

## ORIGINAL PAPER

**SLOVENIAN EXPERIENCE IN PIG CARCASS CLASSIFICATION ACCORDING TO SEUROP DURING THE YEARS 1996 TO 2004****SLOVENSKE IZKUŠNJE PRI OCENJEVANJU MESNATOSTI PRAŠIČEV PO SEUROP V LETIH 1996 DO 2004****Marjeta ČANDEK-POTOKAR<sup>1\*</sup>, Milena KOVAČ<sup>2</sup>, Špela MALOVRH<sup>2</sup>**<sup>1\*</sup>Agricultural Institute of Slovenia, Hacquetova 17, 1000 Ljubljana

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**ABSTRACT**

Slovenian results on pig carcass classification according to SEUROP (average lean meat percentage, carcass weight, measurements of fat and muscle and their variability) are presented for years from 1996 to 2004. In these years, an important increase of average lean meat percentage was noted (51.9 % in year 1996 vs. 55.9 % in year 2004). As a consequence the percentage of pig carcasses being graded into S and E classes was almost tripled from 1996 to 2004 (21.3 to 58.2%, respectively). This improvement was initiated by the payment according to the lean meat percentage, to which pig breeders responded by better management of herds and partly by increased use of pietrain breed. Potential for further improvement remains in attaining genetically more uniform herds and reduction of carcass weight variability. A new method, introducing an optic probe Hennessy, adapted to changes of the EU legislation, is expected to shift up the average meat percentage close to 57%, which places Slovenian pigs into the EU average.

**KEY WORDS: pig / carcass classification/ SEUROP / lean meat percentage / Slovenia****POVZETEK**

S prispevkom želimo predstaviti slovenske izkušnje pri ocenjevanju mesnatosti prašičjih klavnih trupov po SEUROP sistemu v letih 1996 do 2004. Metoda, ki je bila vpeljana leta 1996 upoštevajoč EU zakonodajo in imenovana DM5, temelji na izračunu odstotka mesa v prašičjem klavnem trupu na podlagi enačbe, ki vključuje dve meritvi na liniji razseka trupa; meritev F, ki je debelina slanine na mestu, kjer je ta najtanjša oziroma kjer se m. gluteus medius najbolj vrašča v slanino ter meritev M, ki je razdalja med kranialnim robom m. gluteus medius in dorzalnim robom hrbtničnega kanala, kot kazalcem debeline hrbtnice mišice (slika 1). Zbrali smo mesečne statistične podatke (poprečja in standardne odklone) za obdobje od julija 1996 do decembra 2004 za lastnosti, ki se merijo ali izračunajo; za meritvi M in F, za odstotek mesa v trupih in klavno težo trupov. Zbrane podatke smo prikazali na letni osnovi (preglednica 1). Z regresijsko analizo, oziroma uporabo procedure REG statističnega paketa SAS, smo ocenili mesečne trende ter jih grafično prikazali. Rezultati ocenjevanja mesnatosti prašičev na klavni liniji kažejo na velik napredek v mesnatosti prašičev. Poprečni odstotek mesa v trupih se je dvignil iz 51,9 % v letu 1996 na 55,9 % v letu 2004 (preglednica 1), kar v obliki trendov predstavlja statistično značilen ( $p < 0,001$ ) pozitiven trend na ravni 0,045 % mesečno oziroma 0,54 % letno (slika 7). Ta napredek v mesnatosti pripisujemo predvsem uvedbi plačevanja na osnovi odstotka mesa v trupih ter posledično izboljšanju rejskega dela ter deloma tudi večji uporabi pasme pietrain pri križanju; ne moremo pa jih pripisati spremembam v teži klavnih trupov, saj se ta ni bistveno spremenila (preglednica 1). Rezerve za izboljšanje klavne kakovosti prašičev ostajajo v zagotavljanju večje izenačenosti populacije glede na klavno težo in mesnatost. Ugotavljamo namreč veliko variabilnost v klavni teži (preglednica 1), ki bi jo bilo mogoče izboljšati z ustrezno plačilno shemo (pribitki oziroma odbitki glede na klavno težo) ter veliko variabilnost v mesnatosti, ki je delno posledica variabilnosti v teži, delno pa velikega števila različnih genotipov v relativno majhni populaciji prašičev. V letu 2004 naj bi se uveljavila nova metoda, ki temelji na uporabi optične sonde Hennessy Grading Probe in je prilagojena spremembam EU zakonodaje. Pričakujemo, da bo nova metoda dvignila poprečno mesnatost blizu 57 %, ta rezultat pa uvršča mesnatost slovenskih prašičev v EU poprečje.

**KLJUČNE BESEDE: prašič / klasifikacija trupov/ SEUROP / mesnatost / Slovenija**

## INTRODUCTION

Grading of pig carcasses has quite a long tradition in Slovenia. It was first introduced in the former state Yugoslavia, as an obligatory standard in 1973 and later replaced by the regulation in 1985 [7]. The payment of pigs was based on the so called meat units (kg of meat in four main cuts). When Slovenia became independent, the old system was abandoned and the payment of pigs according to live weight was practiced, which negatively affected the carcass quality. In 1996, the method was replaced by a new one, named DM5<sup>1</sup> [4], which was prepared according to the EU regulations (SEUROPE classification) [1, 2]; i.e. on the basis of the total dissection on 120 pig carcasses and root mean square error of prediction inferior to 2.5 [2]. Meanwhile, the EU regulation [1, 2] was changed by amendments. The total dissection was replaced by a new reference method i.e. dissection of only four main cuts [10]. This change had practical implications. As a consequence EU countries had to harmonize their methods. In addition, the methods based on the total dissection would underestimate the lean meat percentage compared to the new reference dissection. Another reason that supported the idea to renew Slovenian method was important increase of average lean meat percentage. Thus in Slovenia, the decision was taken to renew the method for pig carcass grading, and to introduce an optic grading probe Hennessy Grading Probe (Hennessy Grading Systems Ltd., Auckland, New Zealand). The new method HGP4 has been prepared and published [5]. It is foreseen, that it shall be implemented on the slaughter line in 2004. The objective of the present paper is thus to make an overview of the past eight years of Slovenian experience in pig carcass grading according to the EU regulation.

## MATERIAL AND METHODS

Officially approved method DM5 [6] consists of two measurements taken at the carcass split line which enter into the equation DM5 to give lean meat percentage (Fig. 1). The method was approved for carcasses having weight in the range of 50 to 120 kg. At the slaughter line, the measurements are taken by the operator using a caliper connected to the computer (Fig. 2). The grading of carcasses is performed only in the abattoirs that slaughter more than 200 pigs per week on a yearly average basis and only for carcasses that are dehaired and prepared according to legislation [2, 6].

<sup>1</sup>abbreviation DM5 is coming from Slovenian word "dvomestna metoda" i.e. translation of german word "zweipunkt"; the fifth equation which was checked fulfilled the required error term

The information on pig carcass classification was collected from the summary reports on pig carcass grading from the start in July 1996 to October 2004 [8]. Besides number of carcasses classified, the average value and standard deviation of the following traits were recorded for each month:

- M; distance in mm between the cranial edge of m. gluteus medius and the dorsal edge of canalis vertebralis measured at the carcass split line (Fig. 1) as an indicator of muscle depth
- F; fat thickness (thinnest part) in mm measured at the level of m. gluteus medius at the carcass split line (Fig. 1)
- warm carcass weight and
- carcass meat percentage calculated using DM5 equation [4].

Graphical presentations of changes over time were made. In order to evaluate the changes of lean meat percentage, warm carcass weight and measurements of M and F, the regression analysis was performed using REG procedure of the SAS statistical package [9].

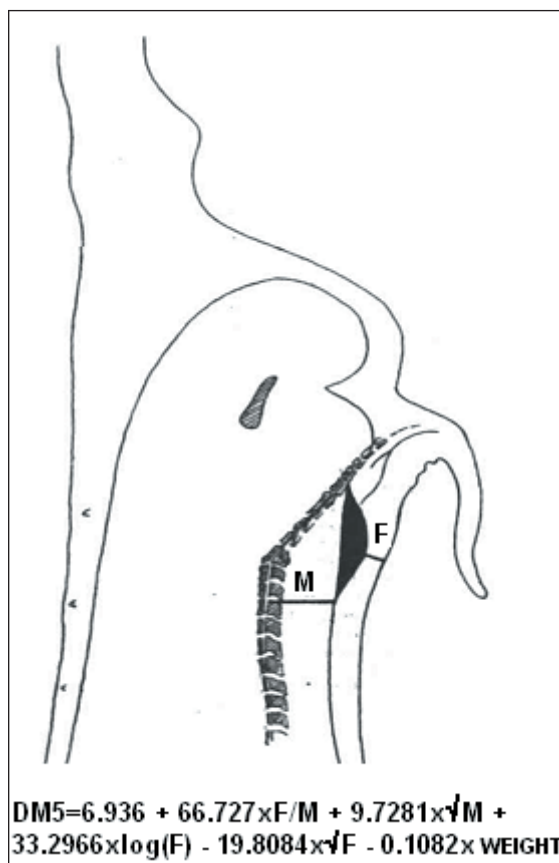


Figure 1: Slovenian method for evaluation of pig carcass lean meat % in years 1996-2004

## RESULTS AND DISCUSSION

### a) Number of classified carcasses

According to official statistics [10] for the period 1996 to 2003, about 730 000 to 850 000 of pigs were slaughtered yearly in Slovenia; out of that only 30 to 50 % were graded on the slaughter line. After the grading of pigs according to the SEUROP classification had started, the number of graded carcasses gradually increased (Table 1). In 1999, there was a notable increase in number of graded pigs. This increase could be explained by the crisis on the Slovenian pig market. In the spring of 1999 the government had to intervene on the pig market; as a consequence more pigs were sold to the abattoirs which grade. Already in year 2000 the number of graded pigs declined (but was higher than in 1998) and for the next two years remained at similar level, and thereafter increased. In the year 1996 when the grading of pigs according to the SEUROP classification started, about fifteen thousand pigs were graded monthly, and the number is presently almost doubled. Gradual increase in number of graded pigs could be explained by the structural changes in meat industry, especially in the abattoirs. Closing of small abattoirs and specialization can be expected to continue.



Figure 2. Measuring with the caliper at the carcass split line

### b) Measurement M (loin muscle depth)

Comparing years 1996 and 2004, the increase in M is close to 4 mm (Table 1). On a yearly basis, the average of M shows tendency to increase. The monthly averages (Fig. 3) show a notable variation of M within a year, but overall, there is a significant positive trend confirmed by the regression analysis ( $b_1=0.03$  mm per month,  $R^2=0.58$ ,  $p<0.001$ ). The increase in M over time indicates a progress in muscle thickness and therefore muscularity of pigs.

### c) Measurement F (fat thickness)

The average backfat thickness in the year 1996 was 20.0 mm and in 2004 it was 14.8 mm resulting in 5.2 mm of reduction (Table 1). On a yearly basis, the average back fat thickness constantly decreased. The graphical presentation (Fig. 4) of monthly averages shows a significant negative trend confirmed by a regression analysis ( $b_1=-0.06$  mm per month,  $R^2=0.86$ ,  $p<0.001$ ). Lesser extent of decrease in carcass fat thickness in last years accompanied by a slight shift up in 2003 indicates a possibility of standstill in the progress.

### d) Warm carcass weight

Monthly averages for carcass weight of graded pig carcasses varied remarkably within a year (Fig. 5) but less between the years (Table 1). We can observe a certain pattern of increase and decrease within years; lower average carcass weight during summer months can be explained by increased demand and higher average carcass weight at the beginning of the year by decreased demand and difficulties in selling pigs. However, on the whole, the graphical presentation of monthly averages reveals a minor but significant trend of decrease in carcass weight ( $b=-0.015$  kg per month,  $R^2=0.04$ ,  $p<0.05$ ) during the observed period. To our opinion, this result could be explained by the fact, that some farms abandoned prolonged fattening of pigs.

Variability of carcass weight makes a part of carcass quality evaluation as it shows the uniformity of pig population. It also depends on the weight range for which the method is valid; in case of larger range, also larger variation can be expected. However, high variation in carcass weight points to the insufficient uniformity of the pig population. During the years 1996 to 2004, the standard deviation of carcass weights on a monthly basis varied between 10 and 13 kg giving a coefficient of variation between 12 and 16 %, as shown in [8]. During the years 1996 to 2004 the variability of pig carcass weight slightly decreased (Table 1), however no major progress in this perspective can be noted.

In Slovenia, pigs are paid according to the lean meat

Table 1. Descriptive statistics for pig carcass grading in Slovenia from 1996 to 2004

| Year                     | Number of graded pig carcasses |                                   | Carcass weight, kg | F, mm            | M, mm            | Lean meat, %     |
|--------------------------|--------------------------------|-----------------------------------|--------------------|------------------|------------------|------------------|
|                          | total                          | per month<br>( $\bar{x} \pm sd$ ) | $\bar{x} \pm sd$   | $\bar{x} \pm sd$ | $\bar{x} \pm sd$ | $\bar{x} \pm sd$ |
| 1996 (7-12) <sup>1</sup> | 107572                         | 15367<br>± 2695                   | 83.21<br>± 12.54   | 20.01<br>± 6.46  | 64.51<br>± 6.87  | 51.94<br>± 3.82  |
| 1997                     | 244657                         | 20388<br>± 2286                   | 82.73<br>± 12.67   | 19.64<br>± 6.44  | 65.87<br>± 6.85  | 52.53<br>± 3.93  |
| 1998                     | 264360                         | 22038<br>± 4760                   | 84.72<br>± 12.45   | 19.10<br>± 6.18  | 66.72<br>± 6.77  | 52.81<br>± 3.91  |
| 1999                     | 388575                         | 32382<br>± 8406                   | 82.66<br>± 11.58   | 17.92<br>± 6.05  | 66.12<br>± 6.61  | 53.43<br>± 3.89  |
| 2000                     | 308161                         | 25676<br>± 4485                   | 80.89<br>± 11.30   | 16.48<br>± 5.75  | 66.46<br>± 6.66  | 54.48<br>± 4.00  |
| 2001                     | 301317                         | 25107<br>± 3523                   | 82.53<br>± 11.57   | 15.85<br>± 5.64  | 67.24<br>± 6.83  | 54.95<br>± 4.19  |
| 2002                     | 334289                         | 27857<br>± 3953                   | 82.13<br>± 11.71   | 15.44<br>± 5.50  | 67.80<br>± 7.00  | 55.41<br>± 4.20  |
| 2003                     | 356580                         | 29455<br>± 2455                   | 82.73<br>± 11.68   | 15.57<br>± 5.43  | 68.39<br>± 7.09  | 55.47<br>± 4.17  |
| 2004 (1-10) <sup>2</sup> | 286403                         | 28640<br>± 4560                   | 82.68<br>± 11.69   | 14.82<br>± 5.34  | 68.35<br>± 7.11  | 55.89<br>± 4.15  |

<sup>1</sup>from July to December 1996<sup>2</sup>from January to October 2004

percentage evaluated on the slaughter line, but there is no adjustment of payment according to the carcass weight. Additionally, pigs are not paid according to the individual meat percentage but according to the batch average. Hence, for the same average lean meat percentage, a group of pigs at two extremes (very light and very heavy), will get the same payment as a group of uniform pigs. In order to reduce the variability in carcass weight, the paying system should award the uniformity of pig carcasses which can be achieved by including carcass weight as additional criteria in the payment system.

#### e) Lean meat percentage

On a yearly basis, the average carcass lean meat percentage continuously increased (Table 1). This result corroborates the observed changes in fat thickness, which is the most important factor in the equation for calculating lean meat percentage. The average lean meat percentage of pig carcasses in the year 1996 was 51.9 % and in 2004 it was 55.9 %, giving an increase of 4.0 % points. As a result, less than a quarter (21.3 %) of pig carcasses were graded in the S and E class in 1996, whereas in 2004 more than a half (58.2 %) of all carcasses were graded into S and E class (Fig. 6). Monthly averages (Fig. 7) show a continuous increase in carcass lean meat percentage

confirmed by a significant positive trend ( $b_1=0.045$  % point per month,  $R^2=0.92$ ,  $p<0.001$ ).

This important improvement in carcass quality was initiated by the payment according to lean meat percentage. When the system of payment according to carcass value and not live weight was restored, pig breeders responded by better management of herds and some of them also by increased use of boars of pietrain or pietrain crosses. However, it is difficult to evaluate the contribution of each from the available data. To our opinion, the improvement of carcass quality could be even better, if the paying system was based on the individual evaluation and not just batch average.

As mentioned earlier, there seem to be a slowdown of progress in the quality of slaughtered pigs after 2002. However, the present result is expected to be improved with the new, harmonized method with Hennessy probe. The recent study showed that we can expect an average lean meat percentage close to 57% [3], which puts Slovenian results close to the EU average. Due to the genetic composition of Slovenian herds we find this result realistic. Moreover, there are many types of breeds and crossbreeds for the size of pig population, which makes the population very heterogeneous. Further progress in lean meat percentage of Slovenian pig population can

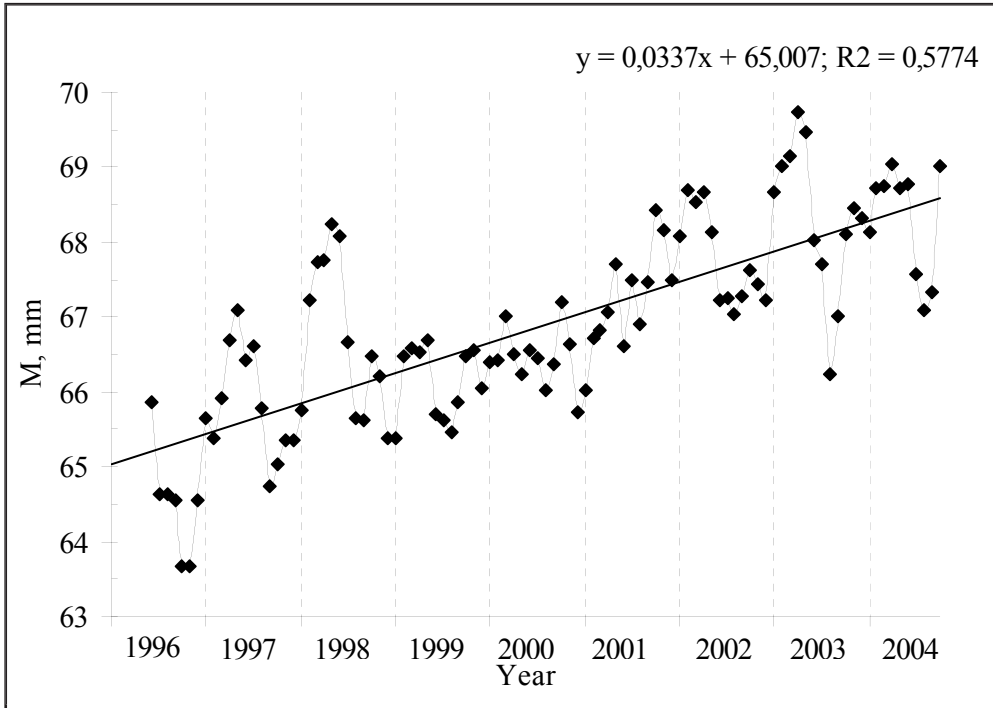


Figure 3. Changes of M (muscle depth) and overall trend of increase from 1996 to 2004

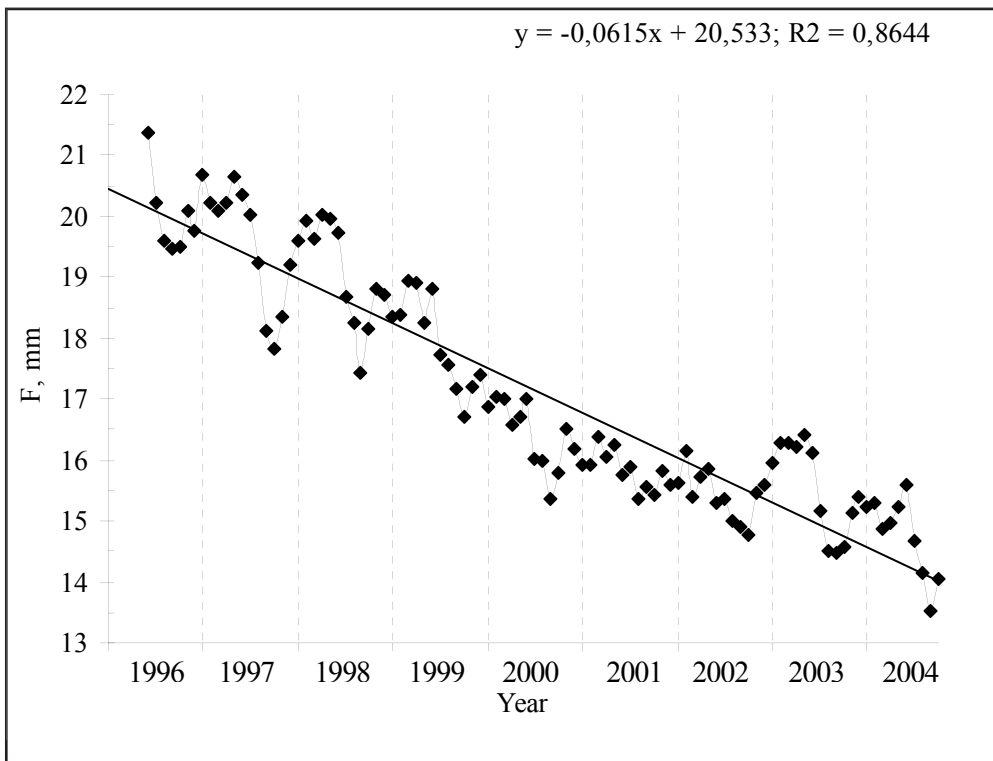


Figure 4. Changes of F (fat thickness) and overall trend of decrease from 1996 to 2004

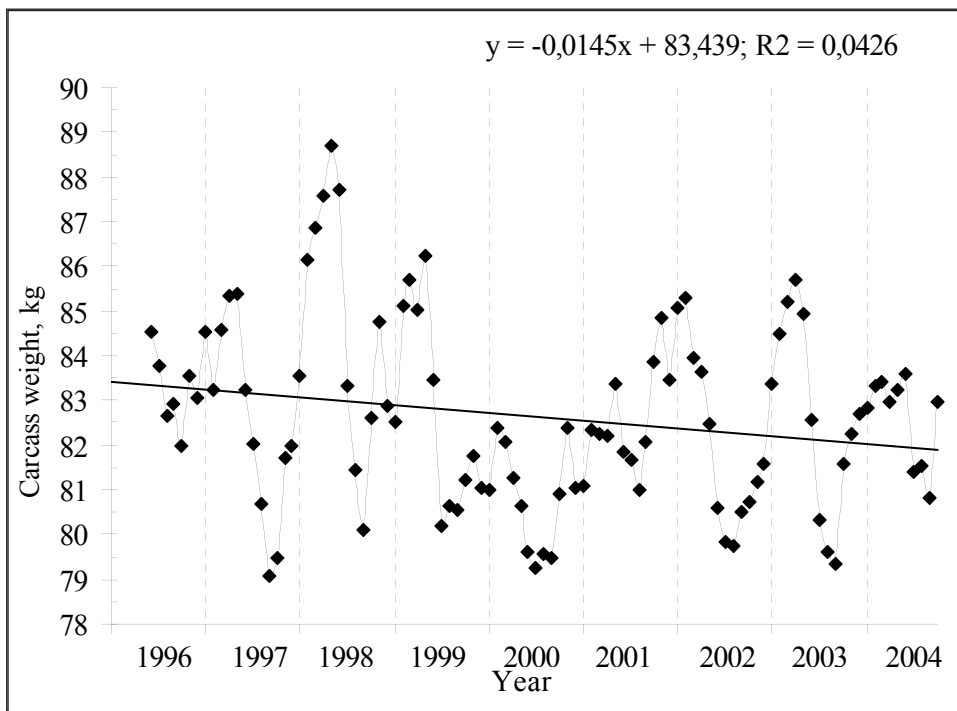


Figure 5. Changes of pig carcass weight and overall trend of decrease from 1996 to 2004

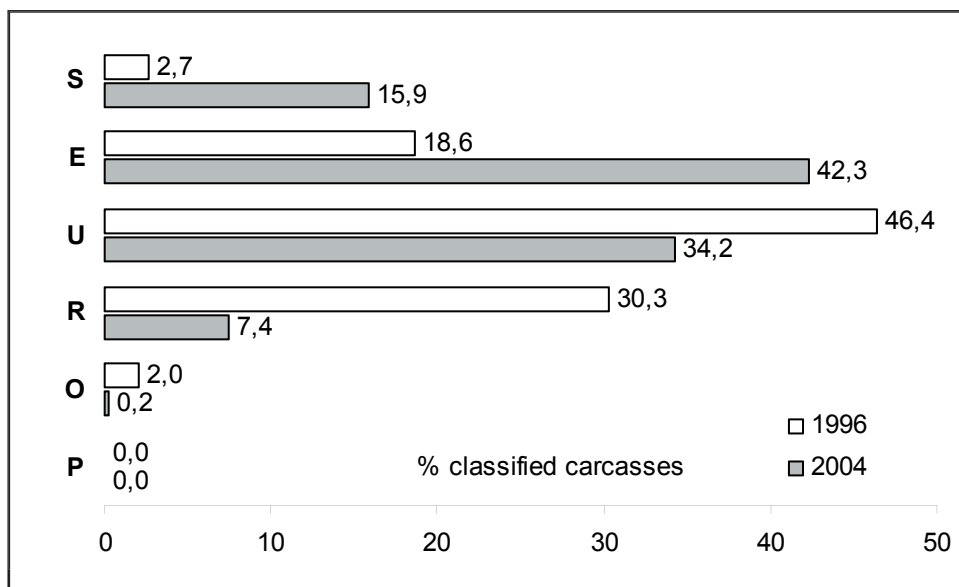


Figure 6. Distribution of pig carcasses according to SEUROP class in 1996 and 2004

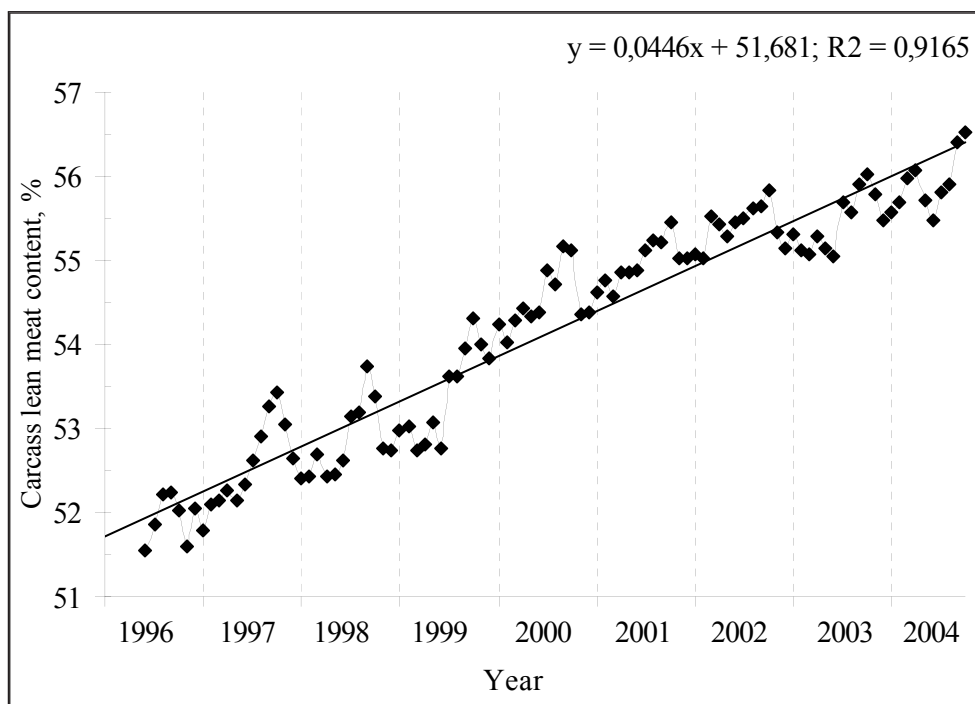


Figure 7. Changes of pig carcass lean meat % and overall trend of increase from 1996 to 2004

therefore be expected if genetically more uniform pig population is obtained and/or in case of increased use of meaty breeds. However, the later could be detrimental to meat quality.

## CONCLUSIONS

Introduction of SEUROP classification and payment according to carcass lean meat percentage in Slovenia lead to continuous progress. After seven years of grading, more than one half of all pigs are graded in S and E classes. With new, harmonized method a shift up in lean meat percentage is expected, placing Slovenian pigs in the EU average.

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