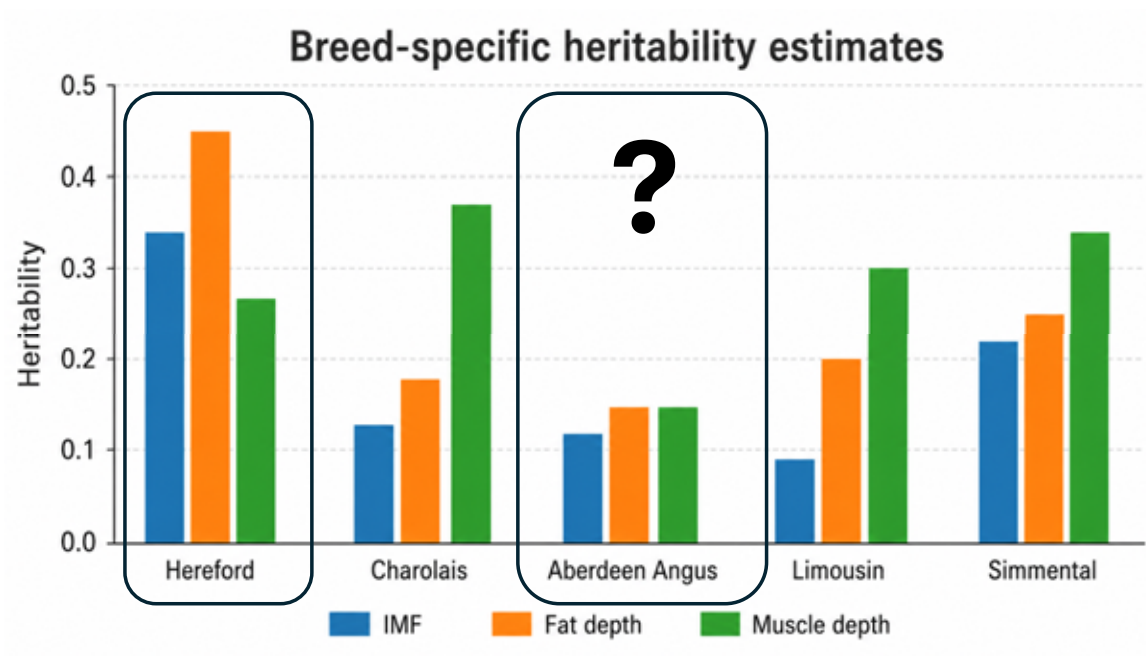
Regression

Random

Within breed - heritabilities



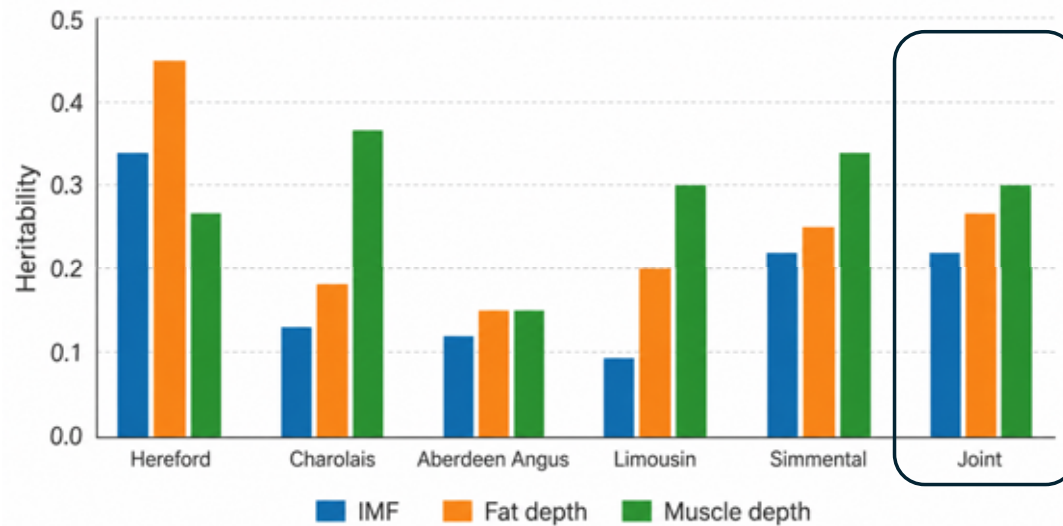
Within breed - heritabilities



- Angus has very low h^2 for all traits.
- Explanation? Coat color? Excitability?

Results multi-breed evaluations

Heritabilities

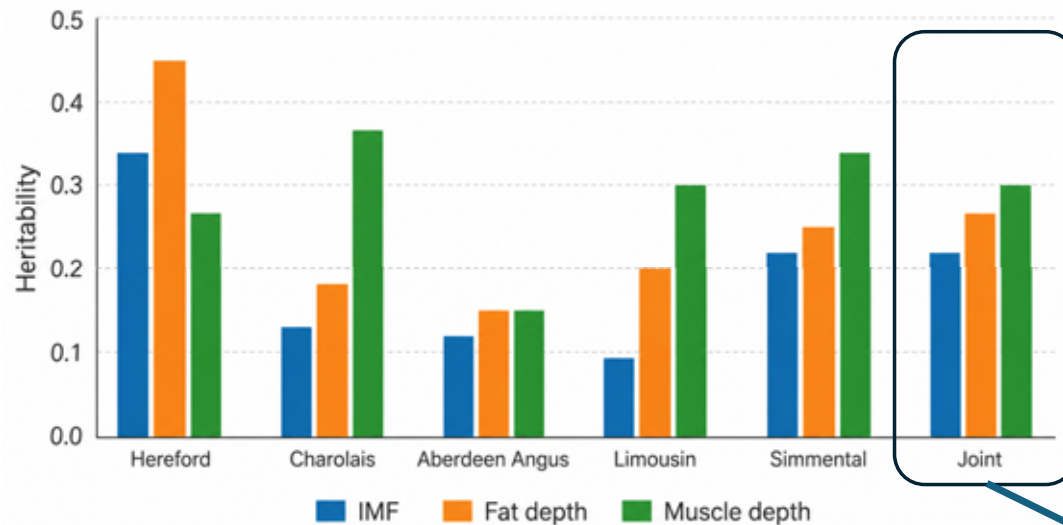


Genetic correlations

IMF ↔ fat depth	0.94
IMF ↔ muscle depth	-0.15
fat depth ↔ muscle depth	-0.04

Results multi-breed evaluations

Heritabilities



Genetic correlations

IMF ↔ fat depth	0.94
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Used in genetic evaluation

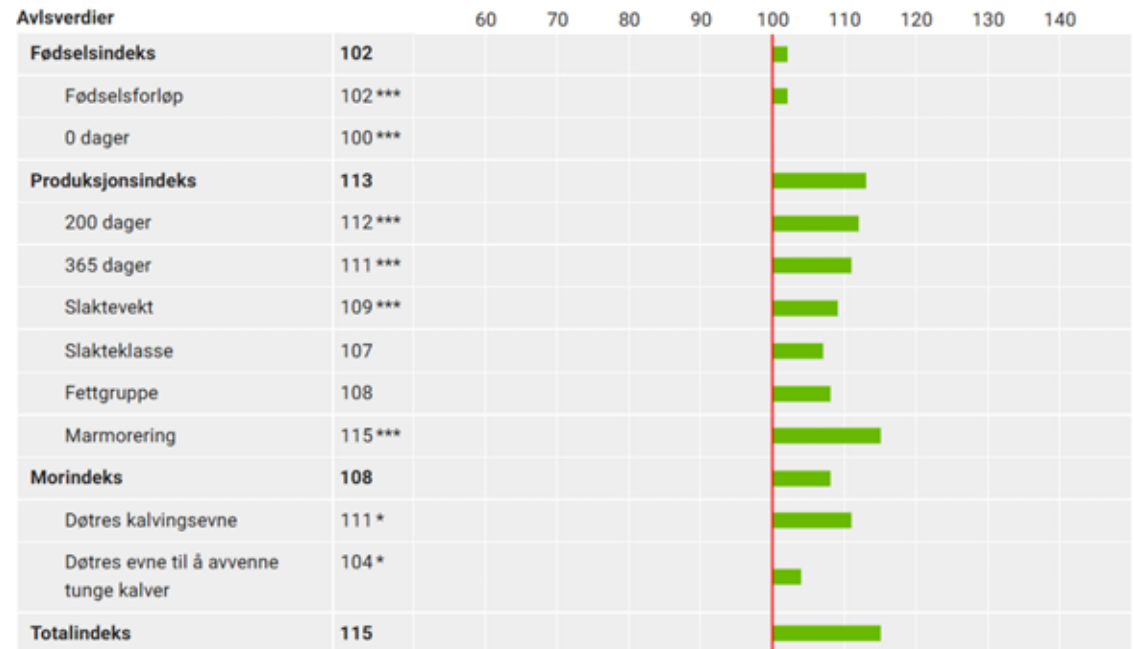
To sum up

- IMF is included in genetic evaluation → published as a single trait, not in total merit index (TMI)
- If IMF gets an economic value, it should be included in a breed-specific TMI
- Because IMF is strongly correlated with fat depth, increased emphasis on IMF may also influence fatness
- Selection program for IMF in the Aberdeen Angus



To sum up

- IMF is included in genetic evaluation → published as a single trait, not in total merit index (TMI)
- If IMF gets an economic value, and becomes part of the breeding objective, it should be included in a breed-specific TMI
- Because IMF is strongly correlated with fat depth, increased emphasis on IMF may also influence fatness
- Selection program for IMF in the Aberdeen Angus



Thank you for your attention!



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