PS3.06 Prediction of Yield from Carcass Grading by EUROP and Video Image Analysis 354.00

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Abstract - The objective of this study was to make predictions of yields from carcass information to sort and cut optimally. Robust predictions of yields from single carcasses are needed to make possible allocation of carcasses due to quality attributes. Predictions were calculated based on subjective EUROP and Video Image Analysis (VIA). The different approximations gave fairly similar results, where direct VIA estimation produced highest R2. Real-time tests have shown that detailed carcass information can be applied for and improve logistics in cutting plants.

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Index Terms—carcass grading, yield, cutting patterns, beef, video image analysis. P

I. INTRODUCTION

rediction of carcass yield is important to balance prizes between farmers and the meat industry, but also to provide incitements for future production and breeding. In Norway, the EUROP system is applied. Each carcass is visually assessed into 15 conformation classes and 15 fat groups. The yields have been estimated from deboning trials. Any skewness should in the long run be equalized due to random distribution of carcasses between factories. The random distribution may prevent effective sorting and splitting of carcasses to optimize local factories' production. Yield is defined as the weight proportion of single cuts per carcass. The carcass is first cut into primal cuts, which again are cut into saleable cuts (steak, filets etc) or standardized into manufacturing meat depending on fat content. Robust predictions of yields from single carcasses were needed to make possible allocation of carcasses due to quality attributes. The aim of the study was to predict yield from carcass information (weight, conformation class, fat group, category, age and breed) to sort and cut optimally for quality and earnings.

II. MATERIALS AND METHODS

The study was made from two different trials. In the first trial, a selection of 1001 beef carcasses representative for the Norwegian population have been deboned under non-commercial conditions during several years to estimate yields from a standard cutting pattern; "14 %" (Table 1). The manufacturing meat should be maximized into batches with 14 % fat. The carcasses had been subjectively assessed according to the EUROP system. In the second trial, 36 beef carcasses from categories "young bulls" and "cows" were selected to validate derived estimates from the first trial when applied on other cutting patterns (Table 2). The carcasses were classified subjectively and with video image analysis (VIA) [1]. The carcasses were cut in a commercial cutting plant. Each side of the carcasses where assumed to be identical. One half of each carcass was cut into cutting pattern "Hamburger I"; where the manufacturing meat should be maximized into batches with 16-18 % fat. The other half was cut into cutting pattern "5 %", where manufacturing meat with a fat content of 5 % should be maximised. Each cut from every carcass were weighed in both trials. A set of linear regression equations were made for all cuts where yield was the dependent variable, and category, conformation, fat group, age (months) and breed were explanatory variables. Coefficients of determination (R2) of estimates from the first trial were calculated based on a) subjective EUROP, b) VIA determined EUROP and c) direct yield estimates from VIA. The direct VIA estimations were made from data tables only (not images), due to local server malfunction. SAS statistical software has been used for the analyses.

III. RESULTS AND DISCUSSION

The three approximations (N=36) gave fairly similar results, where direct VIA estimation produced highest R2. These results will probably be improved with images available for the analysis. Table 3 shows that the R2 varies for different cuts and type of manufacturing meat. This was due to low number of carcasses involved, variation in cutting accuracy, weighing insecurity or erroneous weight registrations. Even in the non-commercial settings (N=1001), our highly experienced and "calibrated" cutters were not able to obtain satisfactory R2 for manufacturing meats. From EUROP classification, highest R2 was obtained when information included age, race, conformation and fat group. Cutting pattern "14 %" obtained the highest R2, which is natural because it is based on data from 1001 beef, based on direct estimation, and deboned under non-commercial conditions. Only small diffences in yields were obtained from the different cutting patterns. When the "5 %" should be maximised, there were actually produced less "5 %" than when the cutting was according to the "14 %" pattern. This means that there are no differences between these two cutting patterns. Instead the carcasses should probably be sorted on fat groups to optimally fulfill cutting plans. The equations have been successfully applied in cutting optimization models in realtime tests, and improved economical results significantly [2].

IV. CONCLUSION

The trials show that detailed carcass information can be used to improve prediction of carcass yields. If the results are applied to improve planning and logistics, the potential to collect added values are significant.

ACKNOWLEDGEMENT

Nortura BA is acknowledged for hosting, collaboration and funding of this sub-project of the "Meat Vision" project. The Norwegian Research Council is thanked for their grant to this project. Mr I.J. Hellerud, Mr P.H. Bjørnstad and Mr V. Haugen are thanked for practical input.

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Table 1. Beef carcasses (N=1001)

	No.	Carcassweight (kg)		Conformation class		Fat group	
		Mean	Std.dev	Mean	Std.dev	Mean	Std.dev
Calf	1	130,8		4		5	
Young bull	636	305,2	58,9	5,9	2,2	6,3	1,6
Bull	4	480,8	109,7	8,3	3,2	6,5	1,0
Castrate	5	257,7	34,3	3,2	0,9	7,2	3,1
Heifer	70	233,8	61,8	5,0	2,3	7,6	2,6
Young cow	119	232,7	54,1	2,8	1,7	6,6	3,2
Cow	166	271,0	59,2	3,3	1,9	8,0	3,5

Table 2. Beef carcasses (N=36)

Weigth category		No.	Carcassweight (kg)		Conformation class		Fat group	
			Mean	Std.dev	Mean	Std.dev	Mean	Std.dev
Low	Young bull	7	235,1	16,2	4,0	0,6	4,9	1,2
	Cow	5	224,6	13,1	2,2	0,4	6,4	2,3
Medium	Young bull	6	290,9	12,7	5,0	0,0	6,0	0,9
	Cow	4	260,5	19,1	2,3	0,5	7,3	1,9
High	Young bull	9	337,5	16,3	5,2	0,4	6,4	0,9
	Cow	5	318,0	14,0	3,8	1,3	7,8	1,6