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Duration Of Economic Use Of Breeding Sows With The Different Levels Of Fat Depth And Early Maturity.

Uhtverov AM^{1*}, BaymishevKh B², Khakimov IN¹, Kohanov MA³, Grigoryev VS², and Varakin AT³.

¹Doctor of Agricultural Sciences, Professor, Samara State Agricultural Academy.

²Doctor of Biological Sciences, Professor, Samara State Agricultural Academy.

³Doctor of Agricultural Sciences, Professor, Volgograd State Agrarian University.

ABSTRACT

The aim of the research was to determine the influence of fattening and meat qualities of pigs on their economic use duration. Studies were carried out on pigs of a large white breed in the conditions of a pedigree reproducer. All the experimental livestock was divided into groups, depending on the level of development of the fat depth and early maturity. Breeding sows, regardless of their group affiliation, differed by the date of their birth for 2-3 months. These animals were used in a herd of pig-breeding farm under the same animal welfare. In the process of control over these animals during 5 years, the number of animals culled on the annual herd classification date and their reproductive qualities were taken into account. In the course of the research, it was found that the greatest number of productive sows up to 44 months of age was in those groups where the pigs had a 2.46-3.30 cm fat depth. In addition, by the age of five, there were the greatest amount of pigs in the herd with a fat depth from 2.82 to 3.30 cm. It was also found that early maturity had practically no effect on the pig's life span until the age of 4-5 years. Analysis of the animals imported into the industrial complex showed that the main reason for the culling of pigs was the bronchopneumonia disease. In the group of breeding sows with the 2.16 cm fat depth, 31% of pigs were culled, in the second group - 25% and in the third group - 18%. The rest of the animals were culled for other reasons. As for first-time farrowed sows, there is no significant difference between pigs with a fat depth from 2.85 to 3.50 cm. At the same time, 27% of the pigs with a lowered backfat depth of generally did not give a single farrow due to premature culling. Regarding the age of the first farrowing animals practically did not differ from each other. However, the sows with the smallest backfat depth were characterized by a reduced yield of piglets per the first farrow, by 0.3-0.6 heads less compared to animals from other groups. As the thickness of the fat in each group increases, the gross output of piglets increases as well. If 124 pigs were obtained from the sows with the smallest fat depth, the same number of pigs with a fat depth from 3.03 to 3.50 cm gave 2.5-3 times more piglets. The given data give us the ground to believe that during the selection of pigs for meat or early-maturing type, extreme variants should not be taken into account. Apparently, the most favorable for pigs of combined breeds used in the conditions of large industrial complexes as maternal is the 2.7-3.0 cm fat depth level at a weight of 100 kg, 180-200 days early maturity and 11-12 prolificacy.

Keywords: Fat Depth, Early Maturity, Prolificacy, Breeding sow, Breed, Herd Classification, Farrow, Group.

**Corresponding author*

INTRODUCTION

According to the literature and our own studies, it is noted that individuals with record performance indicators for any one of the traits are inferior in level of development to other animals that have average performance indicators for all the traits being selected. For example, pigs with a very small fat depth of too early maturing are less prolific by the results of the first farrowing [1,3].

In this connection, we obtain a question how long and preferential selection of pigs according to a single characteristic (in terms of the fat depth or early maturity) will affect the development of other economically useful traits (especially the duration of economic use).

According to the results of experimental studies of a number of researchers, it is not possible to stop the genetic shift in large populations. Indeed, there is no the reduction in the breeding effect for a period of 13 generations on a single trait in the lots of the researchers materials. It took almost 25 years to obtain such a number of pigs generations. They also indicate that the correlation coefficients obtained do not indicate a stable deterioration in the reproductive qualities of animals in lines selected for reducing the fat depth. The multi-year Danish experience of improving pigs testifies to the continuation of the genetic shift. According to foreign producers of pigs over 40 years of work, the growth rate and feed payment for the Danish Landrace breed improved by about 10-15%, the length of the carcass increased by 9%, and the backfat depth decreased by 40%. However, the Danish experience also shows that prolonged selection for high meat has an undesirable effect on the quality of pork and the reproductive ability of sows. Almost continuously, the color of meat deteriorates and its moisture-retaining capacity decreases [2,4,6,7,8,9,10].

A. Berryuks found the decrease in the weight of piglets at birth by 15%, the number of piglets in the nest at a weaning by 22%, the average weight of piglets in the nest at weaning by 29%, and of the nest weight in the 130 days of age by 6% in the line selected for meat as compared to control in five generations, [4,16,17,18,19,20,21,22].

A number of other studies also note that achieving a high rate of growth and meat in pigs is accompanied by a decrease in viability, an increase in sensitivity to stress factors and a deterioration of the quality of meat [5,11,12,13,14,15].

Some authors note that in a number of cases the effect of selection actually ceased, even when a significant genotypic variation persisted in the lines being selected. Sometimes the reason for this was the inability to realize all possible combinations of genes, as a consequence of the linkage between the desired and undesirable genes. For example, I.M. Lerner selected chickens of white leggorn breed for elongation of legs for 12 generations. After 10-12 generations, the length of the legs increased by 1.4 cm, after 12 generations such selection did not give an effect. The number of full-grown offspring decreased in the population. This meant that when the selection plateau was reached, a decrease in viability was observed [6,7,8,9,10].

From a brief analytical review it is clear that in recent times there has been a certain contradiction between the quantity and quality of the products in the breeding work, so the solution of this question is topical.

In this connection, the following research materials attempt to elucidate the following question. Up to what limit it is possible to improve the parameters of the fat depth and early maturity, in which there will be no deterioration of viability, reproductive qualities and duration of economic use.

The aim of the research was to determine the influence of fattening and meat qualities on the duration of economic use of pigs.

To achieve this aim, the following research objectives were identified:

- to study the influence of sows fat depth on the duration of their economic use;
- to study the influence of sows early maturity on the duration of their economic use;
- to conduct an industrial check of the duration of economic use of sows in the industrial complex.

METHODS

Experiments were carried out in the conditions of a pedigree reproducer on pigs of a large white breed. The scheme of combining the sows into experimental groups is given in Table 1.

Table 1: The scheme of experience

Grouping of the sows by the fat depth		Grouping of the sows by early maturity	
The number of sows in the covering age, heads	Fat depth, cm	The number of sows in the covering age, heads	Early maturity, days
20	2,01±0,03	21	175±1,69
10	2,46±0,01	13	192±0,81
17	2,60±0,01	20	205±0,77
27	2,82±0,01	26	214±0,53
29	3,04±0,02	29	223±0,47
40	3,30±0,01	39	234±0,50
23	3,70±0,01	23	243±0,51
		17	254±0,66
		15	270±0,61

Breeding sows, regardless of their group affiliation, differed by the date of their birth for 2-3 months. These animals were used in a herd of pedigree reproducer under the same animal welfare. In the process of control over these animals during 5 years, the number of animals culled on the annual herd classification date and their reproductive qualities were taken into account.

RESULTS

During the research it was found that the number of farrowed sows with varying amounts of subcutaneous fat at the time of annual herd classification was ambiguous. The data are given in Table 2.

From the table it can be seen that the maximum number of sows was first time farrowed in those groups where the animals had a fat depth of 2.82 cm.

The highest number of productive sows up to 44 months of age was found in groups where they had a fat depth of 6-7 thoracic vertebrae level in the range of 2.46-3.30 cm. And by the age of five, herd with a fat depth from 2.82 to 3.30 cm had the most amount of sows.

Table 2: Number of farrowed sows by the time of annual herd classification

Groups	Grouping of sows by the level of fat depth, cm	The number of live sows by the time of the annual herd classification, %			
		in 100 kg	after 1 farrow	in the age of 42-44 months	in the age of 54-60 months
1	2,01	100	64	20	4
2	2,46	100	66	48	13
3	2,60	100	72	36	16
4	2,82	100	83	38	25
5	3,04	100	66	50	44
6	3,30	100	58	32	37
7	3,70	100	71	29	19

According to the table, we can see the largest waste of sows in the first group, where animals were characterized by too big fat depth. After five years of usage in this group, 4% of the sows remained, compared with the number of livestock that was at the beginning of the first mating. At the same time, there were quite a lot animals with a fat depth of 2.82-3.30 cm to this age in the herd (25-44%). After 44 months of age, the

number of sows decreases remarkably in groups where the animals had a fat of 2.01 cm and from 3.30 to 3.70 cm. This means that the sows with a very thin or very thick layer of fat is less adapted to prolonged use in conditions of the farm.

In order to study the effect of the early maturity of sows on their lifetime productivity, the same animals were used as in the previous experiment. Only in the formation of groups on early maturity two more groups of 15-17 heads in each were added. They were not used in the first experiment because they lacked the fat depth data (table 1).

The number of sows that was covered by annual herd classification after their farrowing is presented in table 3.

It can be seen from the table that the age of reaching a live weight of 100 kg had practically no effect on the pig's life span until the age of 4-5 years. The number of sows at the time of each herd classification in all groups was different, but we did not find their regular culling depending on early maturity. However, at the age of 54-60 months, the fastest-growing group lost the largest number of animals. When in all other groups by the indicated age in the herd there were from 18 to 40% of sows, in the first group there were only 15% of them. Perhaps, very early maturing sows do not stand against long-term usage and by the age of five they are culled more than sows from the remaining groups with more moderate and late-maturing indicators of maturity. Of course, the differences received by us are not too obvious, but they should be taken into account.

Table3: Number of farrowed sows by the time of annual herd classification

Groups	Early maturity of sows, days	The number of live sows by the time of the annual herd classification, %			
		in 100 kg	after 1 farrow	in the age of 42-44 months	in the age of 54-60 months
1	175	100	70	30	15
2	192	100	80	60	40
3	205	100	59	23	18
4	214	100	56	30	22
5	223	100	66	40	24
6	234	100	68	32	22
7	243	100	74	52	22
8	254	100	82	29	18
9	270	100	80	40	33

An analysis of the reproductive qualities of the sows indicates that there is no clear dependence of the reproductive ability on the age of early maturity. By the number of received farrowing for a certain period of time and by the reproductive qualities of the sows at an older age, the sows from different groups was practically the same.

Thus, reproductive qualities of sows are less susceptible to the negative influence of the overdeveloped early maturity of animals, rather than the fat depth.

Among the large white breed, as mentioned above, there are animals that differ among themselves in the level of development of economic-useful traits. Preliminary study of the productivity of pigs with different levels of development of meat and fattening quality showed that such pigs are not equal in terms of their reproductive quality and the duration of fruitful usage.

Considering the fact, that herd replacements come from breeding farms to commodity farms, it is not uninteresting to study their operational characteristics in conditions of large industrial complexes.

To study this issue 112 replacement gilts from the breeding farm were brought into the industrial complex (40 thousand heads of fattening per year). Their characteristics are presented in table 4.

Table4: Characteristics of experienced pigs (n = 16 heads in each group when buying)

Groups	With a live weight of 100 kg		At the age of 10 months				
	fat depth, cm	early maturity, days	amount of heads	liveweight, kg	culled animals, heads	% of culling	because of bronchopneumonia included, %
1	2,15±0,02	233±4,2	11	123±1,5	5	31	31
2	2,40±0,01	237±6,1	12	125±1,7	4	25	25
3	2,60±0,01	229±4,8	12	128±2,2	4	25	18
4	2,85±0,01	227±3,6	14	128±1,6	2	12	-
5	3,03±0,01	222±4,5	16	131±1,8	-	-	-
6	3,28±0,02	223±3,1	15	131±1,4	1	6	-
7	3,50±0,01	225±4,3	15	132±1,3	1	6	-

The data of the table indicate that the imported animals were similar in age. When grouping them according to the fat depth, it turned out that the pigs with a smaller fat depth had a slightly smaller live mass than animals with a thicker layer of backfat. These differences are preserved with a live weight of 100 kg and when the animals reach a covering age. These differences were reliable only at 10 months of age.

The greatest interest is represented by the number of culled animals from the time they are imported and until the age of maturity. Most of the pigs were culled in groups where animals were characterized by a very thin layer of fat. The main reason for the culling of pigs is their bronchopneumonia disease. In the group of sows with a 2.16 cm fat depth, 31% were culled, in the second group - 25% and in the third group - 18%. The rest of the animals were culled for other reasons.

Next, we tracked the culling of animals from the herd in the process of their production operation (table 5).

Table 5: Number of sows remaining in the herd after the ordinary farrowing

Groups of sows depending on the fat depth, cm	Number of sows covered, heads	Sows remained after the ordinary farrowing, %				
		1	2	3	4	5
		%	%	%	%	%
2,15	11	73	27	9	-	-
2,40	12	75	42	25	-	-
2,60	12	75	50	33	17	-
2,85	14	86	50	36	21	-
3,03	16	87	50	37	25	18
3,28	15	87	53	40	27	-
3,50	15	80	60	47	33	20

The table gives the number of sows from which farrowing is received during their operation.

As for the number of farrowed pigs for the first time, there is no significant difference between sows with a 2.85-3.50 cm fat depth. At the same time, 27% of the pigs with a reduced backfat layer generally did not give a single farrowing due to precocious culling. For the second time, the same number of sows was farrowed in all the groups except the first. In this group, there were two times less of farrowed sows than in the rest.

In groups with a very thin layer of backfat, the sows were generally culled after the third farrowing, whereas animals with a normal or thicker layer of backfat were culled from the herd much later. A significant part of them stood 4-5 farrowing.

As in the breeding reproducer the sows with a very small fat depth poorly maintain the conditions of industrial farm. These differences in the commodity farm are expressed more obviously than in the breeding farm itself.

The account of the productivity of the sows after each farrowing is presented in table 6.

Table 6: Multiple fertility of the sows depending on the level of development of fat depth

Groups	Fat depth, cm	Farrowings					Number of live achieved piglets from all the sows, heads
		1	2	3	4	5	
		heads	heads	heads	heads	heads	
1	2,15	10,3±0,19	10,3±0,82	10,2±0,92	-	-	124
2	2,40	10,6±0,28	10,6±0,42	10,5±0,40	-	-	180
3	2,60	10,6±0,43	10,7±0,29	10,5±0,43	10,5±0,63	-	222
4	2,85	10,9±0,59	10,8±0,22	10,6±0,42	10,5±0,37	-	292
5	3,03	10,9±0,32	10,6±0,24	10,5±0,75	10,3±0,27	10,4±0,33	369
6	3,28	10,9±0,25	10,6±0,24	10,5±0,75	10,6±0,82	-	332
7	3,50	10,7±0,26	10,7±0,52	10,3±0,42	10,5±0,42	10,5±0,38	381

By the age of the first farrowing animals practically did not differ from each other. However, as for the first farrowing, the sows with the thinnest layer of backfat were characterized by a decreased yield of piglets per 1 litter by 0.3-0.6 heads less compared to animals from other groups. The multiplicity of the sows in subsequent farrowing in all groups was practically the same.

The number of piglets received in each group from all sows during their lifetime use is of the greatest interest. Since the number of imported breeding pigs in each group was the same, the obtained data can fully characterize the effectiveness of using animals with different fat depth in the conditions of large commodity farms.

According to the table, the direct dependence of the total number of piglets received in each group from all sows during their life on the level of backfat development is clearly seen.

With the increasing of fat depth in each group the gross yield of the piglets is also increasing. If 124 piglets were obtained from the sows with the thinnest layer of fat, the same number of sows with 3.03-3.50 cm fat depth gave 2.5-3 times more piglets.

CONCLUSION

The presented material allows us to conclude that when one of the characteristics evades toward its improvement to an excessive extent, there are negative consequences for the development of other characteristics.

Excessive thinning of fat and improvement of early maturity lead to a deterioration in the reproductive qualities of the sows and a reduction in their production use. Animals often catch colds and other lung diseases. Apparently, the fat depth, used in breeding work, as an indicator of meat carcasses, still fulfills a physiological, i.e. protective function. The unfavorable influence caused by unilateral improvement of meat quality is obviously influence on the overall indicator of the productivity of the breeding sows and on their health when they are used in industrial complex conditions.

The above mentioned data give us the ground to say that when the pigs are selecting for meat or early maturing types, we should not be enthusiastic about too extreme variants. Apparently, the most favorable characteristics for pigs of combined breeds used as maternal in the conditions of large industrial complexes must be considered as the fat depth at the level from 2.7 to 3.0 cm with the weight of 100 kg, 180-200 days early maturity and 11-12 piglets multiple pregnancies.

At present, the main economic-useful signs of pigs in most breeding farms are brought to a high productivity level. The further efforts of animal breeders should be directed, first of all, on the increasing of animals viability, which is very important in conditions of widespread transfer of a pig husbandry into industrial production. In addition, the entire technological system of feeding, management and exploitation of pigs should be constantly improved, which would promote the most complete manifestation of the animals genetic characteristics in these conditions.

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