



# Meat@ppli, a smartphone application to predict fat content of beef

## INTRODUCTION

Fat has a major economic importance in the beef sector. It affects all the meat food chain steps: from the farmer to the consumers, through the slaughterer-processor or the retailers. However, nowadays, fat estimation in beef, and especially marbling, is difficult, due to the lack of a suitable assessment tool, i.e., reliable, simple, fast, non-destructive and inexpensive. The exponential growth of smartphones equipped with high quality imagers and high computing power has provided tremendous opportunities to measure fat on bovine carcasses.

The Meat@ppli project aimed:

- To predict intramuscular and total fat content of 6th rib from its image captured under non-standardized and uncontrolled conditions, using image analysis methods and deep learning,
- To embed the algorithms in a smartphone application.

Let's go for a demo!

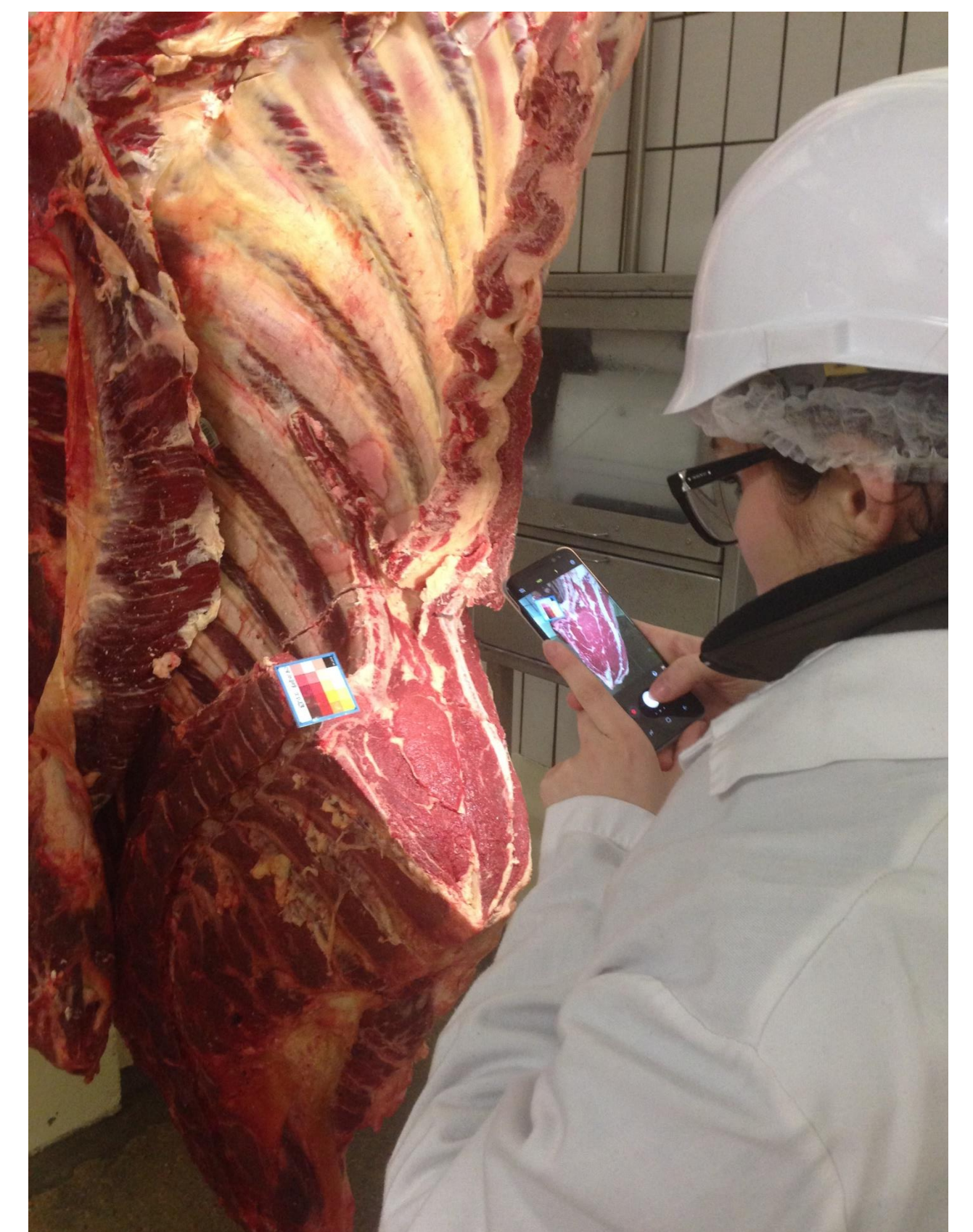


## CONCLUSION

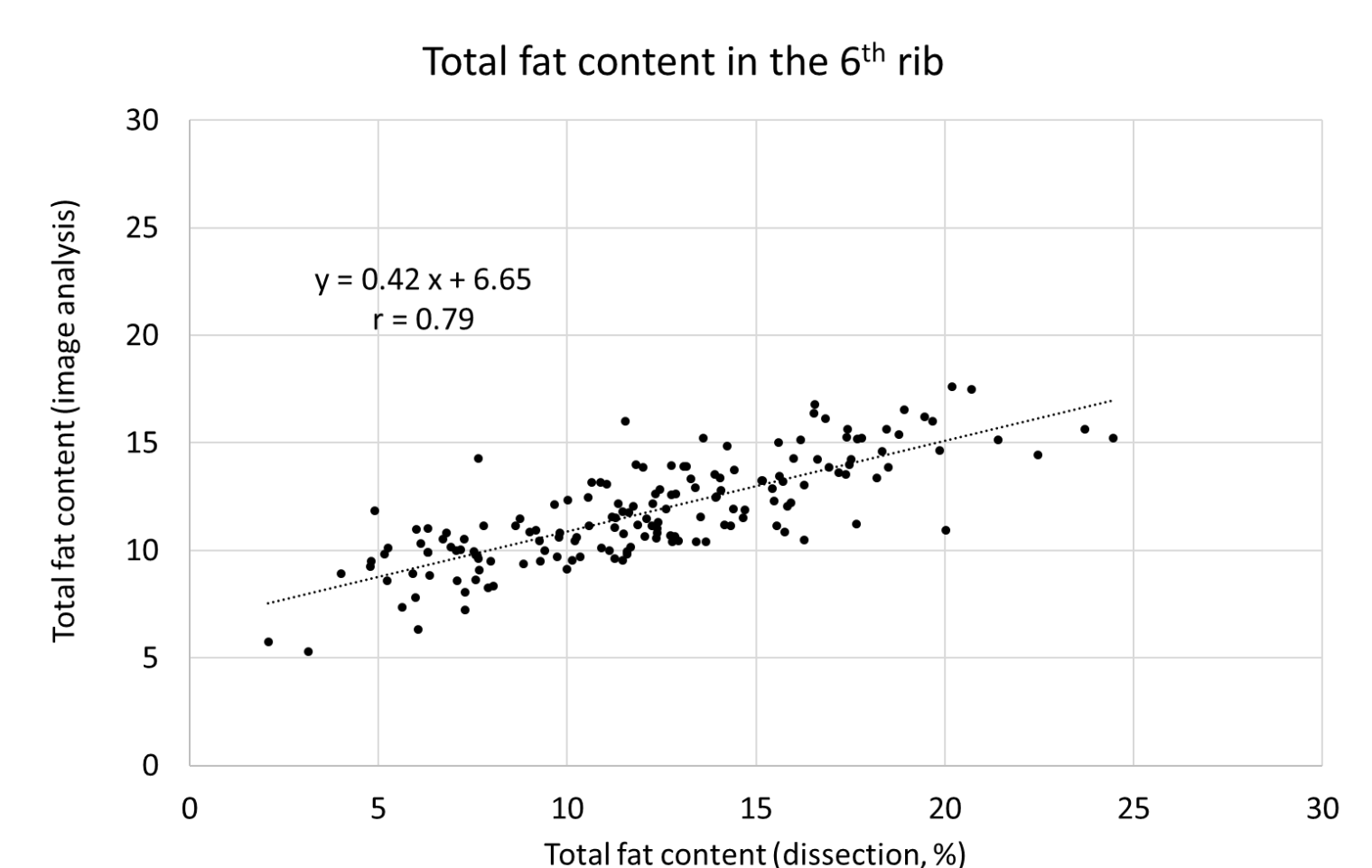
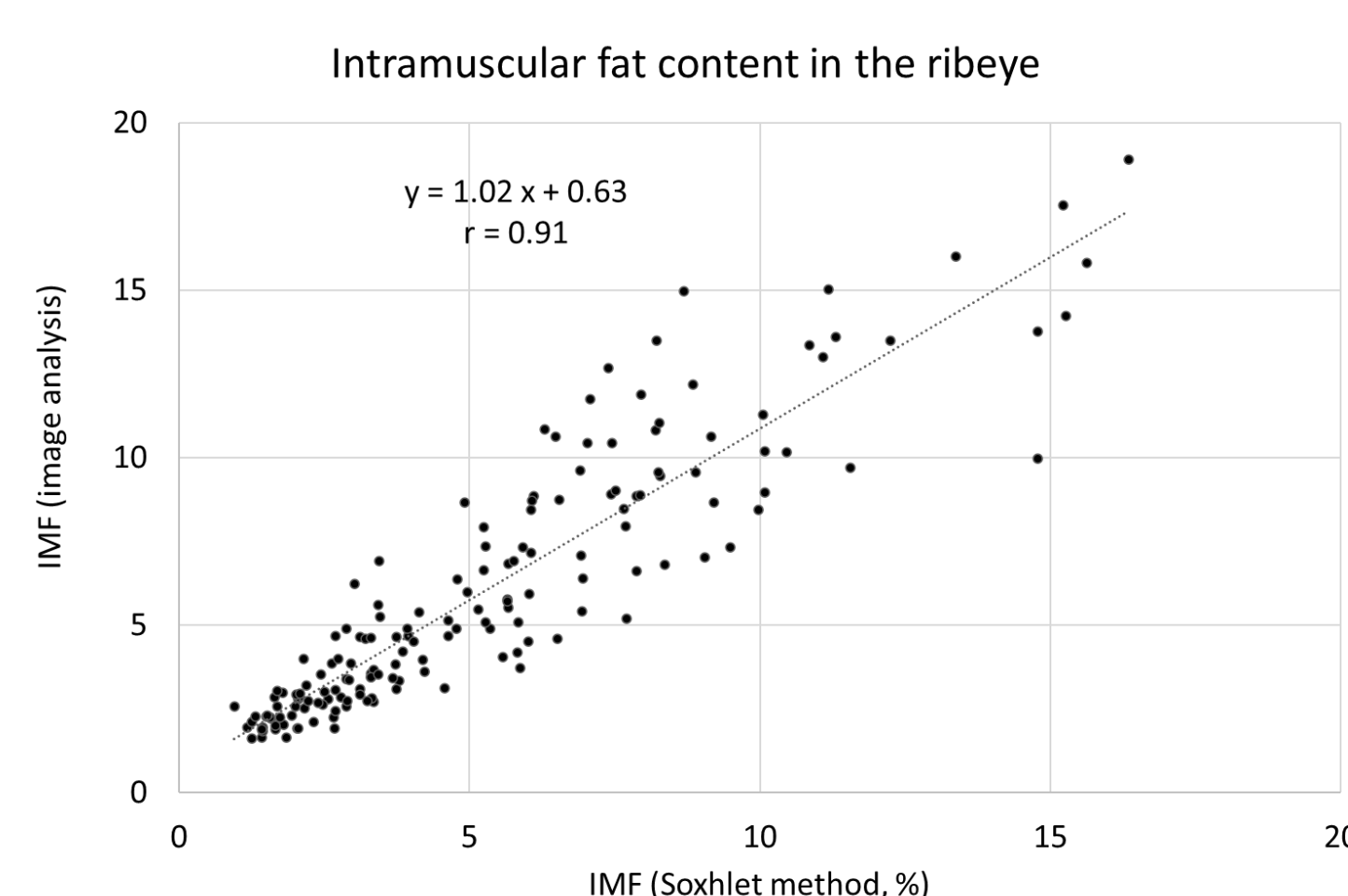
The Meat@ppli application is a successful proof-of-concept for estimating the fat content of the 6<sup>th</sup> rib of a bovine carcass in real time from its photo. A simple imaging device – a smartphone fitted with polarizing filter – was developed to obtain good-quality images in a poorly controlled environment. Automatic image analysis algorithms, using artificial neural networks, were developed to predict the intramuscular fat content of the ribeye and the total fat content of the 6<sup>th</sup> rib. In the future, Meat@ppli could be used by the beef industry to route carcasses to the most suitable distribution channels and to perform massive phenotyping for the selection of bovines with appropriate marbling.

## MATERIALS AND METHODS

- **Step 1:** Cross section images of the 6<sup>th</sup> rib from 164 carcasses chosen to be representative of the European beef marbling variability, were captured with a smartphone Samsung® Galaxy S8 fitted with polarizing filters.
- **Step 2:** The ribs were then removed to determine gold standard measures: total fat content by dissection and weighing, and intramuscular fat content (IMF or marbling) by the Soxhlet method.
- **Step 3:** From more than 3500 images of 6th ribs and gold standard measures, several artificial neural networks were trained to segment the rib, the ribeye, IMF in the ribeye and total fat in the rib.
- **Step 4:** The prediction models were then embedded in the Meat@ppli application.



## RESULTS



- The correlations between the gold standards and the parameters from the image analysis were strong
- With correlation coefficients of 0.91 for IMF
- With correlation coefficients of 0.79 for total fat content

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