Correlations Between the Different Pig Carcass Grading Methods Before and After Changing the Romanian National Formula

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Abstract. Classification of pig carcasses trough objective methods of assessment of carcass lean meat content in slaughterhouses began in Romania in autumn 2004. The methods have been approved by a national experimental dissection done according to the EU reference model used to establish lean meat content. A new dissection experiment took place during 2007 and led to change the formulas for calculating from July 2008 for the optical device method (FOM) as well as the two point’s method (ZP). On this background, while applying the new formulas, we found differences in the correlation between the results obtained through the ZP and FOM methods. In order to quantify these differences, a series of experiments have been conducted in a slaughterhouse, applying both methods on a total number of 162 carcasses. From the data’s collected a difference of 1.8 % lean meat content between the results obtained by applying both methods on the same carcasses has been determined, this having important financial implications. In conclusion, a new national dissection experiment is needed for re-correlation of the results of the two methods, as both farmers and slaughterhouse operators may feel cheated by the results, but legislation imposed them as the basis of value calculation for pigs delivered for slaughter.

Keywords: pig, carcass, grading, lean meat, national dissection experiment.

INTRODUCTION

Classification of pig carcasses in slaughterhouses in Romania started in autumn 2004. The methods used were approved by a national dissection experiment, conducted on 179 cases, according to the EU reference method (Zenici, 2004). A new dissection experiment took place in 2007, on a number of 145 carcasses (Movileanu, 2008), and led to changes in calculation formulas since July 2008 for both the optical probe method (FOM) and by the method of two points (ZP).

After applying the new formulas, we have found differences in the correlation between the quality of carcasses obtained by ZP and FOM methods. To quantify these differences, we conducted a series of experiments in a slaughterhouse in Timisoara, from 19 to 26 January 2010, using several methods for 162 carcasses.

Weekly reports of the price of pig carcasses are submitted to the Commission by MAFRD from January 1, 2007, when Romania joined the EU. The market price for pig carcasses in Romania is the average of the quotations for pig carcasses registered by the Carcass Grading Commission. The market price relates to "standard" (Class E) quality for carcasses from 60 to 120 kg.

An E.U. Commission determines the weekly average price for pig carcasses in the Community by weighting the prices recorded in each Member State by coefficients expressing the relative size of the pig population in each Member State. Romania has 4.0% share of the Community average pricing and ranks 9 between Member States in this regard.
MATERIALS AND METHODS

For the purpose of the study we used swine carcasses from the slaughter dates of: 19/01/2010 = 11 carcasses; 22/01/2010 = 11 carcasses and 26/01/2010 = 140 carcasses.

As working methods the following were used:
• Determination of the percentage of lean meat with Fat-O-Meater
  Calculation of percentage of lean meat is based on the thickness of fat and muscle measured at the third to fourth last rib at a distance of 7 cm from the midline.
  Actual measurement is performed by an operator with a manual measuring instrument, i.e., a probe that penetrates through the skin and fat and meat tissue; lean meat content calculations are performed on a microprocessor embedded in the terminal with buttons and interface functions.
  Components of the Fat-o-Meater device:
  The device is equipped with a probe diameter of 6 mm, containing a type photodiode Siemens SFH 950/960 with an operating margin of between 3 and 103 mm. Results of the measurements are converted into estimated lean meat content using a computer.
  • Zwei Punkte method (ZP) is performed by using a ruler.
  Determining the percentage of meat with Fat-O-Meater device according to Romanian legislation in force from 17 July 2008:
  Lean meat content is calculated using the following formula:
  \[= 60.26989 - 0.81506 \times X1 + 0.20097 \times X2\]
  where:
  \[= \text{Estimated percentage of lean meat in carcass}\]
  \[X1 = \text{thickness of the bacon (including skin) in millimetres, measured at a distance of 7 cm from the midline;}\]
  \[X2 = \text{thickness of the bacon (including skin) in millimetres, measured at 7 cm from the midline between the third and fourth last rib.}\]
  The formula is valid for carcasses weighing between 50 and 120 kg.
  Determining the percentage of meat with Fat-O-Meater device according to Romanian legislation before 17 July 2008:
  The percentage of muscle tissue of the case is based on the following formula:
  \[Y = 52.2925-.5252 \times .1837 \times G1 + F1\]
  where:
  \[Y: \text{estimated percentage of muscle tissue in the carcass;}\]
  \[G1: \text{thickness of fat between the third and fourth last rib, 7 cm from the midline;}\]
  \[F1: \text{Longissimus dorsi muscle thickness between the third and fourth last rib, 7 cm from the midline.}\]
  The formula is valid for carcasses weighing between 50-120 kg.
  Determining the percentage of meat by ZP method, according to Romanian legislation in force from July 17, 2008:
  1. Grading is performed using a ruler.
  2. The lean meat content of the carcass is calculated using the following formula:
  \[= 50.89767 - 0.70985 \times 0.26457 \times X1 + X2\]
  where:
  \[= \text{Estimated percentage of lean meat in carcass}\]
  \[X1 = \text{thickness of the bacon (including skin) in millimetres, above Gluteus medius muscle, at minimum;}\]
X2 = meat thickness in millimetres, in a straight line between the spinal canal and Gluteus medius muscle at peak.

The formula is valid for carcasses weighing between 50 and 120 kg.

Determining the percentage of meat by ZP method, according to Romanian legislation in force until July 17, 2008:

1. Classification of pig carcasses is carried out using the method of estimation ZP.
2. The percentage of muscle tissue is calculated using the following formula:
   \[ Y = 50.226 - 0.6105 \times 0.2148 \times S_1 + S_2 \]
   where:
   - Y: estimated percentage of muscle tissue in the carcass;
   - S1: Gluteus medius muscle thickness over bacon, including skin, at minimum;
   - S2: thickness of meat in a straight line of the spinal canal and Gluteus medius muscle at peak.

   The formula is valid for carcasses weighing between 50-120 kg.

RESULTS AND DISCUSSION

Given the technological and work program, for the first experiment the last 11 carcasses arriving from Iecea Mare farm were used, which led to the use of cases with a high weight variation, with four of 11 carcasses weighing over 100 kg. Since we cannot know before this and no influence on the results, we decided to resume the next day slaughter experiment.

At this time, working on carcasses provided from Ciacova farm, we also found a great variability in terms of carcass weight from 69 to 103 kg. Graphic interpretation of the results gave a different form that the previous experiment. We decided to make a new experiment on a larger number of cases to increase the relevance of the data.

We included data accumulated in the table and we looked them as shown in the chart below, taking into account the averages for each farm by each method. The graphical interpretation of the results reveals a strong resemblance to last three sequences of data, from the pig carcasses originating from Voivodeni, Boldur and Gataia farms, obtained on a large number of cases with a small variation of their weight.

Data from the chart expresses the results of the comparison of lean meat percentage obtained by the new formula FOM with new formula ZP, as well as the old formulas applied. In the chart below, you can see that the new formula did not meet the proportionality in terms of increasing lean meat percentage obtained compared to that obtained by the old formula.
As it is seen on this graphic also, the old formulas had a closer correlation in results obtained by grading same carcasses with different methods, while applying the same calculation for the new grading formulas generates increasing columns.

The economic value of data obtained:
Weekly reports on the price of pig carcasses are based on data sent from the classifiers working in slaughterhouses about quality and price.
In the period under review, the national average of percentage lean meat in carcass classified is reported to be 60.2%, with an average price of 648.97 RON/100 Kg. for Week 3 (18-24 January 2010) (Comisia, 2010).

In the week 18 to 24 January 2010- Week 4 -national average of percentage lean meat in carcass was: 60%, with an average price of 641.44 RON/100 Kg. (Comisia, 2010).

In Week 3 (18-24 January 2010) 13.01% of cases were classified by ZP method, as long as in week 4 (25 to 31 January 2010) 16.57% of cases were classified by ZP method.

In the current economic situation, with the relatively high value of investment needed in order to use an automated grading system, as well as the legal requirement that leaves most of the Romanian slaughterhouses out of the range of weekly slaughtering numbers asking such a system, both methods are expected to remain in use for a long period.

CONCLUSIONS

During our experiments, we found a mean difference of 1.8% percent of carcass meat content according to the classification method applied to the same cases. Given the national average percentage of meat in carcass, falling 60% line, and the difference of ± 2% of value paid to farmers for each share of meat in ± at national level the resulting value is:

- 674,460 RON for Week 3
- 687,116.3 RON for Week 4

This value could be claimed by the parties involved as either being paid excessively, either not received, pending on the approach of considering the results of FOM or ZP method as being accurate.

As well, it is worth to mention the fact that state subsidies have been paid to the pig farmers based on the lean meat content of the carcasses obtained from the pigs delivered to the slaughterhouses in the 2007-2009 period.

Changing the carcass grading formula inside this time frame determined the flow of pigs to certain slaughterhouses based on the grading method, in order to get as many as possible pigs inside the frame of results assuring the highest subsidy value on one hand, and different deboning yields obtained from carcasses graded identical, but with different methods, on the other hand, all parties starting to doubt about the results.

The data analyzed is showing that, after changing the formulas for calculating the results of swine carcasses grading, classification of same carcass by two different methods gives different results and may affect all parties involved: farmers, slaughterhouse operator, classifier, customer, national institutions and European analysis and statistics.

A new national dissection is necessary for the re-correlation of the results of the swine carcass grading by different methods.

REFERENCES