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THE EFFICIENCY OF PORKERS PRODUCTION OF INTENSIVELY AND EXTENSIVELY FEEDED

Pepliński Benedykt^{1*}, Wajszczuk Karol¹, Baum Rafał¹, Majchrzycki Dariusz¹, Wawrzynowicz Jacek¹, Lisiak Dariusz² & Janiszewski Piotr²

¹*Poznan University of Life Sciences, Department of Management and Law, Poland*
email: peplinski@up.poznan.pl, wajszczuk@up.poznan.pl, baum@up.poznan.pl, darmaj@up.poznan.pl, jacekwaw@up.poznan.pl

²*Institute of Agricultural and Food Biotechnology, Department of Meat and Fat Technology, Poland*
email: darek.lisiak@ipmt.waw.pl, pjanisz@bizon.ipmt.waw.pl
*corresponding author

Abstract: The aim of this study is a comparative analysis of the costs of production of intensively and extensively fed porkers in view of the qualitative parameters of meat obtained after slaughter. The production experiment, which involved the parallel fattening of 3 groups of 30 porkers (fed intensively up to a weight of about 120 kg and extensively up to weights of about 100 kg and 120 kg), was carried out between 2011 and 2012 in a deliberately selected farm. The researchers assumed average prices of the means of production and prices of livestock pigs in individual meatiness classes noted in Poland in 2012. The fattening started when the animals weighed about 40 kg. The feeds used for extensive fattening contained less total protein, energy and basic exogenous amino acids, but more raw fibre. The analysis proved that the extensive production of porkers up to 100 kg in 2012 was not profitable. The most profitable production was the intensive production up to 120 kg (a profit of €0.100 per kg, whereas in the extensive feeding up to 120 kg the profit was €0.072 per kg). The porkers which were fed less intensively had a higher slaughter value, thinner fatback, higher dressing percentage and smaller content of fatback in the half-carcase, whereas their meat contained more water and less protein, fat and ash than the meat from the group of porkers fed with the mix richer in protein and energy.

Key words: pigs, cost effectiveness, extensive production

Introduction

Pork is the most commonly consumed meat around the world, but in the near future we should expect further decreases in the growth rate of meat production and further increases in the significance of poultry at the expense of beef and, to an extent even larger than now, at the expense of pork. Undoubtedly, this situation will be favoured by the lower production costs of poultry meat and the process of the replacement of pork with poultry meat, chiefly due to the fact that poultry meat is regarded as healthier than red meat (beef and pork). This process can be observed in Poland, where the population of pigs has been falling rapidly since 2006 (from 18.88 million to 11.13 million pigs at the end of 2012, a decrease of more than 41% (Central Statistical Office 2006, Central Statistical Office 2012) to the level of the 1950s. The diminishing of the pig population by as much as half has taken place in almost all Eastern European countries, but in Poland it occurred latest. The causes of the situation can be explained through aspects such as

the strong fragmentation of production, low productivity of sows, high consumption of feeds, and low standards of agricultural counselling (Pepliński et al. 2012), resulting in the low competitiveness of those countries on both domestic and international markets. In view of this fact, farmers in those countries should seek alternative markets for their products. In Poland many small producers still produce pigs using traditional methods. If separate channels of processing and distribution are organised and if there is appropriate certification and control, there is a chance to create a new segment in the market, which will be a good alternative to organic products, which are on average 30–50% more expensive than conventional food (Komorowska 2009). Large agricultural enterprises should also be involved in the production of pigs with traditional methods as they may supply large homogenous batches of animals for slaughter.

The aim of this study is a comparative analysis of the costs of production of intensively and extensively fed porkers in view of the qualitative parameters of meat obtained after slaughter.

Materials and methods

The production experiment, which involved the parallel fattening of 3 groups of 30 porkers (fed intensively up to a weight of about 120 kg and extensively up to weights of about 100 kg and 120 kg), was carried out between 2011 and 2012 in a deliberately selected farm.

The piglets, a crossbreed of Large Polish White and Polish White Lop-Eared breeds, came from our own breeding farm. The fattening started on 30 October 2011 when the animals' average weights were 43.1 kg (aged 78 days), 48.4 kg (aged 86 days) and 47.6 kg (aged 85 days) respectively. The feeds used for extensive fattening contained less total protein, energy and basic exogenous amino acids, such as lysine, methionine, cysteine, threonine and tryptophan, but they contained more raw fibre. Table 1 shows a detailed specification of the feeds. The feeding plan assumed the consumption of feed for piglets at 50 kg per head (intensively fed porkers) and 52 kg per head (extensively fed porkers). At the second part of the experiment, the animals received another total mixed ration. The porkers were fed from automatic feeders with a wet feeding system and were bred without bedding. The fattening took place in a separate farm building with mechanical ventilation to meet animal welfare requirements.

The animals were weighed once a month, which enabled the differentiation of four fattening periods: the first period from 30 October 2011 to 28 November 2011, the second period from 28 November 2011 to 27 December 2011, the third period from 27 December 2011 to 30 January 2012 and the fourth period from 30 January 2012 to 27 February 2012. The animals were sold every second week from 30 January 2012 to 27 February 2012. During the first sale, all porkers from the extensive group were sold, which were to reach the weight of about 100 kg, and several porkers from the other groups were sold, which exceeded the weight of 120 kg. On 13 February 2012 all the other porkers from the intensive group and several

porkers from the third group were sold. The rest of the animals were sold on 27 February 2012.

The analysis of profitability of all three of the variants of pig production was made for the farm where the experiment was carried out, with full cost accounting. The farm specialised in the production of cereals and porkers. On average it had 140 sows and supplemented its own production of piglets with 1190 piglets purchased from another farm. During one year it sold 3836 porkers and the analysis of production profitability was made on that number of animals. The costs were calculated by their type (Fig. 1). The researchers assumed average prices of the means of production and prices of livestock pigs in individual meatiness classes noted in Poland in 2012.

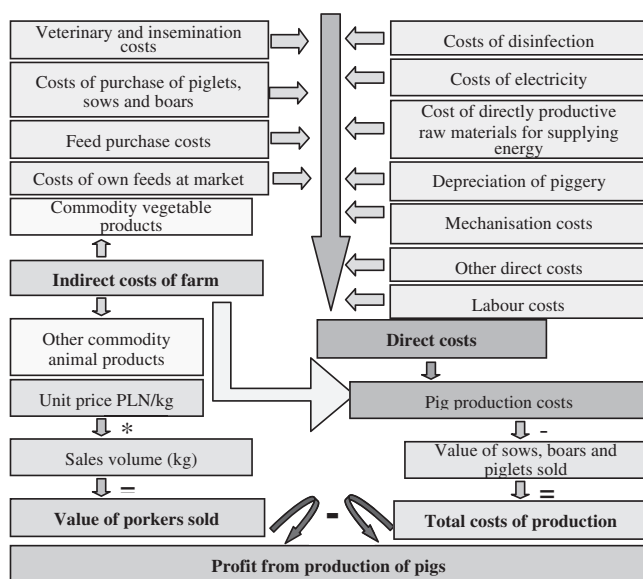


Figure 1. The methodology of calculation of profit from pig production
Source: Pepliński B., Wajszczuk K., Wielicki W. Integracja pionowa a opłacalność produkcji żywca wieprzowego. Wyd. AR w Poznaniu 2004.

Table 1. The composition of feed used in the experiment

Specification		piglets		pigs	
		extensive feeding	intensive feeding	extensive feeding	intensive feeding
Total protein	%	16.5	17.5	15.0	15.5
Total protein range	%	16.0 – 18.0	16.0 – 19.0	14.0 – 16.5	15.0 – 17.0
Net energy	kcal	2163	2310	2163	2268
Metabolic energy	MJ/kg	12.4	13.2	12.4	12.9
Lysine	%	0.96	1.10	0.82	0.90
Digestible lysine	%	0.80	0.94	0.66	0.74
Methionine	%	0.32	0.34	0.25	0.28
Methionine+Cystine	%	0.65	0.69	0.66	0.61
Threonine	%	0.64	0.71	0.56	0.60
Tryptophan	%	0.19	0.21	0.17	0.18
Crude fibre (min-max)	%	4–7	3–6	4.5–7	4.5–6.5
Ca	%	0.70	0.70	0.65	0.65
P total	%	0.60	0.60	0.65	0.60
Na	%	0.15	0.15	0.14	0.14
Vitamin A	IU	10 000	10 000	6000	7000
Vitamin D3	IU	2 000	2 000	1200	1400
Vitamin E	mg	40	120	30	120
Nutricine eq.		++	++	+	+

Source: Based on the data obtained from the feed producer

Research results

According to the assumptions of the experiment, the diversified composition of the feed resulted in different rates of growth among the porkers (Fig. 2). A higher content of protein and energy and a lower content of raw fibre contributed to faster increases in the weight of intensively fed animals. In spite of having the lowest starting weight (around 5 kg lower) on the starting day of the experiment, as early as the first check measurement the average weight of intensively fed animals was higher than the weight of extensively fed animals. The tendency could also be observed in the period that followed. The smallest difference in the growth rate took place during the second period when the intensively fed porkers were 2-3 kg heavier than the others. During the last period under investigation, i.e. between 30 January 2012 and 27 February 2012, the intensively fed porkers grew 7.48 kg heavier within two weeks of feeding, whereas the extensively fed porkers from the weight group up to 120 kg grew only 11.53 kg heavier within the entire period. However, it is necessary to remember that the porkers from the above-mentioned groups were sold gradually, so not all animals were sold during the last period of sale from a particular group (except for the group of extensively fed porkers up to 100 kg). The average weights were as follows: 126.1 kg for the intensively fed porkers, 109.45 kg for the extensively fed porkers up to 100 kg, and 121.83 kg for the extensively fed porkers up to 120 kg. The total average weight gains were 83.00 kg, 61.05 kg and 74.23 kg within 105 days, 93 days and 114 days, respectively.

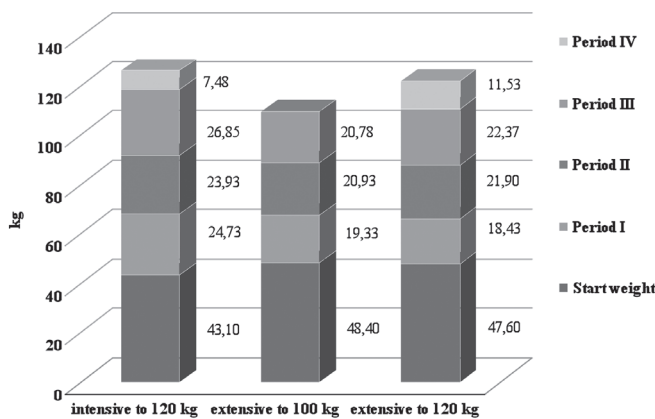


Figure 2. The dynamics of weight gain of pigs during the experiment. Source: Own investigation

The daily weight gain, which is shown in Figure 3, is a more reliable measure in the case under analysis. The porkers' weight gain was not steady either in time or in individual groups. The intensively fed porkers had the highest weight gains, i.e. 0.787 kg per day vs. only 0.657 and 0.645 kg per day for the extensively fed porkers. As the animals' body weight increased, the weight gain dropped. The intensively fed porkers showed the highest weight gain during the first period of fattening, i.e. 0.853 kg per day, whereas during the third month of fattening the weight gain dropped to 0.757 kg per day. During the last two weeks of fattening, when the

slowest-growing animals were left, the weight gain dropped to 0.620 kg per day. As far as the extensively fed animals are concerned, the highest gains were noted in the second month of the experiment when the daily weight gains were 0.734–0.730 kg, as opposed to 0.667–0.636 kg in the first month of fattening and 0.584–0.638 kg in the third month of fattening. The porkers' slow weight gain in the first month may suggest that younger animals react more strongly to a poorer feed than older animals, which results in greater loss for producers during that feeding period.

The nutrients in the feed are used for the following purposes (Pepliński et al., 2004):

- animals' livelihood needs related to maintenance of vital functions, which depend on such factors as the temperature in the building, humidity and traffic intensity. During the experiment the animals were kept in the same building over the same period and in crates of similar size, meaning that the porkers were provided with similar conditions as regards their livelihood needs;
- productive needs, which are related with the body weight gain. These needs are relatively steady for a particular species and breed of animals, so the experiment met this requirement as well.

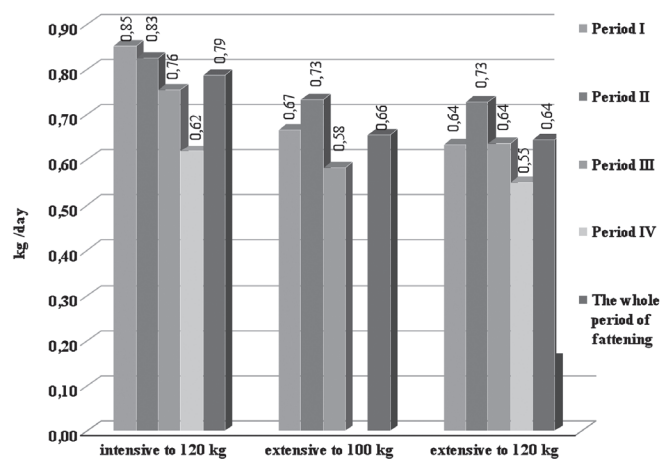


Figure 3. Pigs' daily weight gain during the experiment. Source: Own investigation

The lower gain weight influences most livelihood needs per gain unit, as the time necessary for the body weight to grow by the unit is extended.

Another element that increases the consumption of feed in the extensive feeding group is the lower amount of nutrients, necessitating a higher intake of feed to provide the same amount of protein, energy, and so on.

When analysing different groups of animals, the increasing consumption of feed must be noted per kilogram of weight gain as the porkers grow older and heavier.

In the experiment in question, the lowest consumption of feed was observed in intensively fed porkers (Fig. 4), where the average consumption was 3.06 kg of feed per kilogram of weight gain. The youngest animals consumed the least feed – 2.73 kg/kg, whereas the highest consumption could be ob-

served at the last stage of fattening, when it rose to 3.46 kg. As far as the extensively fed animals are concerned, at certain times their consumption of feed was higher; in the first month of the experiment it was about 5% higher, while in the following months of the experiment it was 8-10% higher than consumption by the intensively fed porkers. In consequence, the average consumption of feed in the group of extensively fed porkers up to 100 kg was 3.27 kg of feed per kilogram of weight gain, i.e. 6.8% more, whereas in the group of extensively fed porkers up to 120 kg, the consumption was 3.36 kg of feed per kilogram of weight gain, i.e. 9.8% more than in the intensive group.

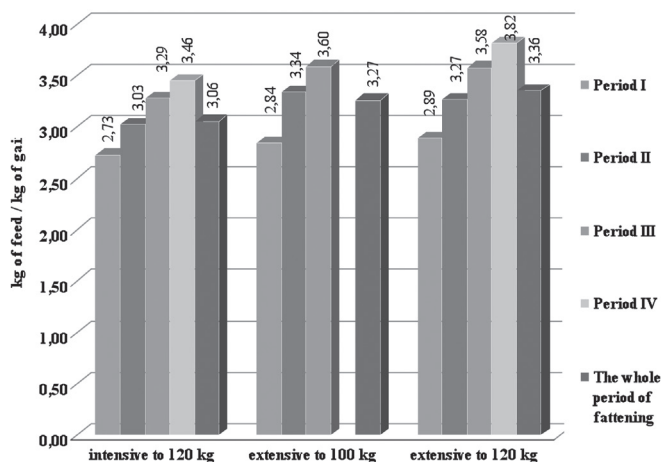


Figure 4. Feed consumption per kilogram of gain during the experiment
Source: Own investigation

From an economic point of view, the costs of feeds are the most significant, given that they can constitute as much as 60-75% of the total costs if cereals are priced very highly on the global market. In the groups of porkers under analysis, the costs of feed per kilogram of weight gain were less diversified than the consumption of feed (Fig. 5) and they fluctuated between 3.66 PLN per kilogram of weight gain in the group of extensively fed porkers up to 100 kg and 3.79 PLN/kg of weight gain in the group of extensively fed porkers up to 120 kg.

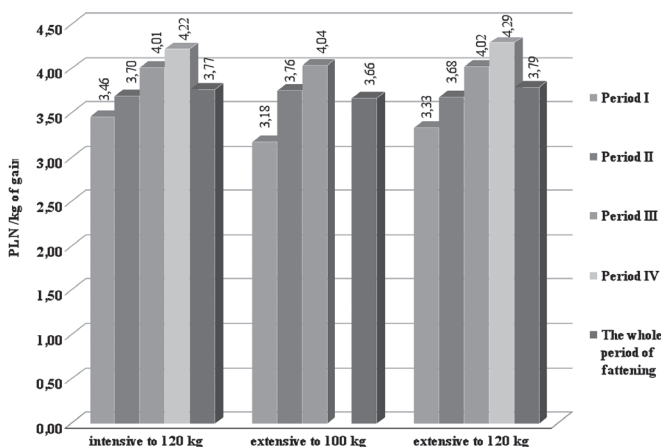


Figure 5. The cost of feed consumed per kilogram of gain during the experiment
Source: Own investigation

A slightly higher consumption of feed by extensive porkers in the first month of the experiment was compensated by the lower price of the feed, resulting in the cost of feed for both groups of porkers during that period reaching 0.13 and 0.28 PLN/kg of weight gain lower than in the intensive group. In the following months of fattening, a slightly higher growth of costs could be observed in the extensively fed porkers, so that in the third month of the experiment, the difference in costs amounted only to 0.03 PLN/kg of weight gain, and in the last month of the fattening, the costs of feed for the extensively fed porkers up to 120 kg were 0.07 PLN/kg higher than the costs of feed for the intensively fed porkers.

When the feeds consumed by sows and piglets used in the production were included in the starting weight in the experiment (about 45 kg), the lowest costs of feeds per kilogram of porkers sold turned out to be in the production up to 120 kg – both intensive and extensive groups. These were 4.15 PLN/kg and 4.16 PLN/kg, respectively, whereas the cost of feeds in the extensive production up to 100 kg was 4.38 PLN/kg (Fig. 6). This result is primarily related to the fact that the costs of feeds consumed by sows are divided into a smaller amount of kilograms in the porkers. Similar tendencies were observed in the other costs of production (Figures 6 and 7).

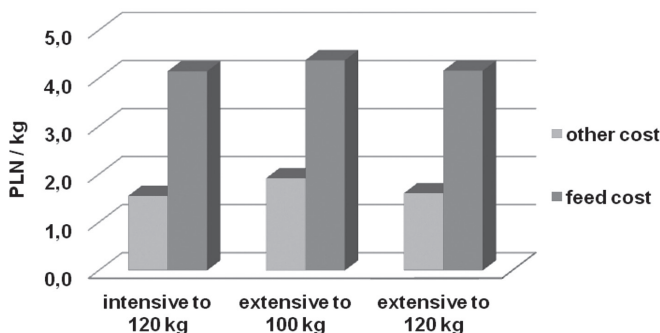


Figure 6. The costs of production of porkers in the farm under analysis in 2012
Source: Own investigation

Due to the fact that the farm supplemented its own production of piglets with external purchases, considerable costs arise for the purchase of piglets as part of the production costs. In view of the deficit of piglets on the market and record-high prices, the cost of purchasing piglets were high for the farm under analysis, and ranged from 0.53 PLN/kg in the intensively fattened group up to 120 kg, to 0.65 PLN/kg in the extensively fattened group up to 100 kg.

Labour costs are also very significant in the production of porkers. In the analysis, the authors assumed the costs of labour equal to the average pay in the national economy in Poland, i.e. 14.95 PLN/hour. The lowest costs of labour were 0.37 PLN/kg in the intensive production up to 120 kg and 0.38 PLN/kg in the extensive production up to 120 kg, and 0.46 PLN/kg in the extensive production up to 100 kg.

The costs of veterinary and insemination treatment fluctuated between 0.16 and 0.19 PLN/kg, depreciation costs between 0.12 and 0.15 PLN/kg, costs of mechanisation works between 0.11 and 0.13 PLN/kg, and electricity costs be-

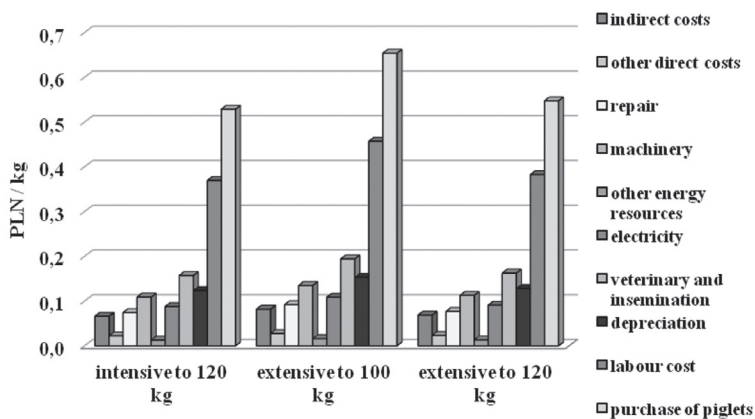


Figure 7. The costs of production of porkers (without feeds) in the farm under analysis in 2012
Source: Own investigation

tween 0.09 and 0.11 PLN/kg. Other costs did not exceed 0.10 PLN/kg.

The lowest total production cost, i.e. 5.70 PLN/kg, were found in the group of intensive production up to 120 kg, whereas the cost of extensive production up to 120 kg was 5.77 PLN/kg and the cost of extensive production up to 100 kg were as high as 6.30 PLN/kg. When the costs of production were corrected by the value of sows sold, the costs of production of porkers were 5.61 PLN/kg, 5.67 PLN/kg and 6.18 PLN/kg, respectively (Fig. 8).

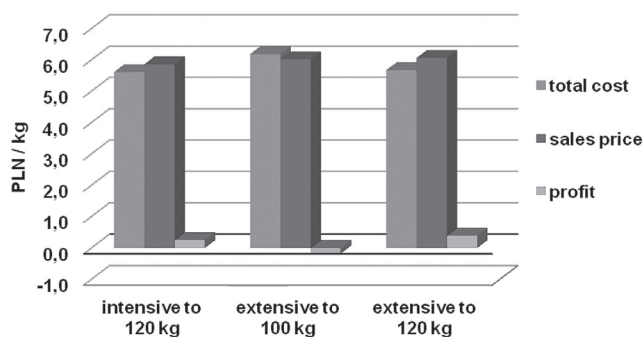


Figure 8. The costs of production, the sales price and the profit from the production of porkers in the farm under analysis in 2012.
Source: Own investigation

As far as extensive fattening up to 100 kg is concerned, the average sales price in 2012 (6.01 PLN/kg) did not fully cover the costs of production, which resulted in a loss of 0.17 PLN/kg. The production was cost-effective only at the time when the prices were the highest, i.e. in September and October 2012 in Poland. As far as intensive fattening up to 120 kg is concerned, the profit was 0.25 PLN/kg, whereas the profit from extensive fattening up to 120 kg was 0.39 PLN/kg.

Extensive fattening up to 120 kg was, the most profitability chiefly resulted from the higher sales price (6.06 PLN/kg) rather than from intensive fattening up to 120 kg (5.86 PLN/kg). This was related to the fact that the porkers from this group achieved the highest average meatiness, i.e. 58.83%. Of 30 porkers that were sold, 11 were classified as class S, 1 as class U, and the other 18 as class E. The average meatiness of in-

tensively fed porkers up to 120 kg was the lowest, i.e. 56.95%. Among the animals sold, 5 were in class S, 3 in class U, 2 in class R and the others in class E. The average price difference between meatiness classes in Poland is about 0.30 PLN/kg.

Tests of the meat quality proved that (depending on the place of measurement) the thickness of fatback in the porkers from the intensive fattening up to 120 kg was on average between 0.24 and 0.68 cm greater than in the carcasses of the extensively fed porkers. 45 minutes after slaughter, the average pH values of both muscles under investigation were lower in the extensively fed porkers. However, the differences proved to be significant only in the SEM muscle ($P \leq 0.05$). In both groups of extensively fed porkers, the presence of PSE meat was found in about 10% of the carcasses.

On the other hand, DFD meat in the LD muscle was noted in 3.7% of the carcasses of intensively fed pigs. In comparison with the intensive system in the LD muscle of extensively fed porkers up to 120 kg, there was a lower content of intramuscular fat and protein (by 0.44% and 0.71% respectively). The muscles of intensively fed porkers were slightly darker L^* 46.28 in the group of intensively fed porkers, as opposed to 47.45 and 48.17 in the groups of extensively fed porkers up to 100 kg and 120 kg, respectively. Furthermore, in comparison with the carcasses of the intensively fed porkers up to 120 kg, the meat from the carcasses of the extensively fed porkers up to 100 kg and 120 kg exhibited worst water absorption (32.08% vs. 34.39 and 32.93% respectively) and higher natural exudate from the raw tissue (by 0.98% in the intensive group and 0.78% in the extensive groups) and from thermally processed tissue (by 3.72% in the intensive group and 3.46% in the extensive groups).

The smell, juiciness, tenderness and tastiness of the muscles of the porkers of both feeding systems received an average mark of higher than 4 points. The tenderness and tastiness were better in extensively fed porkers. On the other hand, the results of shearometric measurements of the muscles of the groups under investigation were similar (shear force from 27.14 to 28.33 N/cm²).

Conclusions

1. The use of feeds with a smaller content of protein, energy and exogenous amino acids but with a higher content of fibre in feeding extends the fattening time, reduces porkers' daily body weight gain and increases the consumption of feed per kilogram of weight gain.
2. In the experiment, the costs of feed per kilogram of weight gain were similar in the groups of intensively and extensively fed porkers up to 120 kg, which suggests that the lower price of the feed fully compensated for the lower weight gains.
3. Reduced fattening time causes reduced average costs of production of porkers, due primarily to the higher weight of porkers sold, where fixed costs such as the cost of rearing piglets, depreciation costs, and so on are included.

4. The extensively fed animals up to 120 kg were the most profitable, because they had the highest meatiness.
5. The experiment shows that increased intensity of fattening is not economically justified in local Polish cross-breeds of pigs.
6. Tests of the quality of meat from extensively fed pigs showed that its qualitative parameters were more often worse than those of the meat from intensively fed pigs.

Acknowledgement

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