Economic Consequences of Different Lean Percentage Estimation Methods

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SUMMARY

The economic effects of the choice of two different lean percentage estimation methods and terminal sire breed were investigated on 53 pig carcasses divided in two groups. In the 1st group were progeny of Pietrain used as terminal sire (n=25) and in 2nd the progeny of Large White terminal sire. It was found that the breed of terminal sire haven't had influence on cold carcass weight and fat thickness measured for TP method of lean percentage estimation. Inclusion of Pietrain as terminal sire had influence on MLD thickness measured for TP and INS methods which was significantly higher, while fat thickness measured for instrumental method was significantly lower ($p<0.01$). Carcasses of the same group had higher lean percentage estimated by TP and INS methods ($p<0.05$ and $p<0.01$, resp.). Also, different methods of lean percentage estimation resulted in different classification of the carcasses into SEUROP classes. The choice of the lean percentage estimation method had no significant effect on the price of the carcasses from 2nd group which had Large White as terminal sire, while in pig carcasses from the 1st group (Pietrain as terminal sire), the choice of lean percentage method of estimation determined the price of the carcasses, and by this also economic surplus (or loss) of the producers. It is concluded that both methods are equally applicable in the case of Large White crossbreeds, while caution should be taken in the case of pig carcasses originated from Pietrain as terminal sire because carcasses of such pigs reached higher prices when estimated by instrumental method.

KEY WORDS

lean percentage estimation, market, pigs, value

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INTRODUCTION

The choice of pig carcass quality in relation to the price which satisfies the offer at the market is rather complex and rises many questions and different approaches in its application. In theory, there are more approaches to this issue and in our conditions the most acceptable one is so called "market approach" which implies the connection between the producers and consumers. The needs and relations developed by this approach in all segments of food production must necessarily be adjusted to numerous qualitative and quantitative changes at the market surrounds us and also to the market law which propose "good quality of goods offered to the consumers with adequate price to the final consumer which at the same time coveres all the expenses of production with profit of the produced calculated in". The market approach enables the most efficient solution to the consumers and producers demands by putting them into equal position. The producers want to maximize the profit in a long term by selling high quantities of their products and to accomplish the highest possible prices. On the other side, typical consumer wants to satisfy his needs as much as possible buying with his moderate and limited money sources and at most possible lowest prices. However, the application of market approach is not at all easy to be done in praxis as shown in the current study.

The market of trading with pig carcasses in Croatia is ordered by Regulations (1999) which prescribe two methods for carcass lean percentage estimation: instrumental and manual method ("Two Points"-TP). For both methods prediction equations are set by which the percentage of muscle tissue in the pig carcass is calculated. On the basis of such calculations pig carcasses are classified into quality classes (SEUROP). It is also suggested that manual (TP) method should be applied on groups of slaughtered animals up to 50, while for bigger groups (over 50) carcasses instrumental method for lean percentage estimation must be used. However, the results obtained by these two methods do not always have to be in agreement since they employ two different equations. Petričević et al. (1993) reported that swine carcass classification according to SEUROP system differed regarding the applied method for lean percentage estimation. Anderson et al. (1995) found that Swedish carcass grading system generally underestimated the carcasses from Hampshire crosses (genotypes with larger and leaner hams) more than other breeds. Similarly, Kušec et al. (1998) found that genotype had influence of on lean percentage estimation in swine carcasses and that pig producers who use leaner genotypes could suffer financial losses due to possible incorrect classification. Having this in mind it is clear that differences in pig carcass classification can occur due to the lean percentage estimation method and genotypes that prevailed in the group of slaughter animals. The aim of current study is to investigate economic consequences of application two different lean percentage estimation method on two groups of crossbred pigs, differing in the breed of the terminal sire.

MATERIAL AND METHODS

This study was performed on 53 carcasses of three way crossed castrated pigs divided into two groups regarding the breed of the terminal sire. The dams were all double crossbred: Swedish Landrace x Large White, while Pietrain and Large White boars were used as terminal sire. Pietrain group had 25 and Large White group included 28 pigs. The pigs were slaughtered at approximately 100 kg live weight in "Sotin" slaughter plant VUPIK, Vukovar.

At the slaughter line, warm carcass weight was measured and after that, necessary measures for lean percentage estimation were taken. For two points method of lean percentage estimation, backfat thickness (mm) was measured caudally at the place where *m. gluteus medius* gets the deepest in the subcutaneous fat; muscle depth (mm) was measured as the shortest distance between the cranial end of *m. gluteus medius* and dorsal spinal edge. Backfat thickness and muscle depth (mm) for the purpose of instrumental method of lean percentage estimation were obtained by Fat-o-Meter (FOM). On the basis of two estimations of lean percentage carcasses were classified into SEUROP quality classes according to the following scheme:

Class	Carcass lean percentage (%)
S	60 and more
E	55 and more, but less than 60
U	50 and more, but less than 55
R	45 and more, but less than 50
O	40 and more, but less than 45
P	Less than 40

Calculation of the prices for investigated group of carcasses and graphs were made by Excel for Windows XP program, while statistical analysis was performed by use of SPSS 10.0 for Windows program package.

RESULTS AND DISCUSSION

It is obvious from Table 1 that sire line had no influence on cold carcass weight and fat thickness measured for "two points" (TP) method of lean percentage estimation. On the other hand, carcasses of the pigs from Pietrain group had significantly higher thickness of *m. longissimus dorsi* measured for "two points" and instrumental (FOM) method of lean percentage estimation, while fat thickness, measured at the place of instrumental method was

Table 1. Slaughter traits and difference between the pigs from two investigated groups

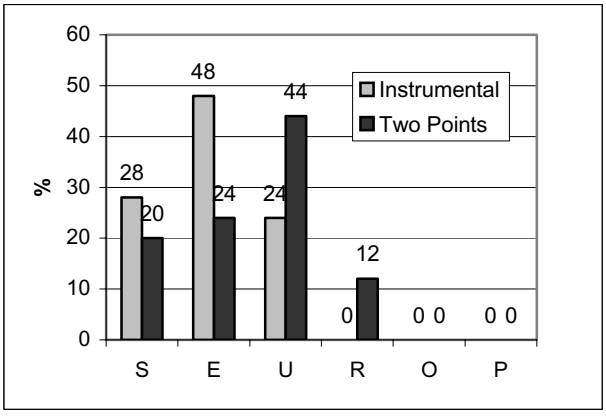
Slaughter traits	1st group	2nd group	Level of significance
Cooled carcass weight, kg	78.56	75.75	n.s.
Fat depth (TP), mm	16.60	19.57	n.s.
Muscle depth (TP), mm	70.48	63.71	p<0.01
Meatiness estimation (TP), %	55.21	52.06	p<0.05
Fat depth (INS.), mm	13.20	16.32	p<0.01
MLD depth (INS.), mm	61.60	53.79	p<0.01
Meatiness estimation (INS.), %	57.60	53.60	p<0.01

significantly lower (p<0.01) than in the carcasses from Large White group of pigs. These carcasses had also higher lean percentage estimated by both TP and instrumental method (p<0.05 and p<0.01, respectively).

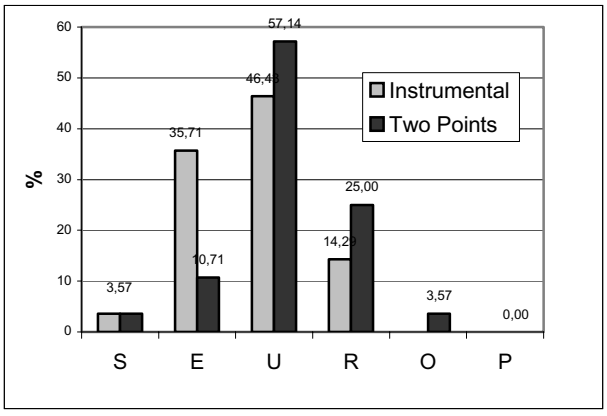
Contrary to present study, Hamilton et al. (2001) found significant effect of sire line on hot carcass weight. Sire line had significant effect on both hot and cold carcass weight, while no influence on carcass length, fat measurements and lean percentage was found by Miller et al. (2000). Similar results reported Leach et al. (1996) who found significant differences between the two sire lines in cold carcass weight and no differences in lean meat percentage, carcass length and fat measurements. However, these differences were influenced by different MHS-genotype of the sire.

Graph 1 presents the distribution (%) of the carcasses from the 1st group into (S)EUROP quality classes performed by two different methods of lean percentage estimation (instrumental and two points). It is obvious that different methods of lean percentage estimation yielded different results regarding the distribution of the carcasses into quality classes. In class S, 28% of the carcasses were classified by instrumental method, while two points method classified in the same class 20% of the pig carcasses from the 1st group. Similarly, 48% of the carcasses were classified into class E by instrumental method and only 24% of them were classified into the same class by TP method. Contrary to this, lower percentage of the carcasses were distributed in class U by instrumental than by TP estimation method (24% and 44%, resp.) In class R, 12% of the pig carcasses from the 1st group were classified by TP method and none by instrumental. The first group of carcasses originated from Pietrain terminal sires had no members in classes O and P by both methods.

On the graph 2, the distribution of the pig carcasses from 2nd group (Large White as terminal sires) into quality classes by instrumental and two points method of lean percentage estimation is shown. As can be observed, into class S, equal number of carcasses was classified by both methods (3.57%). Dramatic difference can be seen in the case of class E where 35.71% of the carcasses were classified by instrumental method, in contrast to only 10% which were estimated by TP method. Class U contained 46.43% of the pig carcasses from 2nd group when instrumental method was applied, but when TP estimation was applied, 57.14% of the carcasses were classified in the same class. Instrumental method estimated 14.29% carcasses to be in class R, while TP method classified into the same class 25% of the carcasses from the group of pigs with Large White as terminal sire. In class O, 3.57% of the carcasses were classified by TP method while by instrumental method no carcass belonged to this class. No carcasses from this group were found to belong to class P.



Graph 1. The distribution (%) of carcasses from the 1st group (Pietrain sires) into SEUROP classes



Graph 2. The distribution (%) of carcasses from the 1st group (Lage White sires) into SEUROP classes

Table 2. Procedure of carcass price calculation for the 1st group of pigs originated from Pietrain terminal sires

Live weight (kg)	Cooled carcass weight (kg)	Lean meat in carcasses INS. %	INS. kg	TP %	TP kg	Class	The price of lean meat kn/kg	kn/%	Carcass price (kn/kg) INS	TP	Carcass value (kn) INS	TP	The difference price class carcass : «R» class INS. %	INS. kn	TP %	TP kn	The price of the live pig (kn/kg) INS	TP
100	78.56	61.42	48.25	64.04	50.31	S	27.28	0.273	16.76	17.48	1316.66	1373.23	+27.89	+278.89	+33.54	+335.46	13.16	13.73
100	78.56	57.36	45.06	56.61	44.47	E	27.28	0.273	15.66	15.45	1230.25	1213.75	+18.32	+192.48	+17.60	+175.98	12.30	12.13
100	78.56	53.6	42.11	52.28	41.07	U	27.28	0.273	14.63	14.27	1149.33	1121.05	+11.56	+111.56	+8.33	+83.28	11.49	11.21
100	78.56			48.42	38.04	R	27.28	0.273		13.21		1037.77			±0.00	±0.00		10.37

Table 3. Procedure of carcass price calculation for the 2nd group of pigs originated from Large White terminal sires

Live weight (kg)	Cooled carcass weight (kg)	Lean meat in carcasses INS. %	INS. kg	TP %	TP kg	Class	The price of lean meat kn/kg	kn/%	Carcass price (kn/kg) INS	TP	Carcass value (kn) INS	TP	The difference price class carcass : «R» class INS. %	INS. kn	TP %	TP kn	The price of the live pig (kn/kg) INS	TP
100	77.21	60.62	46.81	60.78	46.93	S	27.28	0.273	16.55	16.59	1277.82	1280.91	+23.39	+233.94	+23.7	+237.03	12.77	12.81
100	77.21	56.87	43.91	57.22	44.18	E	27.28	0.273	15.52	15.62	1198.29	1206.02	+15.44	+154.41	+16.21	+162.14	11.98	12.06
100	77.21	51.99	40.14	52.61	40.62	U	27.28	0.273	14.19	14.36	1095.61	1108.73	+5.17	+51.73	+6.48	+64.85	10.95	11.08
100	77.21	49.11	37.91	49.53	38.24	R	27.28	0.273	13.41	13.52	1035.38	1043.88	±0.00	±0.00	±0.00	±0.00	10.35	10.44
100	77.21			44.38	34.26	O	27.28	0.273		12.11		935.01			-10.88	-108.87		9.35

The lean meat percentage is one of the most important traits of the pig carcasses because it is taken as a base on which the market value of the carcasses is formed. Obviously the different methods of estimation of the lean percentage yielded different classification of the carcasses which can have an economic effect on the value of the pig production. Also, it seems that the breed of the terminal sire can have influence on the results of different methods of lean meat percentage estimation, hence classification into SEUROP classes, as previously shown by Kušec et. al (1998).

Tables 2 and 3 show the procedure for price calculation of the carcasses of the 1st and 2nd group. As border value or null value for the value of the carcasses, R class was chosen. It can be seen from the results presented that in the 2nd group with Large White as terminal sire that application of instrumental (INS) and two points (TP) methods did not resulted in differences in mean estimated lean percentage (60.62% and 60.78%, resp.) as well in the final prices of the carcasses in question (12.77 kn/kg and 12.81 kn/kg). In other words, the choice of the estimation method havn't had significant influence on the price of the carcasses which means that both methods are equally suitable for estimation of lean percentage for this crossbreed. Contrary to this, in the 1st group with Pietrain, as the breed well known for its high lean yield, on the sire side in the crossing, the results of application of different methods (INS and TP) for lean percentage estimation revealed the differences in average lean percentage as well as in the prices of the carcasses. By two points (TP) method, the average estimated percentage of lean in the pig carcasses from class S was higher than in the case of instrumental method (60.04% and 61.42%, resp.) which resulted in higher prices of carcasses estimated by TP method. Simultaneously, in classes E and U, average lean percentages obtained by application of instrumental method were higher (57.36% and 53.60%, resp.) compared to the results of TP estimation method (56.61% and 52.28%, resp.). This resulted in higher price of carcasses of the pigs estimated by instrumental method in these classes. Therefore it is clear that the choice of lean percentage estimation method in pigs characterized by high lean meat yield (Pietrain) can determine the price of carcasses and by this economic surplus (or loss) of the pig producers.

CONCLUSION

On the basis of current study following conclusions can be drawn:

- The breed of terminal sire haven had influence on cold carcass weight and fat thickness measured for TP method of lean percentage estimation. Inclusion of Pietrain as terminal sire had influence on MLD thickness measured for TP and INS methods which was significantly higher, while fat thickness measured for instrumental method was significantly lower ($p<0.01$). Carcasses of the same group had higher lean percentage estimated by TP and INS methods ($p<0.05$ and $p<0.01$, resp.).
- Different methods of lean percentage estimation resulted in different classification of the carcasses into SEUROP classes.
- The choice of the lean percentage estimation method had no significant effect on the price of the carcasses from 2nd group which had Large White as terminal sire, which means that both methods are equally suitable for this crossbreed.
- In pigs characterized by high lean meat percentage such as the pigs from the 1st group with Pietrain as terminal sire, the choice of lean percentage method of estimation can determine the price of the carcasses, and by this also economic surplus (or loss) of the producers. These carcasses reached higher prices when estimated by instrumental method.

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