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EFFICIENCY OF BREEDING OF PUREBRED CROSSBRED AND HYBRID PIGLETS OF THE ENGLISH BREED

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Abstract

The study examined the performance of purebred, crossbred, and hybrid piglets during their rearing period and the efficiency of their results under a liquid feeding system. It was found that during rearing, purebred piglets of the Large White and Landrace breeds were inferior to their counterparts of the synthetic sire line PIC–337 in intra–line breeding by 29.2% and 24.1% in terms of average daily and absolute gains. They had a 29.4% and 24.3% higher mass at the end of this period but were inferior to them by 2.7% and 2.0% in terms of survivability. There was a trend towards a 4.1% improvement in average daily and absolute gains and a significant 4.0% difference in the mass of weaners at the end of rearing in favor of the Landrace breed. Hybrid piglets obtained from crossbred sows of maternal breeds in direct and reverse crossing with boars of the synthetic sire line PIC–337 outperformed their crossbred peers from direct and reciprocal crossing of these two maternal breeds by 8.0–15.7% in average daily and absolute gains, by 9.5–15.3% in live weight at the end of rearing, and by 0.7–1.3% in survivability during rearing. Crossbred animals from direct and reverse crossing of maternal breeds did not have significant differences in reproductive performance indicators. Hybrid piglets consumed and utilized 5.5–14.0% more feed daily and throughout the rearing period compared to their crossbred peers and 9.1–17.0% more compared to purebred animals of the maternal line. They also had better feed conversion by 0.6–2.8% compared to crossbreeds and by 3.8–5.0% compared to purebred peers of the maternal breeds. In turn, crossbred piglets consumed 0.7–4.8% more feed daily and throughout the rearing period and had 2.2–5.3% better feed conversion compared to the original maternal breeds. Piglets of the synthetic sire line consumed feed at the same level as their hybrid peers, 6.3–7.7% more than crossbreeds, and 9.1–11.2% more than purebred animals of the maternal breeds.

Key words: *breed, breeding method, feed payment, maternal line, rearing, growth, terminal line*

INTRODUCTION

It is a well-known fact that crossbreeding often yields better results in animal husbandry compared to purebred breeding. According to [2, 38, 43] an important aspect of crossbreeding is hybrid vigor or heterosis, which enhances offspring performance above the average performance of the parent breeds. In pig farming, this usually results in a higher number of piglets born, faster growth rates, better survival rates, and improved feed conversion efficiency, especially when the breeds involved have high genetic diversity. According to [9], hybrid vigor is due to the collective effect of many genes that individually have a small impact but together produce a significant effect. This has led to the widespread use of industrial crossbreeding in commercial pig production over the past centuries to fully exploit this phenomenon. In recent decades, this phenomenon has been extensively studied by both domestic and foreign scientists [3, 6, 10, 12, 15, 19, 21, 22, 24, 28, 31, 33, 35, 39, 45]. According to [13, 18, 23], genotype is a determining factor in the growth and development of pigs due to its influence on a number of physiological and biochemical processes. As stated by [16], the genotype of pigs affects their growth rate, and therefore different breeds and lines of pigs have different growth intensities. In modern pig farming, separate selection is conducted for maternal and paternal lines, where the latter are selected for growth rate, feed efficiency, and carcass quality [38]. According to [11], fattening qualities of pigs are closely related to their genotype, which determines the potential for growth rate, feed efficiency, meat quality, and disease resistance. The use of modern genetic technologies and selection methods allows for significant improvement of these characteristics, ensuring more efficient production and better product quality. According to [4, 21], genomic selection reveals genes and alleles responsible for growth hormones, which can accelerate this process and significantly impact its intensity in pigs. Additionally, according to [17], feed efficiency also depends on genotype and breeding method, manifested in the genetic predisposition to feed utilization. According to [7], some pig genotypes have a better ability to convert feed into muscle mass due to differences in their digestive efficiency and metabolic pathways, while others do not. This opinion is supported by [21], who believe that genetic predisposition to feed utilization is determined by genes regulating appetite and metabolism, affecting appetite, nutrient absorption, and utilization. Specifically, genetic variations in genes regulating protein, fat, and carbohydrate metabolism can influence feed efficiency, significantly affecting the efficiency of pig farming. According to [1], modern selection programs use genetic data to improve fattening qualities, thereby enhancing economic performance in pig production. Studies by [8, 37] report integrating economic parameters into genetic selection to utilize economically important genes to improve fattening qualities, and consequently, the efficiency and competitiveness of pig production. According to [34], genotype affects the immune system of pigs, determining their disease resistance and better feed utilization, thereby improving fattening performance. Therefore, selection based on genes for disease resistance can reduce treatment losses and improve overall fattening qualities. According to [5], extensive use of crossbreeding in pig farming is due to the benefits of hybrid vigor and breed compatibility. However, as noted by [36], such improvements are usually not observed in subsequent generations of crossbreeding, making it important to maintain purebred forms for crossbreeding and their continuous improvement. At the same time, due to the differing inheritance of reproductive and fattening traits, the full effect of heterosis cannot be fully utilized. Therefore, a more advanced form of breeding – intra-breed or breed-line hybridization is used in modern pig farming [25]. In this form of breeding, maternal breeds and lines, mainly represented by Yorkshire and Landrace breeds, and paternal (terminal) lines, usually represented by Duroc and Pietrain breeds or their crosses, are selected separately and continuously tested for their combinatory ability [2, 6, 14, 42], not all performance parameters achieved in nucleus herds are fully realized in commercial herds of hybrid offspring due to different management conditions. Some papers [29] reported that hybrid pigs had 40% lower growth efficiency and 18% lower feed utilization compared to purebred Duroc pigs, with a 2.7% lower meat yield in crossbred Landrace × Yorkshire × Duroc pigs compared to purebred Duroc pigs. According to [27], using different paternal breeds and synthetic lines for hybridization results in varying growth and feed conversion efficiency. Their data show that Landrace × Yorkshire × Duroc crosses had 142 g higher daily gains, 0.14 FEsv/kg better feed conversion, but 2.0% lower meat content in the carcass. Similar conclusions were drawn by [29], reporting that feed conversion and meat content in Duroc (LY) crosses were worse than in purebred Duroc pigs, but the incidence of diseases and mortality were significantly lower. At the same time, it was reported [5] uneven growth in purebred and crossbred pigs during different production cycles, stating that high growth intensity during the suckling period does not always translate to similar trends in subsequent production periods. In Ukrainian industrial enterprises, according to [44], foreign breeds and lines of pigs are predominantly used, making it essential to test their productivity and combinatory ability under specific Ukrainian conditions. This is especially important for such a sensitive technological group of pigs as those in the rearing period, during which, according to [26, 40, 32, 41], a significant number of stressful events occur. Therefore, it is crucial to have information on the rearing efficiency of maternal, paternal forms, and their hybrids of foreign origin under industrial pig production conditions, which is the goal of our study.

MATERIALS AND METHODS

For conducting research at the breeding reducer of the limited liability company "Globinsky Pig Complex," seven groups of 10 sows each were selected using the group analogy method according to the scheme presented in Table 1.

The first and fourth groups included purebred sows of the Large White breed, the second and fifth groups included purebred animals of the Landrace breed, the sixth group consisted of crossbred animals from Large White sows and Landrace boars, and the seventh group included animals from the reciprocal crossing of these breeds.

The third group comprised sows of the synthetic PIC-337 line.

The sows in the first and fifth groups were inseminated with the semen of Large White boars, their analogues from the second and fourth groups were inseminated with the semen of Landrace boars.

The sows in the third, sixth, and seventh groups were inseminated with the semen of boars from the synthetic terminal line PIC-337.

Table 1. Scheme of the experiment

A group of animals	I	II	III	IV	V	VI	VII
Maternal genotype	LW	L	PIC337	LW	L	♀ LW ×♂ L	♀L×♂ LW
Number of sows, head	10	10	5	10	10	10	10
Genotype of boars	LW	L	PIC337	L	LW	PIC337	PIC337
Number of boars, head	3	3	3	3	3	3	3
Genotype of offspring	LW	L	PIC337	½LW½ L	½ L ½LW	¼ LW ¼ L ½ PIC337	¼ L ¼ LW ½ PIC337
The number of piglets at the beginning of the experiment, head	75	75	50	75	75	75	75
Age of piglets at the beginning of the experiment, days	28	28	28	28	28	28	28
Duration of growing, days	49	49	49	49	49	49	49
Combination of genotypes	♀LW×♂LW	♀L×♂L	♀PIC337×♂PIC337	♀LW×♂L	♀L×♂LW	(♀LW×♂L)×♂PIC337	(♀L×♂LW×♂PIC337

Source: own calculations.

During the dry and conditionally gestational periods, all experimental sows were kept in identical conditions in individual stall boxes with regulated feeding of complete feed mixtures according to specific recipes. On the 33rd–35th day of pregnancy, after echoscanning, they were transferred to the gestation house where they were kept under identical conditions in stable groups with regulated feeding using Velos feeding stations from the Dutch company Nedap. On the 110th–112th day of pregnancy, the animals from all experimental groups were moved to the farrowing section of the same facility, where they were kept in individual pens with diagonal fixation of the sow (Photo 1). The sows were fed ad libitum using continuous feed dispensers with complete balanced feeds.

Photo 1. Conditions for keeping piglets during the suckling period
Source: own calculations.

Supplementary feeding of the piglets began on the 14th day after birth with dry pre-starter compound feeds.

At weaning, experimental groups of piglets were formed from each experimental group by the method of analogous groups, each consisting of 75 heads, and were transferred to Growing Unit No. 4. For this purpose, all weaned piglets from each experimental group were subjected to group weighing, after which the average weight for each group was calculated. The next step in our research was the individual weighing of all experimental piglets, during which their weight and order number in the litter were marked on their backs with a chemical marker. During the weighing, the piglets were sorted within each group by weight, which was closest to the average weight of the group, taking into account the sex of the animals.

Upon completion of the formation of all seven experimental groups, the average weight of the formed groups was adjusted to match the average weight of the piglets determined by group weighing in each group by replacing piglets of varying weights of the same sex. All experimental piglets were then tagged with numbered ear tags of different colors or shapes on their right ears, and were transported, considering their groups, to the rearing section of Growing Unit No. 4 (Photo 2). During the growing period, the piglets were kept identically in group pens on fully slatted floors, with 75 heads in each pen at a stocking density of 0.32 m² per head.

Photo 2. Conditions for keeping piglets during the rearing period
Source: own calculations.

Their feeding was carried out with liquid feed mixtures in a ratio of three parts water to one part dry complete feed. Until the 41st day of life, all experimental piglets were fed the same pre-starter feed they received during the suckling period. From the 42nd day of life, they were switched to a second starter feed, which was fed until they reached an average weight of 15 kg, after which they were switched to starter compound feed, which was fed until they were transferred to fattening. The recording of feed consumption was conducted by the feed station processor for each pen for each feed distribution, converted into the amount of dry compound feed. All zootechnical and veterinary procedures for the animals in the experimental groups, both during the suckling period and the growing period, were identical.

During the growing period, the removal of piglets was recorded in the research journal with the date of removal, quantity, and weight of the removed piglets. On the 49th day of rearing, all piglets were individually weighed and transferred to fattening. The feeding conditions of the animals, housing, and all veterinary procedures in the experiment complied with European and domestic requirements for the care of pigs during the experiment.

The data of the experiment were processed using the method of variation statistics with the use of the MS Excel 2016 and presented as M±m. The significance of the differences in piglet growth rates was determined by Student's t-test.

RESULTS AND DISCUSSIONS

In the purebred and intra-line breeding of pigs from the original maternal breeds and the paternal line, a significant difference in the growth rate and survival of piglets between the maternal and paternal genotypes was established. As shown in Table 2, the highest growth intensity during the rearing period was observed in piglets of the synthetic line PIC-337 with intra-line breeding. They maintained the growth rate advantages gained during the suckling period and had higher average daily gains during the rearing period by 121–104 g ($p<0.001$) compared to the purebred offspring of the maternal breeds Large White and Landrace, respectively. Due to the higher growth intensity during the rearing period, they demonstrated significantly ($p<0.001$) higher absolute gains by 5.8 and 5.0 kg compared to the peers of the Large White and Landrace breeds. Due to the higher live weight of the piglets at the start of rearing and the greater absolute gains, the animals of group III surpassed the peers of groups I and II in terms of piglet weight at weaning by 7.9 and 6.8 kg, respectively ($p<0.001$).

Table 2. Productivity of purebred piglets for rearing

Indicators	Groups		
	I	II	III
Age of piglets at the beginning of rearing, days	28.7	28.6	28.9
The average weight of one piglet at the beginning of rearing, kg	6.75±0.137	7.01±0.159	8.77±0.203 bbb ccc
Age of piglets at the end of rearing, days	77.0	77.0	77.0
Weight of piglets at the end of rearing, kg	26.8±0.397	27.9±0.356 a	34.7±0.606 bbb ccc
Absolute growth of piglets during the rearing period, kg	20.0±0.389	20.9±0.356	25.9±0.609 bbb ccc
Average daily growth of piglets during the rearing period, g	415±12.7	432±13.3	536±18.9 bbb ccc
Preservation of piglets during rearing,%	98.7	98.0	96.0

Notes: probability of difference between groups: d – 4 and 5; e– 4 and 6; f– 4 and 7; g– 5 and 6; h – 5 and 7; i – 6 and 7
Source: own calculations.

When comparing the growth intensity of crossbred and hybrid piglets, the latter were found to have an advantage in almost all performance indicators. Hybrid piglets of group VI significantly exceeded crossbred animals of groups IV and V in average daily gains ($p<0.01$) by 37 and 51 g, in absolute gains during the rearing period ($p<0.001$) by 1.79 and 2.46 kg, in piglet weight at the end of rearing ($p<0.001$) by 2.77 and 3.38 kg, but had lower survival rates during rearing by 0.67 and 1.33%. Hybrid piglets obtained from crossbred sows (♀L×♂LW) and boars of the synthetic line PIC-337, which formed group VII, also had significant advantages in all performance indicators during rearing compared to piglets of groups IV and V. They exceeded their crossbred counterparts from groups IV and V in average daily gains by 56 ($p<0.01$) and 70 ($p<0.001$) g, in absolute gains by 2.70 and 3.38 kg ($p<0.001$), had higher live weights by 3.76 and 4.38 kg ($p<0.001$) when transferred to fattening, and had better survival rates by 1.3 and 0.7% during rearing.

No significant difference in the productivity of hybrid piglets from groups VI and VII was established in our studies. However, there was a trend towards a slight improvement in the productivity of animals in group VII over those in group VI, with average daily gains higher by 19 g, absolute gains higher by 0.92 kg, live weight at the end of rearing higher by 1.0 kg, and survival rate during rearing higher by 2.0%.

Thus, hybrid piglets obtained from crossbred sows of the maternal breeds Large White and Landrace through direct and reciprocal crossings with boars of the synthetic paternal line PIC-337 surpassed their crossbred peers from direct and reciprocal crossings of these two maternal breeds in average daily and absolute gains by 8.0–15.7%, in live weight at the end of rearing by 9.5–15.3%, and in survival rate during rearing by 0.7–1.3%. Meanwhile, crossbred animals from direct and reciprocal crossings of the maternal breeds showed no significant differences in reproductive performance indicators, although there was a trend towards a 3.0% increase in average daily and absolute gains, a 2.1% increase in average piglet weight at the end of rearing, and a 0.7% increase in survival rate in animals of the (♀L×♂LW) combination compared to their counterparts from the reciprocal crossing of these breeds. A similar situation was observed among the groups of hybrid piglets, where there was a trend towards a slight improvement in the productivity of animals from the combination ♀(♀L×♂LW)×♂PIC-337 over those from crossbred sows (♀LW×♂L) and the same boars in average daily and absolute gains by 3.8%, in live weight at the end of rearing by 3.2%, and in piglet survival rate by 2.0%.

The different growth intensities of purebred, crossbred, and hybrid piglets led to varying daily feed consumption, resulting in different amounts of feed per animal during the rearing period. As shown in the graph in Fig. 1, the purebred piglets of the maternal breeds (Groups I and II) consumed 0.78–0.79 kg of feed daily. Animals in Groups III and IV, consisting of crossbred animals of these breeds, consumed 0.01–0.3 kg more feed daily, while their hybrid peers in Groups VI and VII had daily feed consumption 0.07–0.13 kg higher compared to purebred animals and 0.05–0.11 kg higher compared to crossbred animals of Groups IV and V. Piglets in Group III, represented by animals of the synthetic line PIC-337, consumed more feed daily than purebred and crossbred piglets of the maternal breeds and had this indicator at the level of hybrid piglets in Groups VI and VII.

The different amounts of daily feed consumption over the same rearing period led to varying amounts of feed consumed per piglet during the rearing period. The most feed was consumed by the hybrid piglets of Groups VI and VII and the piglets of Group III, which belonged to the paternal line. The least feed was consumed by purebred animals of the Large White and Landrace breeds, which consumed 0.3–1.8 kg less feed compared to their crossbred peers of these breeds and 3.5–5.7 kg less compared to the hybrid piglets of Groups VI and VII and 3.5–4.2 kg less compared to the piglets of Group III (Fig. 1).

Despite the higher feed consumption by the offspring of boars from the synthetic line PIC-337, their higher growth intensity during the rearing period and correspondingly higher absolute gains during this period contributed to improved feed conversion efficiency. Thus, the best feed conversion was observed in the piglets of the synthetic line PIC-337 under intra-line breeding (1.62 kg) and in the combination of these boars with crossbred sows of the maternal breeds under both direct and reciprocal crossing variants – 1.76–1.74 kg. Meanwhile, piglets of the maternal line, both under purebred breeding and crossing, had worse feed conversion by 0.01–0.13 kg compared to hybrid piglets and by 0.15–0.25 kg compared to their analogues under intra–line breeding of the synthetic paternal line.

Thus, during the rearing period, hybrid piglets consumed 5.5–14.0% more feed daily and in total compared to their crossbred peers and 9.1–17.0% more compared to purebred animals of the maternal line. At the same time, they had 0.6–2.8% better feed conversion compared to crossbreds and 3.8–5.0% better compared to purebred peers of the maternal breeds. Crossbred piglets consumed 0.7–4.8% more feed daily and in total during the rearing period and had 2.2–5.3% better feed conversion compared to the original maternal breeds.

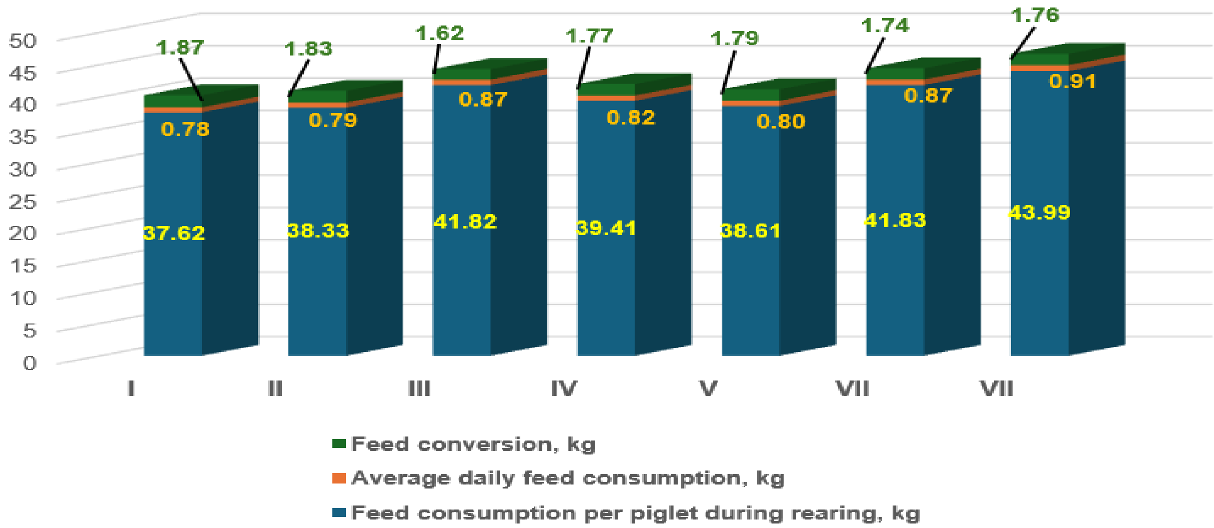

Fig. 1. Feed consumption by purebred, crossbred and hybrid piglets and their conversion during rearing
Source: own calculations.

Meanwhile, piglets of the synthetic paternal line consumed almost the same amount of feed daily and during the rearing period as their hybrid peers, 6.3–7.7% more than crossbreds, and 9.1–11.2% more than purebred animals of the maternal breeds. Additionally, these animals demonstrated the best feed conversion among all the experimental animals, which was 7.4–8.6% better than hybrid piglets, 9.3–10.5% better than crossbred animals, and 11.5–13.5% better compared to purebred analogues of the maternal genotypes.

The amount of feed consumed by purebred, crossbred, and hybrid piglets and their slightly different costs, depending on the growth intensity of the piglets, also affected the cost indicators of the rearing process and the cost of one piglet at the end of the rearing period. As shown in the graph in Fig. 2, the lowest feed cost was observed in piglets of the Large White and Landrace breeds – 15.75–16.06 EUR, which outperformed their crossbred peers of Groups IV and V by 0.11–0.75 EUR, hybrid piglets of Groups VI and VII by 1.16–2.35 EUR, and animals of the synthetic paternal line by 1.16–1.46 EUR.

Since the share of feed in the operational cost of rearing one piglet was almost equal for all groups of animals, the dynamics of the operational cost of the experimental groups of pigs were similar to their feed cost. As shown in the table, the lowest cost was for purebred piglets of maternal genotypes, while crossbred animals of these genotypes had 0.14–0.95 EUR higher costs, and piglets of the synthetic paternal line had 1.47–1.85 EUR higher costs.

The highest operational cost was found in hybrid piglets, which had an operational cost 1.47–2.98 EUR higher compared to purebred piglets of the Large White and Landrace breeds.

The operational cost of one piglet at the end of the rearing period included the rearing cost and the operational cost of the piglet at the start of this process. The highest operational cost per head at the end of the rearing period was in piglets of the synthetic paternal line, at 67.11 EUR. The sixth and seventh groups had slightly lower costs, by 2.27–3.81 EUR.

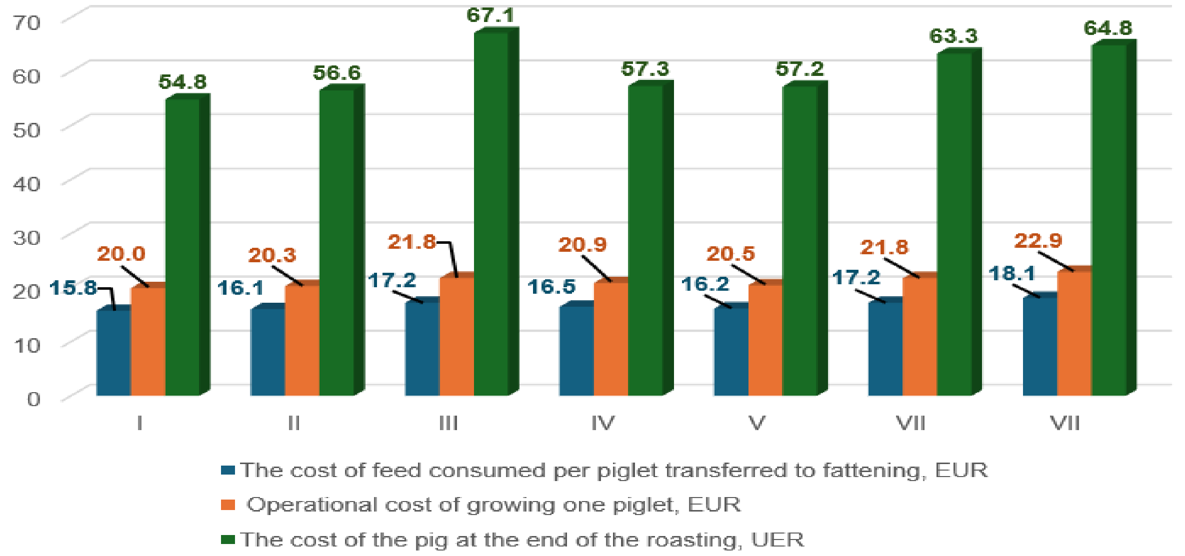

Fig. 2. Fodder and operational cost of rearing piglets and their cost upon completion of rearing
Source: own calculations.

Crossbred animals of maternal genotypes had even lower costs, by 9.78–9.90 EUR. The lowest costs (10.56–12.28 EUR) were in purebred animals of maternal genotypes.

Thus, piglets of the Large White and Landrace breeds had the lowest feed cost, operational cost, and cost per animal at the end of the rearing period. Crossbred piglets from combinations of maternal genotypes had higher feed, operational, and end-of-rearing costs compared to purebred animals, but these costs were lower than those of hybrid animals and piglets of the synthetic paternal line. The highest operational cost per piglet at the end of the rearing period was found in animals of the synthetic paternal line.

However, different results were obtained when comparing these same indicators per 1 kg of weight gain during the rearing period (Fig. 3).

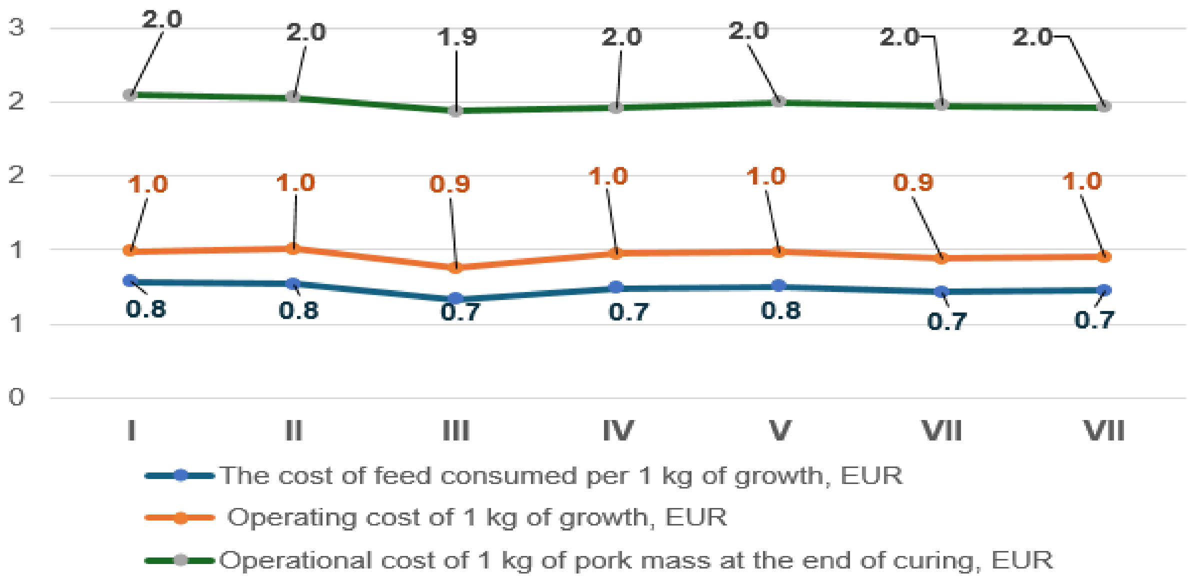

Fig. 3. Feed and operating cost of 1 kg of gain and 1 kg of live weight of piglets after the completion of rearing, EUR
Source: own calculations.

Due to higher growth intensity and greater absolute gains, the animals from the synthetic paternal line exhibited the lowest feed cost per kilogram of gain, outperforming the hybrid

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piglets of the sixth and seventh groups by 0.056–0.057 EUR, the crossbred animals of the fourth and fifth groups by 0.073–0.083 EUR, and the piglets of the first and second groups by 0.11–0.13 EUR.

A similar situation was observed for the operational cost per kilogram of gain and the cost per kilogram of live weight at the end of the rearing period.

Thus, the piglets from the synthetic paternal line demonstrated the lowest feed cost, being 7.4–8.6% lower than the hybrid piglets, 11.2–12.4% lower than the crossbred animals, and 13.0–14.8% lower compared to the maternal breeds.

The highest operational cost per kilogram of gain was found in purebred animals of the Large White and Landrace breeds, at 0.99 and 1.00 EUR, respectively. This was 0.5–3.3% higher than the crossbred animals, 3.8–6.5% higher than the hybrid animals, and 11.5–13.0% higher compared to the synthetic paternal line under their intra–line breeding.

Piglets from these same groups also had the highest cost per kilogram of live weight at the end of the rearing period, showing this indicator to be 1.6–4.3% higher than the crossbred animals, 2.6–4.1% higher than the hybrid piglets, and 4.5–5.4% higher compared to the synthetic paternal line animals.

The ultimate goal of pig production at an industrial enterprise is profitability and cost–effectiveness. As shown in the graph in Figure 4, due to the highest weight at the end of the rearing period, the pigs from the third experimental group had the highest market value, surpassing the hybrid animals of the sixth and seventh groups by 6.68 and 4.14 EUR, respectively, the crossbred animals of the fourth and fifth groups by 13.73 and 15.3 EUR, and the purebred animals of the Large White and Landrace breeds by 20.0 and 17.2 EUR (Fig. 4).

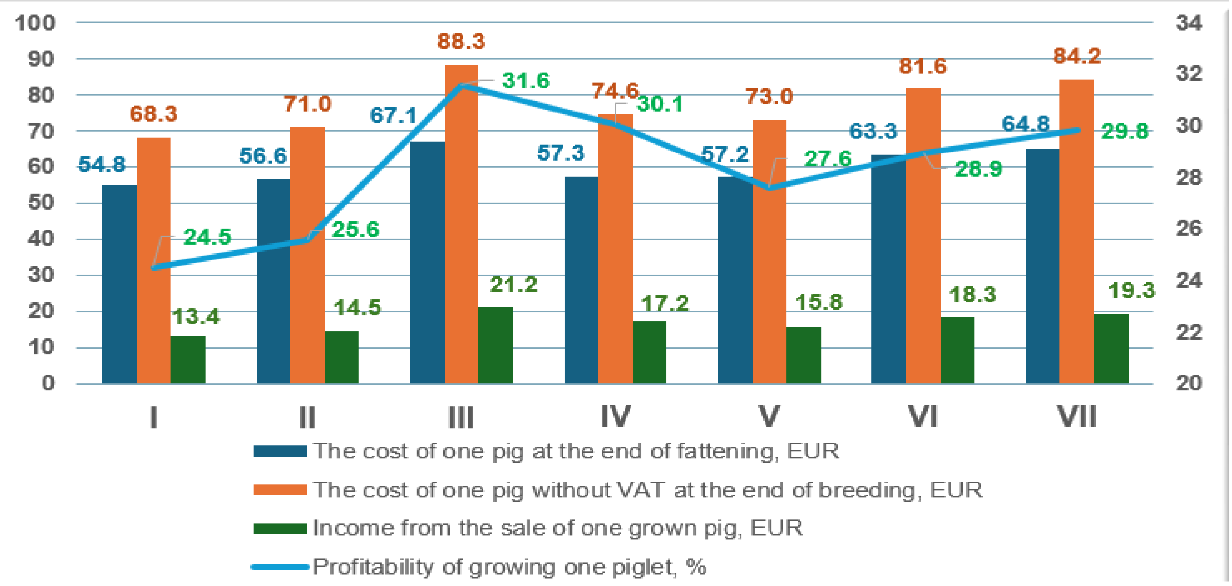

Fig. 4. Operating cost, sales value, income and profitability of raising purebred, crossbred and hybrid piglets
Source: own calculations.

Despite the highest cost for animals in this group, they showed the highest revenue per animal, which was 6.71–7.74 EUR more compared to the purebred analogues of maternal breeds, 3.94–5.4 EUR more compared to the crossbred animals of these breeds, and 1.86–2.86 EUR more compared to the hybrid piglets of the sixth and seventh groups. Due to the varying operational costs of raising one piglet and their different market values at the end of the rearing period, different profitability levels were established for raising purebred, crossbred, and hybrid piglets. As shown in the graph in Figure 4, the highest profitability level was found in the piglets of the synthetic paternal line under their intra-line breeding. The piglets of this group had a profitability level 1.49% higher compared to the crossbred piglets from the Large White and Landrace breeds (IV group), 1.77% higher than animals obtained by mating sows of the same combination with boars of the synthetic paternal line, 2.62% higher compared to hybrid animals from reverse crossing, and 3.98% higher compared to crossbreeds from Landrace sows and Large White boars, and 6.0–7.1% higher compared to purebred piglets of the Large White and Landrace breeds, respectively.

Thus, the highest profitability was obtained from rearing piglets through the intra-line breeding of synthetic paternal line PIC-337 animals, with the revenue from rearing these animals being 8.8–13.5% higher compared to rearing hybrid pigs, 18.6–25.5% higher compared to rearing crossbred animals, and 46.4–57.7% higher compared to rearing purebred animals of maternal genotypes. These same animals also showed the best profitability in production. According to the determined indicator, they surpassed hybrid animals by 1.77–2.62%, crossbred animals by 1.69–3.98%, and purebred animals by 6.0–7.1%.

Our conclusions that during rearing, purebred maternal breeds lagged behind the analogues of the synthetic paternal line PIC–337 in average daily and absolute gains and had higher live weights at the end of this period confirm the reports of [27, 29, 38, 46] about the better fattening performance of terminal line pigs compared to universal breeds and maternal lines. Our data on the 2.0–2.7% lower survival rate of piglets in maternal genotype nests compared to paternal ones are consistent with the reports [30], who also noted lower survival rates during rearing in paternal genotype pigs. The results obtained in our studies that hybrid piglets outperformed their crossbred counterparts from the crossing of these two maternal breeds in average daily and absolute gains and live weight at the end of rearing are identical to the reports of [5, 10, 28, 39] about the higher growth intensity of hybrid piglets compared to crossbreds but contradict the conclusions of [34] about better survival of hybrids compared to purebred and crossbred animals. In our experiments, no clear pattern was found regarding the influence of breeding methods on the percentage of piglet mortality during rearing. Our reports that hybrid piglets of English origin had better feed conversion compared to crossbred and purebred maternal breed counterparts are consistent with the reports of [12, 15, 17, 31], and the results showing that synthetic paternal piglets had better feed conversion compared to maternal breed analogues, their crossbreeds, and hybrids confirm the conclusions of [29].

Our conclusions about the higher efficiency of rearing hybrid piglets compared to purebreds are similar to the reports of [8, 37], who also established greater efficiency of hybridization compared to other breeding methods in pig farming.

We believe that further research is necessary to compare different breeding options for maternal and paternal breeds of foreign origin under the conditions of central Ukraine.

CONCLUSIONS

It has been established that during the rearing period, purebred piglets of the Large White and Landrace breeds were inferior to their counterparts of the synthetic paternal line PIC-337 under intra-line breeding in terms of average daily and absolute gains, had a lower weight at the end of this period but were inferior to them in terms of survivability.

It was determined that hybrid piglets surpassed their crossbred counterparts from direct mating in terms of average daily and absolute gains, live weight at the end of rearing, and survivability.

It was proven that hybrid piglets consumed more feed during the rearing period compared to their crossbred and purebred peers and had better feed conversion. While crossbred piglets consumed more feed and had better feed conversion compared to the original maternal breeds, the synthetic paternal line piglets consumed feed at the same level as their hybrid peers, but more than the crossbred and purebred animals of the maternal breeds, and showed the best feed conversion among all the tested animals.

It was found that purebred piglets had the lowest feed, operational, and per animal cost at the end of rearing. Crossbred piglets had higher costs compared to purebred animals but lower compared to hybrid animals and piglets of the synthetic paternal line. The highest costs were recorded in animals of the synthetic paternal line.

It was determined that purebred animals had the highest operational cost per kilogram of gain and per kilogram of live weight at the end of rearing, which was higher than in crossbred, hybrid animals, and piglets of the synthetic paternal line.

It was established that the highest profitability was obtained from rearing piglets of the synthetic paternal line PIC-337, with revenue from raising them being higher compared to hybrid, crossbred, and purebred animals of maternal genotypes. They also had the highest profitability in rearing.

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