Predicting beef carcass meat, fat & bone proportions from carcass conformation & fat scores

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ASA Beef Event
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Carcass grading

➢ In the EU, carcasses are classified according to the official carcass classification scheme

➢ Data recorded for beef carcasses include:
  - ✓ Carcass weight
  - ✓ Gender (Steer, heifer, young bull, bull and cow)
  - ✓ Carcass conformation score (S,E,U,R,O, P)
  - ✓ Carcass fat score (1 to 5 fattest)

➢ In Ireland mechanical carcass grading has replaced visual grading
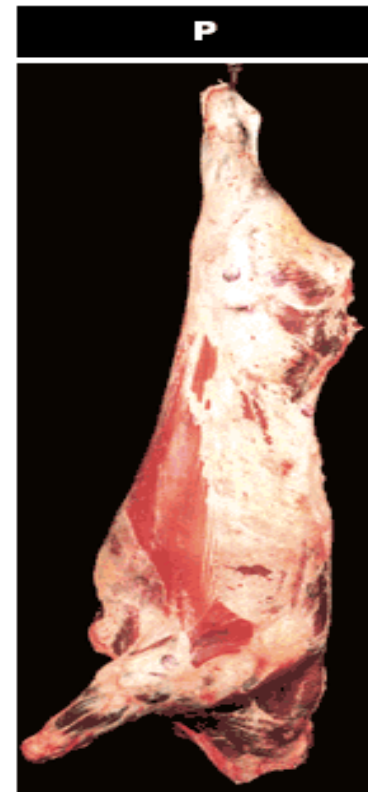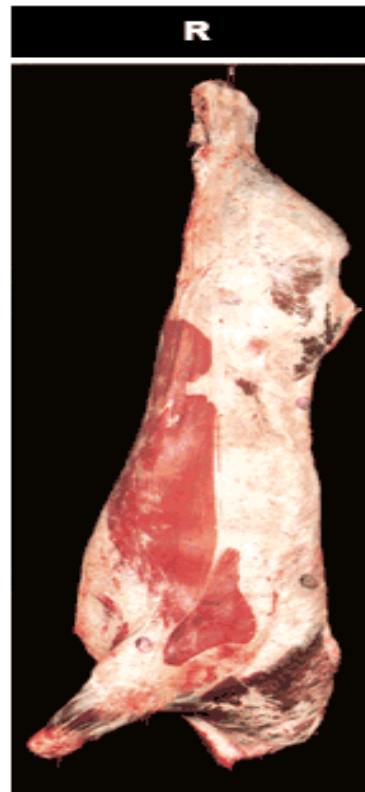 - ✓ Video imaging analysis (VIA) system

Good Conformation

Poor Conformation

Carcass conformation score
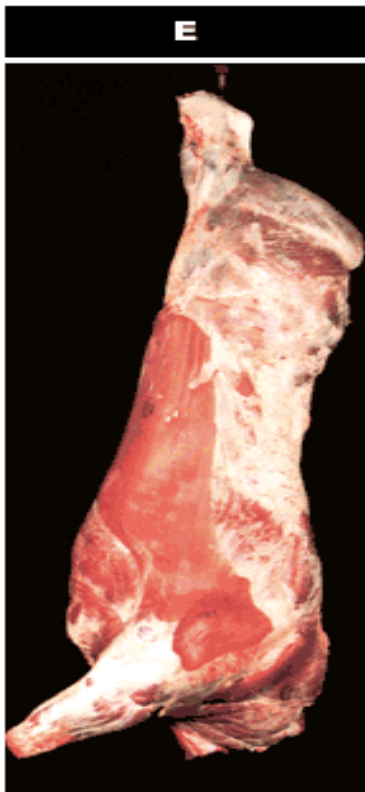
| E | U | R | O | P |

Carcass fat score
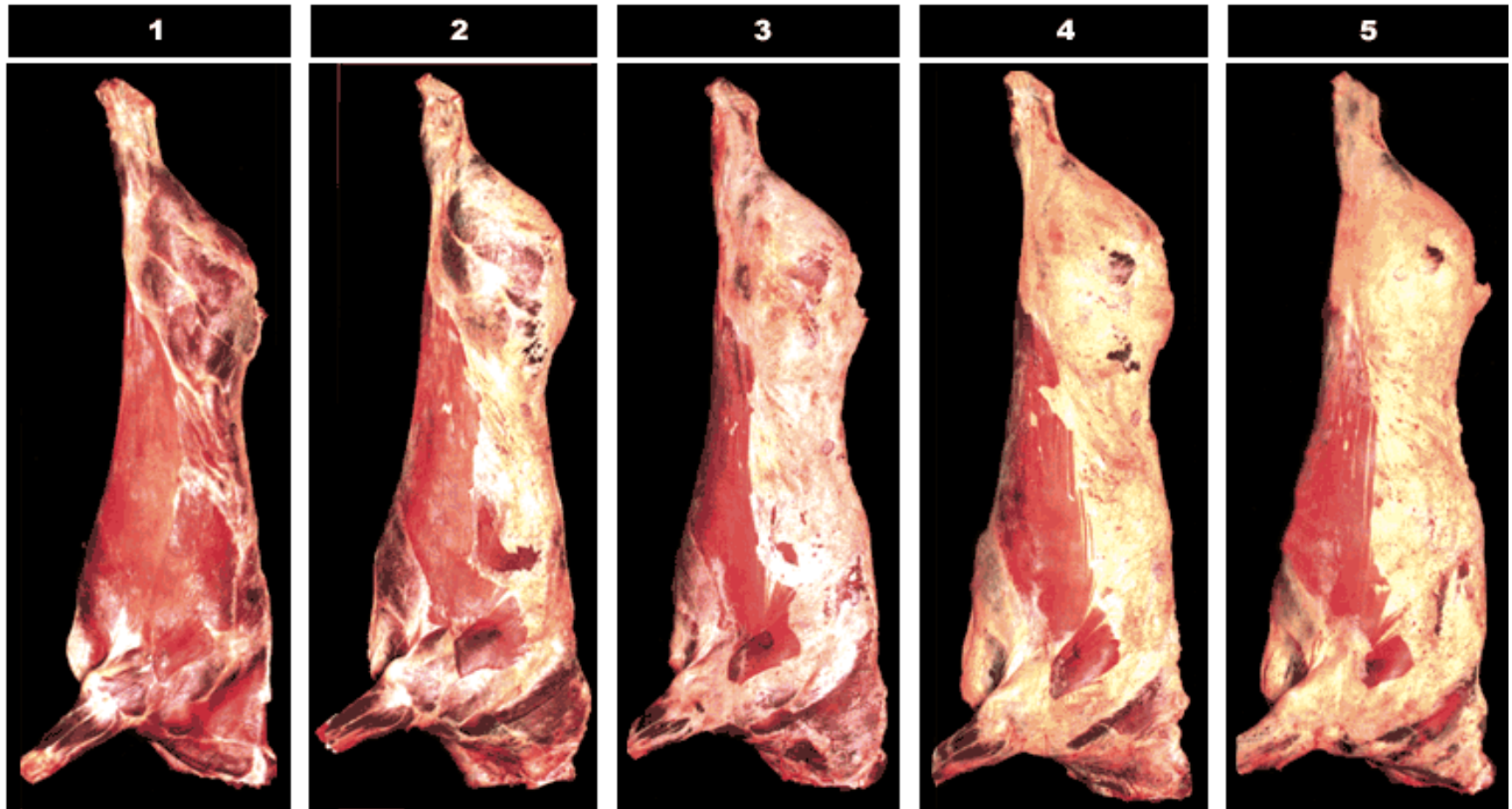
Percentage of beef carcasses in different conformation classes (2015)

	E	U	R	O	P
Steers	-	12	37	42	10
Heifers	-	17	52	28	4

Source: DAFM 2015

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15-point scale

	E+	E	E-	U+	U	U-	R+	R	R-	O+	O	O-	P+	P	P-
1-															
1															
1+															
2-															
2															
2+															
3-															
3															
3+															
4-															
4															
4+															
5-															
5															
5+															

Objective

Develop & test the accuracy of prediction equations for carcass traits derived from carcass grades.

Animals

Gender

➢ **115** bulls (13 to 17 mths old)

➢ **40** heifers (20 mths old)

➢ <u>**507**</u> steers (24 mths old)

   662

Breed Type

➢ **4 genotype groups**

  – Holstein-Friesian (HF)

  – Early-maturing x HF, Early-maturing x Early-maturing

  – Late-maturing x HF, Late-maturing x Early-maturing

  – Genotypes >0.75 Late-maturing

Source: Conroy et al. 2010a

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e.g. Details of Steers used

	Mean	Minimum	Maximum
Slaughter wt (kg)	625	435	884
Cold carcass wt (kg)	333	234	501
Conformation score (1-15)	6.8	2.0	12.0
Fat score (1-15)	8.5	2.8	13.3
Meat (g/kg)	679	564	785
Fat (g/kg)	123	47	260
Bone (g/kg)	197	150	262

Source: Conroy et al. 2010a

	Mean	Minimum	Maximum
Carcass value (c/kg)	293	244	347

Source: Conroy et al. 2009

Carcass Measurements

➢ Carcass weight

➢ EU carcass conformation & fat scores (15-point scale)

➢ **Right side** of each carcass was quartered into
    ➢ 8-rib **Hind-quarter** (Pistola)
    ➢ **Fore-quarter**

➢ **Dissected** in Meat, Fat & Bone

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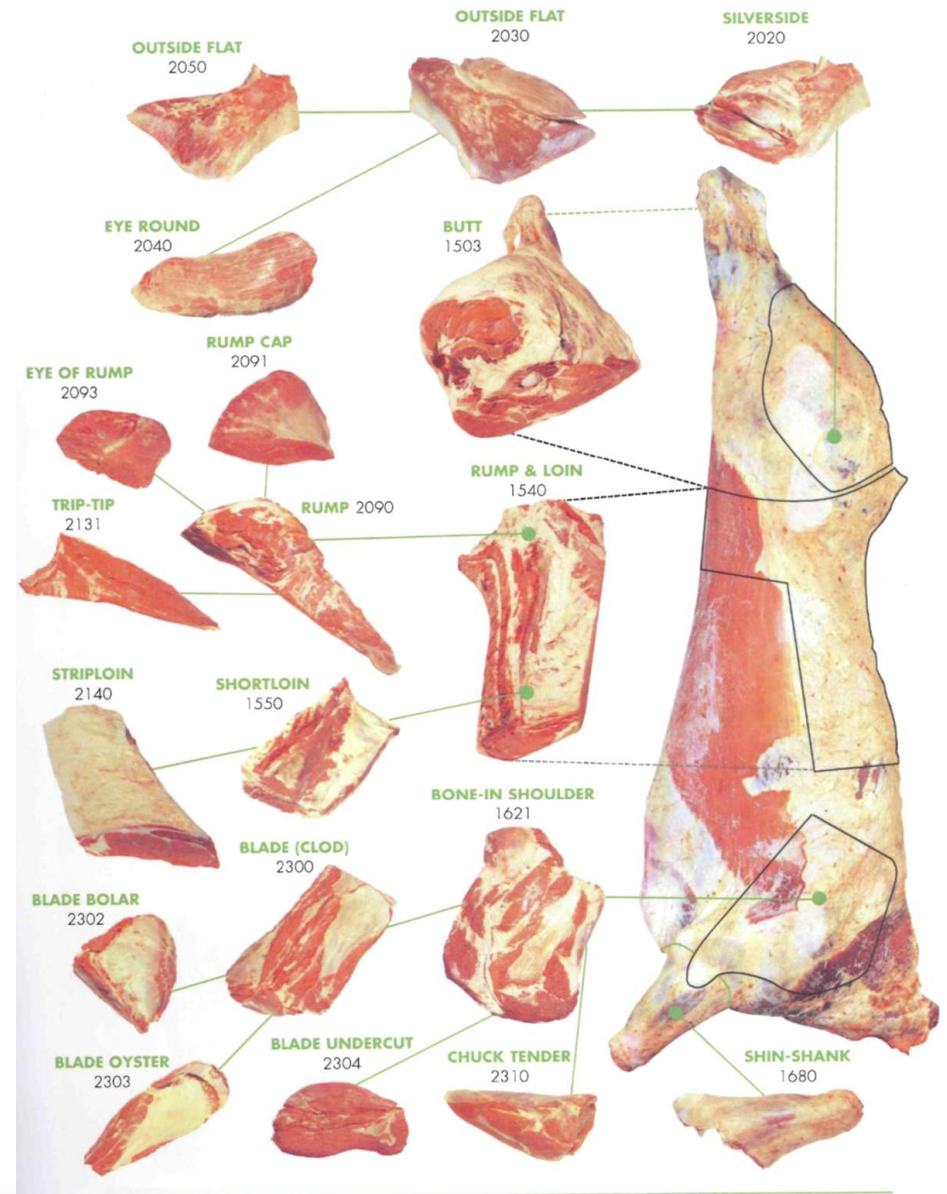
Carcass Dissection

Hind-quarter
13 meat cuts
*leg, heel, silverside, topside, knuckle, rump, tail of rump, cap of rump, **fillet, strip loin, cube roll**, cap of rib, & eye of round*

Fore-quarter
11 meat cuts
front shin, neck, brisket, chuck, flat ribs (1 to 5), plate, M. Triceps brachii, bladesteak, braising muscle, chuck tender, & clod

OUTSIDE FLAT
2050

OUTSIDE FLAT
2030

SILVERSIDE
2020

EYE ROUND
2040

BUTT
1503

RUMP CAP
2091

EYE OF RUMP
2093

TRIP-TIP
2131

RUMP 2090

RUMP & LOIN
1540

STRIPLOIN
2140

SHORTLOIN
1550

BONE-IN SHOULDER
1621

BLADE (CLOD)
2300

BLADE BOLAR
2302

BLADE OYSTER
2303

BLADE UNDERCUT
2304

CHUCK TENDER
2310

SHIN-SHANK
1680

Carcass Dissection

- **Bones** removed from cuts (where applicable) & scraped clean

- All visible **fat** removed from each cut

- Weight of each <u>cut</u> & total weight of <u>fat</u> trim, <u>lean</u> trim & <u>bone</u> recorded for hind-quarter & fore-quarter

- Lean trim added to meat cuts to give **meat yield**

- **Carcass value** = sum of wholesale values of individual meat cuts & lean trim with a small deduction for bone.

Statistical analysis

➢ **Prediction equations <u>developed</u> using multiple regression:**
  - ➢ Dependent variables: Meat, fat and bone proportion
  - ➢ Independent variables: Carcass grades, conformation & fat

➢ **Prediction equations <u>validated</u> using a once-out cross validation.**

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Results: Linear prediction equations for meat, fat & bone proportion using carcass conformation & fat score (1-15)

	Intercept [1]	Conformation score	Fat score	R²
Meat (g/kg)	698[a] 704[b] 713[c]	**+11.8** (0.40)***	**-9.6** (0.47)***	0.73
Fat (g/kg)	113 96 100	**-4.4** (0.36)***	**+12.0** (0.56)***	0.67
Bone (g/kg)	190 200 187	**-7.4** (0.20)***	**-2.4** (0.24)***	0.71

[1] Intercept chosen = conformation & fat scores of 8 (Scale 1-15)
[a]=Steer [b]=Bull [c]=Heifer

Source: Conroy et al. 2010a

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Conclusion

Carcass classification scores (15-point scale) are **relatively accurate predictors** of carcass meat, fat and bone proportions.

Results: Regression of carcass value on carcass conformation & fat scores (1-15): steers

	Intercept	Conformation score	Fat score	R^2
Carcass value (c/kg)	296	**+5.6** (0.30)***	**-5.1**(0.36)***	0.60

Source: Conroy et al. 2009

Effect of a <u>3-unit</u> increase in carcass conformation score (15-point scale) on meat % & carcass value

	<u>O=3=</u>	<u>R=3=</u>	<u>Difference</u>
Meat (%)	66.5	69.9	+3.4
Value (c/kg)	312	330	+18

Source: Drennan & Conroy 2008

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Effect of breed type on carcass meat % & carcass value (c/kg) – Steers

	Holstein-Friesian	Suckler (7/8 Late-maturing breed)	Difference in favour of Suckler-bred
Carcass grades	O$^-$3$^+$	U$^-$3$^+$	
Meat (%)	65.0	71.2	+6.2
Value (c/kg)	<u>300</u>	336	<u>+36</u>

Source: Drennan & McGee 2009

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Beef Carcass Prices 2015 (c/kg)

Carcass Grade	Young Bulls	Steers	Heifers
IRELAND			
O3	375	380	393
U3	402	410	425
Difference	27	30	32
UK			
O3 vs. U3 Difference	52	40	46

vs. 36? ↓ 45

Young Bulls	France	Italy	Germany
O3 vs. U3 Difference	63	90	42

Source: Bord Bia

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Thank you