

BACK BACON EVALUATION WITH THE AUTOFOM

INTRODUCTION

Back bacon is one of the biggest export products of the Danish pork industry. The product consists of 3-4 mm thick slices of the loin (longissimus dorsi; LD) and the belly sides (musculus serratus; MS). The slices consist of two main parts, the "eye" (LD) and the "tail" (MS). It is of tremendous interest for the industry to be able to grade the carcasses based on the lean of the back bacon slices due to potential of optimising the sorting procedures.

Petersen *et al.* (1992) presented a back bacon study, where the bacon slices were classified into five classes with manual inspection. Also a semiautomatic vision segmentation of photographs of the bacon slices were applied. The method was developed to detect the meat percentage in the eye and the tail. It was concluded that the majority of the good quality slices were obtained from the middle part of the loin. From the image segmentation 87% of the bacon slices could be classified according to the subjective judgement.

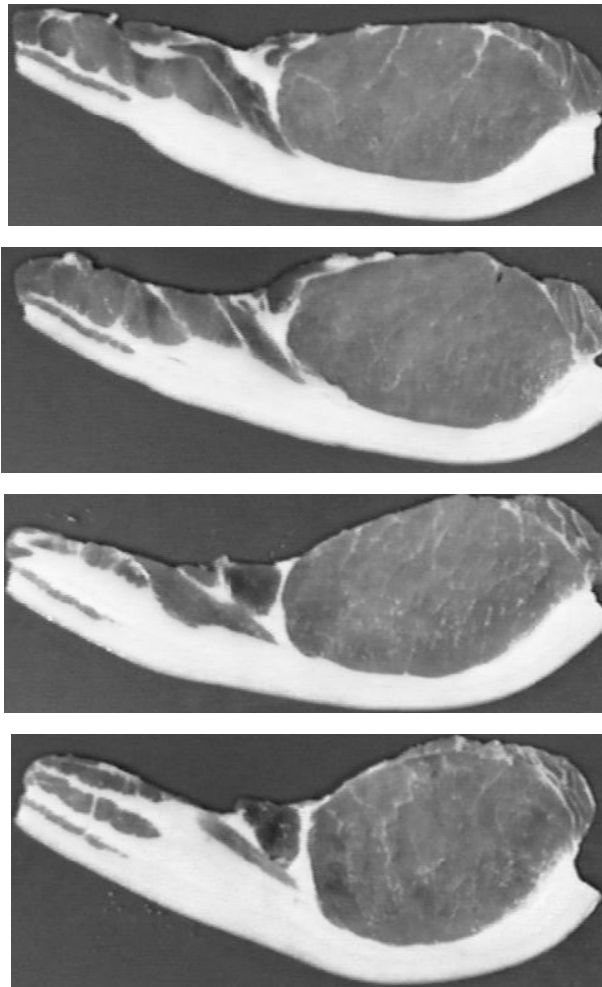
The method proposed by Petersen *et al.* (1992) was destructive and not for on-line use. They therefore proposed the method to be used in combination with an indirect method. This appendix presents the preliminary results with an experiment with the Autofom in this relation.

EXPERIMENT

- 24 carcasses from groups based on the KC meat percentage (MP) were selected. Grp. 7: 50-52%, grp. 8: 55-56%, grp. 9: 60-61%.
- The carcasses were measured with the Autofom (Brøndum 1998).
- 24 hours after slaughter the loin from the right side of the carcass was dissected and sliced into appr. 3mm back bacon slices (from 52 to 90 slices per loin).
- The slices were graded manually from **1** (very lean) to **5** (very fat) based on the lean of the tail (see Figure 1). The average subjective score (AvgSco) was calculated.

- The bacon slices were dissected and the meat percentage in the tails was measured for each slice. The average tail mat percentage (TailMP) was calculated.
- The longitudinal Autofom images at the expected position of the tail (two transducers from the center slice) were selected for each carcass.
- Manual reading of the number and position of the fat layers was made on the ultrasound images.
- Two-dimensional AMT (Brøndum 1999) was measured on the Autofom image in a manually selected region surrounding the C point.
- The manual reading, the AMT texture information, and the meat percentage is used in cross validated PLS

REFERENCE INFORMATION:



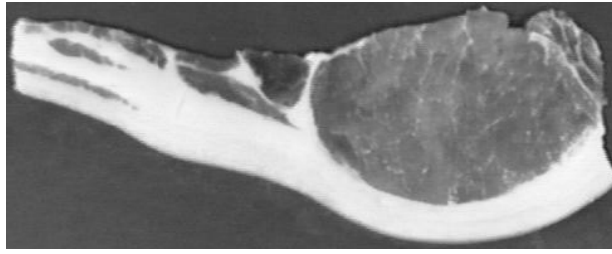


Figure 1: Back bacon slices, with quality score from one (top) to five (bottom) of one of the group 8 samples.

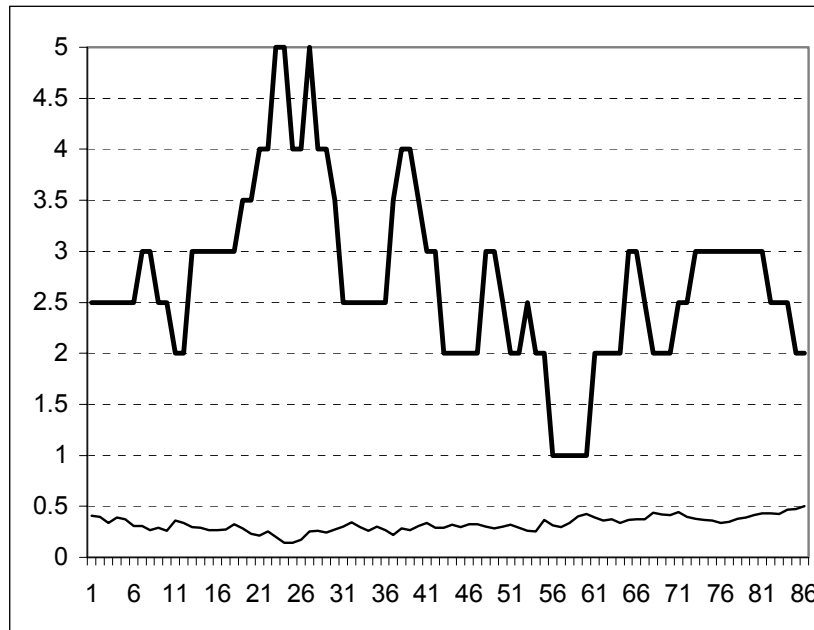


Figure 2. The subjective score (bold line) and the meat percentage for all 86 bacon slices of one group 8 loin.

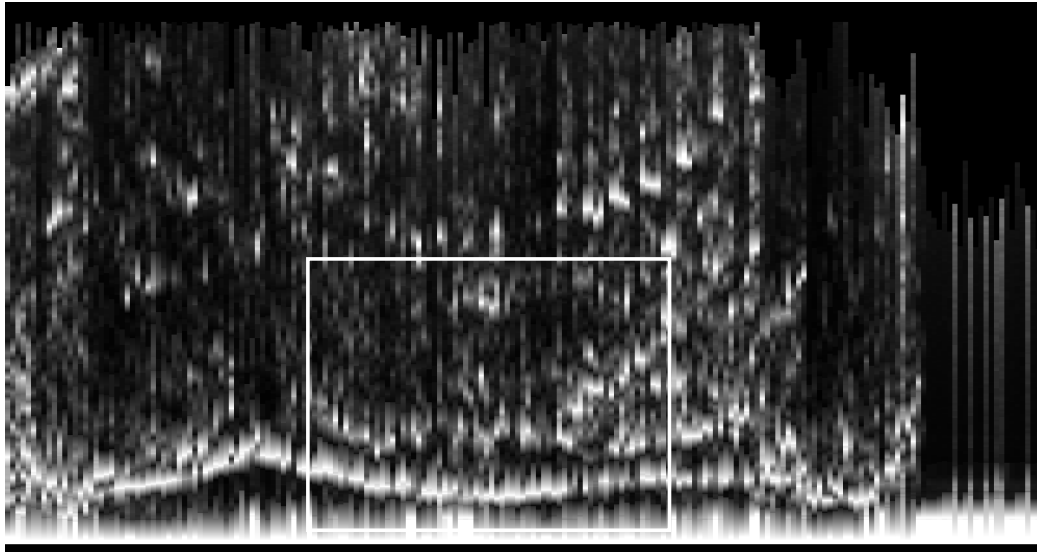


Figure 3: Autofom image of the expected region for one group 8 sample. The squared region marks the manually selected area where the AMT texture analysis is performed.

RESULTS

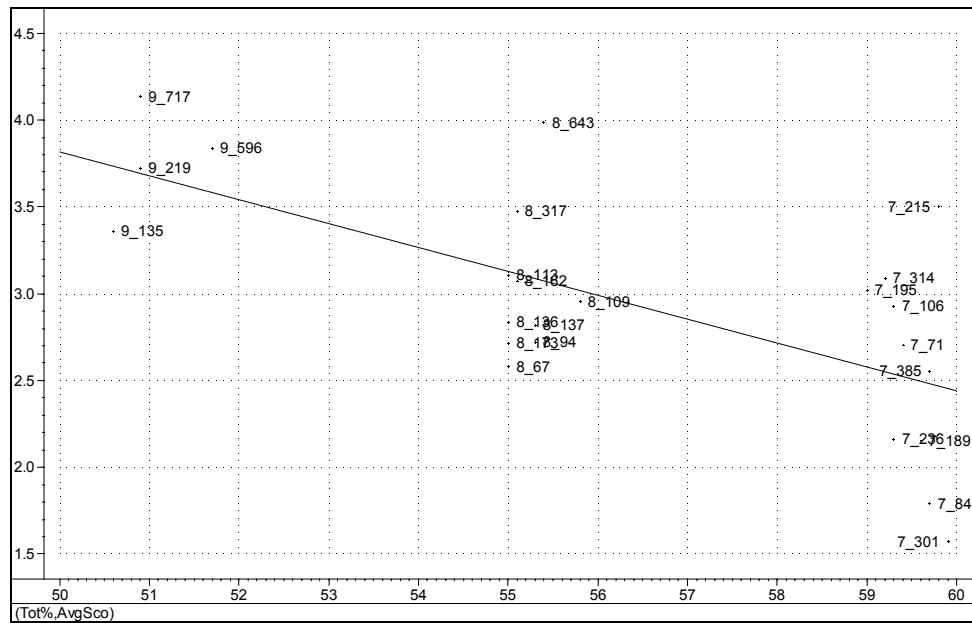


Figure 4: KC total meat percentage (MP) versus Average subjective score for all 24 samples.

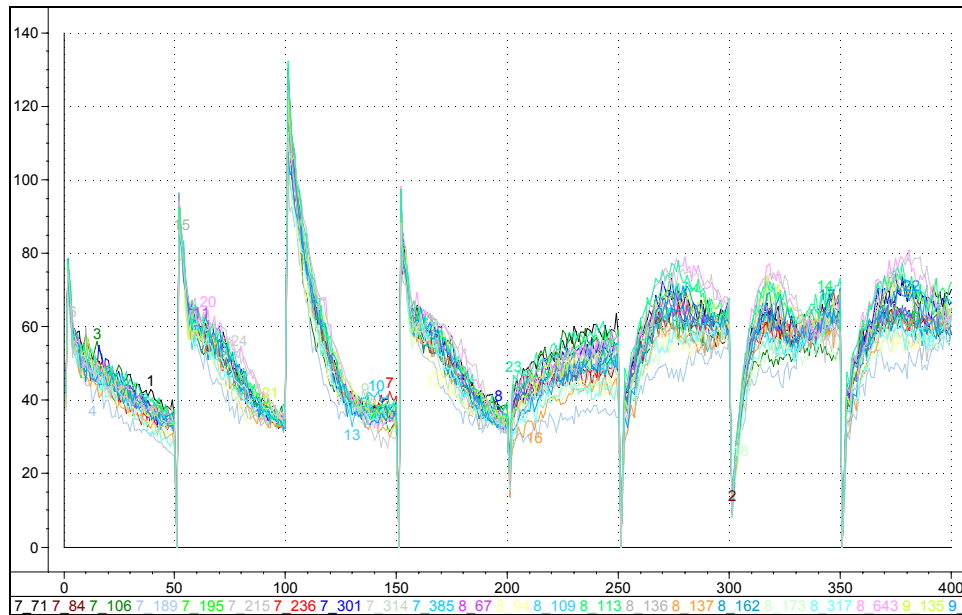


Figure 5: Data from the 2D-AMT for all 24 samples. The four MA spectra are found to the left and the four MY spectra are seen to the right.

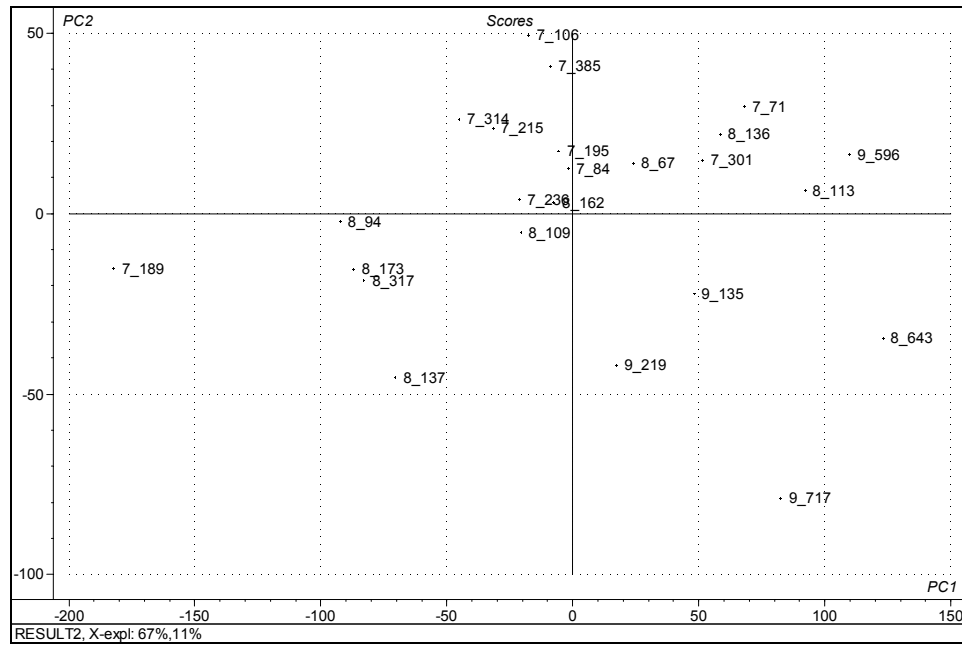


Figure 6: PCA scoreplot for the AMT data.

Tabel 1. PLS prediction results for the average subjective score and the average meat percentage.

	AvgSco (1-5)			TailMP (%)		
	r	SEP	PC	r	SEP	PC
Meat percentage (MP)	0.58	0.53	1	0.63	5.7	1
Manual ultrasound reading	0.51	0.46	2	0.57	6.2	2
AMT Data	0.61	0.43	2	0.62	5.9	2
AMT + MP	0.64	0.41	2	0.63	5.6	2

CONCLUSION

- The combination of the MP and the AMT data showed the best performance.
- The AMT data provides additional information regarding AvgSco compared to the MP used alone.
- More data is necessary, but not necessarily on every slice. Evaluation of 10 e.g. slice is probably sufficient.
- In this material only one evaluator has been used. In future work several graders should be involved if possible.
- There is a tendency for a non-linear relation between the 2DAMT and the AvgSco. Using non-linear regression instead of PLS could show further improvements.
- More structural features should be investigated on the ultrasound images, despite the poor results for the manual reading of the structure in the images.
- Future work is needed before the Autofom can be used for on-line evaluation of the back bacon quality, but there are positive indications in this material.

REFERENCES

- J. Brøndum, M. Egebo, C. Agerskov and H. Busk (1998). Carcass Grading with the Autofom Ultrasound System *J.Anim.Sci.*, **76**, 1859-68.
- J Brøndum 1999. Two-Dimensional Angle Measure Technique for Image Texture Analysis. Submitted to *Pattern Recognition*.
- J.S. Petersen, O.K. Pedersen, H. Busk, M. Andersson, and M. Darré (1992). Midterstykkets Kvalitet ved Back Bacon Produktion. Statens Husdyrsbrugsforsøg, Forskningscenter Foulum, Tjele, Denmark and Slakteriernes Forskningscenter, Roskilde Denmark.